



ADMINISTRATION REPORTS
OF SUBORDINATE OFFICERS OF THE
DEPARTMENT OF AGRICULTURE
MADRAS

FOR

1943-44



PRINTED BY THE SUPERINTENDENT
GOVERNMENT PRESS
MADRAS
1949

R
J. 24/4/43
N49

36138

TABLE OF CONTENTS.

	PAGE
1 Principal, Agricultural College, Coimbatore	I
2 Paddy Specialist, Coimbatore	11
3 Cotton Specialist, Coimbatore	22
4 Millet Specialist, Coimbatore	30
5 Oilseeds Specialist, Coimbatore	44
6 Pulses Specialist, Coimbatore	54
7 Fruit Specialist, Kodur P.O. (Cuddapah district)	56
8 Government Agricultural Chemist, Coimbatore	72
9 Government Entomologist, Coimbatore	81
10 Government Mycologist, Coimbatore	93
11 Lecturer in Botany, Coimbatore	105
12 Bio-Chemist, Kodur	114
13 Research Engineer, Coimbatore	132
14 Senior Lecturer in Agriculture and Superintendent, Central Farm, Coimbatore	141
15 Provincial Marketing Officer, Madras	146
16 Deputy Director of Agriculture, Guntur	157
17 Deputy Director of Agriculture, Chittoor	179
18 Deputy Director of Agriculture, Coimbatore	196
19 Curator Government Botanic Gardens and parks and District Agricultural Officer Ootacamund	226
20 Special Officer for Vegetable Cultivation, Coonoor	234

ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE DEPARTMENT OF AGRICULTURE, MADRAS, FOR 1943-44.

ADMINISTRATION REPORT OF THE PRINCIPAL, AGRICULTURAL COLLEGE, COIMBATORE, FOR THE FASLI YEAR ENDED 30TH JUNE 1944.

I submit herewith the annual report for the fasli year 1943-44.

2. *Charge.*—I was in charge as principal in addition to my permanent post as the Government Agricultural Chemist up to 18th August 1943. As ordered in G.O. Ms. No. 1845, Development Department (confidential), dated 14th August 1943, I assumed charge as the wholetime Principal on 19th August 1943 handing over the post of the Government Agricultural Chemist to Sri H. Shiva Rao.

3. *Staff.*—Sri C. Narasimha Ayyangar, Estate Civil Engineer, availed of leave on average pay granted to him for four months from 24th January 1944 and Sri U. Madhava Rao, officiated as Estate Civil Engineer during the period. Sri C. Narasimha Ayyangar was again granted leave on average pay for two months from 23rd June 1944 preparatory to retirement. I held additional charge of the post from 23rd June 1944 until Sri U. Madhava Rao who was again posted to officiate as Estate Civil Engineer joined duty on 15th July 1944. Sri G. J. Valeswara Ayyar, draughtsman was on leave on average pay for 2½ months from 22nd April 1944.

4. *Tours.*—I was on tour to Samalkota and Madras from 17th to 23rd June 1944 in connection with the selection of students for the B.Sc. Agricultural Class I of 1944-45. Besides this I went on tour to attend the following functions:—

(1) Meeting of the Madras University Board of Studies in Veterinary Science at Madras on 3rd July 1943.

(2) Selection of candidates at Madras for the Post Graduate Course in the Imperial Agricultural Research Institute, New Delhi on 14th August 1943.

(3) To participate in the consultations of Soil Scientists with Dr. H. L. Richardson at Delhi from 9th to 11th September 1943.

(4) To attend a meeting at Bangalore of the question paper setters and examiners for the B.Sc. Agricultural Examinations on the 6th October 1943.

(5) To assist in the selection of candidates for the I grade of the Upper Subordinate Cadre of the Madras Agricultural Subordinate Service by the Madras Public Service Commission at Madras on 1st November 1943.

5. *The College*.—The College re-opened for the second and third year classes on the 15th June 1944 and the 1st year class commenced on 3rd July 1944.

6. *Admissions—1944*.—With a view to meet the acute shortage of agricultural graduates available for employment in the Madras Agricultural Department at the present time and the anticipated demand for these graduates in the post-war years, the Government, in their Order Ms. No. 2776, Development, dated 27th June 1944, sanctioned an increase in the number of admissions from 48 to 96 for a period of three years commencing from 1944-45.

Three hundred and ninety-two qualified candidates applied for admission as against 194 in previous year and 332 candidates appeared for interview, at the three centres, Samalkota, Madras and Coimbatore. Reservation of seats was made for three Orissa Government Scholars and two Hyderabad State students. Selection was made for the balance of 91 seats as per instructions contained in G.O. Ms. No. 19-s, Development, dated 18th June 1941. Thirty-two candidates were placed on the waiting list. Only 82 candidates from the selected list actually joined and nine vacancies were filled up from the waiting list. The present strength of the class is 96. The following table shows the communal and linguistic proportions of the admissions made:—

TABLE I—Communal.

	Strength.
Brahmins	40
Non-Brahmins	30
Muslims	6
Christians	5
Backward	13
Scheduled classes	2
Total	96

TABLE II—Linguistic.

	Strength.
Telugu	42
Tamil	36
Kannada	5
Malayalam	6
Coorg	2
Orissa	3
Hyderabad	2
Total	96

7. *Short Courses in Practical Agriculture*.—The Farm Management Course which comprises the various short courses detailed below was conducted during the year:—

	Strength.
Farm management (crops)	10
Horticulture and vegetable gardening	9
Insect pests and diseases	8
Dairying	8
Care of animals	8
Bee-keeping	6
Jaggery making	7
Malt making	9
Farm implements and machinery	6

8. *Students' tour*.—The restriction in travelling by rail continued and consequently the usual educational tours for the second and third year students were undertaken piecemeal and were confined to nearby places only. The students of the second year were taken in October 1943 and in January 1944 to Mettupalayam, Kallar, Coonoor, Ootacamund, Nanjanad, Pattambi, Trichur and Ernakulam and the third year class to Tanur, Calicut, Taliparamba, Kasaragod and Mangalore in November 1943.

9. *University Examinations*.—The result of the B.Sc. Agricultural Examinations in 1944 were as follows:—

	Number appeared.	Number passed.
First year	46	45
Second year	41	32 in full and 7 with references only.
Third year	35	33

All the six students who had reference in one subject only in the second year examination of 1943 completed the reference subject during the 1944 examination.

10. *Scholarships*.—Scholarships were awarded to students of Classes I to III during the year 1943-44 as follows:—

	First year.	Second year.	Third year.
To Muhammadans	1	2	2
To Backward classes	1	3	3
To Scheduled classes awarded by Labour Department	1	..	..
To other classes (Christians)	1	..	..

One Muslim scholarship in Class III and two backward class scholarships in Class II fell vacant during the year and were awarded to candidates of the respective communities and class. The recipient of the Lord Pentland Scholarship continued while the Dr. Rangachari Scholarship was awarded to a student of the first year class afresh.

11. *College Board*.—The meetings of the College Board, one in December 1943 and the other in March 1944 were held.

12. *The College Hostel*.—The average number of students that stayed in the hostel during the year was 133. Two students left the College, one in July 1943 and the other in December 1943 due to ill-health. Two other students left the college as they were detained in the selection examination. Three students of the Short Course left the college of their own accord without completing the courses.

For the major part of the year three messes, viz., general, Telugu and non-vegetarian, were run but occasionally the Telugu mess was subdivided whenever congestion was felt. A special mess was run during the Christmas vacation as well as during the Summer vacation. The average attendance and daily rates worked out as follows:—

	Average daily attendance.	Average daily rates.
		RS. A. P.
General mess	31.9	0 11 7
Telugu mess A	38.5	0 13 10
Telugu mess B	31.0	0 13 9
Non-vegetarian mess	33.4	0 14 7
Special mess	34.5	0 13 10
Average for the year for all the messes ..	123.0	0 13 6

Rationing of rice was introduced from 5th December 1943 and rice rations were given twice a month. The prices of all provisions have gone high and difficulty was experienced on obtaining them in sufficient quantities even at these high prices, especially fuel, dhall, milk, etc. The general condition of health was good. All the students were inoculated against plague twice, once at the beginning of the year and again in February 1944 as plague situation was serious in Coimbatore town and in the villages bordering the estate. All the servants and suppliers were also compulsorily inoculated.

As the students were very particular in holding the Hostel Day, it was conducted in March 1944, without much expenditure.

Sri T. Nataraj continued to be the Hostel Warden.

13. *Students' Club*.—The inaugural address of the club was delivered by Sri K. C. Ramakrishnan, M.A., Lecturer in Agricultural Economics. Seven lectures and one debate were held during the year under review. The Club Day was celebrated on the 19th February 1944 under the Presidency of R. C. S. Bell, Esq., I.C.S., Collector of Coimbatore. The members of the club contributed to the Rayalaseema and Bengal Relief Fund.

14. *Games*.—The students took an active interest in all the games. Cricket, Hockey and Football were the most popular.

15. *College Day*.—The thirty-second College Day sports were held on the 29th January 1944. New records were set up in 400 metres and 1,500 metres races. The Vengayil Krishnan Nayanar Cup for the Champion athlete of the year was won by student K. Sundaram. The Parlakimedi Cup for the best all round sportsman was awarded to G. H. Sankara Reddi.

16. *The College Museum*.—Besides catering to teaching, the College Museum continued to attract a large number of visitors who numbered 9,228 during the year under review. The visitors included a large number of recruits and officers from the 3rd Madras Regimental Centre at Madukarai and also evacuees in camp at the old Forest College Estate.

17. *The Library*.—Sri D. B. Krishna Rao, B.Sc. (Hons.), M.Sc., Dip. in Lib. was in charge as Librarian throughout the year. Though your orders for the open access system definitely stated that there should not be frequent changes of Library staff to enable unhampered routine work, the transfer of two trained hands, Messrs. P. Anandan Nair and S. Iswaramurthy, Library Head Clerk and library second clerk, respectively, were ordered and in their places temporary appointments under emergency powers have been made. These transfers have interfered with the routine work particularly the compilation of the current literature and the cataloguing of periodical literature.

During the year, 1,772 books and publications and 1,841 numbers of periodicals were received and added to the Library and 1,580 numbers of periodicals were circulated to Heads of Sections at Coimbatore and also to outside officers. From the Main Library 3,726 books and publications were issued on loans to local and outside officers and 1,490 books to students from the Students' Library at the Freeman Building. The open access system has facilitated increased reference service to the officers at the Research Institute and teaching staff and 6,797 books were consulted by them within the Main Library. Three hundred volumes of books and publications were got bound by the Superintendent, Government Press, Madras. The Librarian prepared 8,570 catalogue cards, half of which related to subject analytical entries and the remaining half to Author analytical entries. He prepared a classified list of titles of periodicals in the Main Library with a subject index. He compiled a Bibliography on Cattle Fodder, a short Bibliography on Tapioca and an exhaustive alphabetical subject index to books in the Main Library. He was deputed to attend the Sixth All India Library Conference held at Jaipur where he read a paper on "Agriculture in Colon and Decimal Classification" viewed in perspective.

18. *Estate Committee*.—The usual monthly meetings were held in the first week of every month.

ESSENTIAL SERVICES.

19. *Electricity*.—The connected load in the Estate distribution increased to warrant the erection of a second Transformer of a 75 K.V.A. capacity. This additional Transformer is entirely for

the Malt Factory. The erection of this is in progress. The old battery set required extensive renewals to function properly and even then it was too small to take even the minimum load required at night for the Research Institute. Hence, as recommended by the Electrical Engineer (General), Madras, the set has been dismantled and the two generator sets are run alternatively day and night. The consumption of electrical energy has further increased during the year due mainly to the heavy work at the Malt Factory.

20. *Gas supply*.—During the year 3,76,500 c.ft. of gas was manufactured and distributed to the Laboratories at the Research Institute and the Freeman Buildings. The old corroded and punctured plates of one of the High Pressure gas tanks were renewed.

21. *Water-supply*.—The daily average pumping period for each of the 12 months under report ranged from 13 to 16 hours and the daily average consumption of water ranged from 53,070 gallons to 66,320 gallons.

22. *Activated sludge plant*.—The working of the plant was suspended since May 1942. The parts are being kept clean and protected against corrosion.

23. *Civil Engineering Section*.—A sum of Rs. 9,471 was spent on repairs to non-residential buildings and roads, etc., and works for the other sections as per details below :—

	RS.
(1) Repairs to non-residential buildings	1,100
(2) Repairs to roads	1,061
(3) Renewing the crown and side plates of one high pressure gas holder	4,785
(4) Construction of a masonry pit, etc., for fumigation of foodstuffs	484
(5) Repairs to flooring and roof of cattle-shed in Serum Institute compound	892
(6) Construction of a sales room in the College Orchards	1,149
Total	9,471

Other items of Civil Engineering section consisted of—

	RS.
(a) Estimates prepared	40
	(amounting to Rs. 95)
(b) Bills prepared	31
(c) Plans drawn	8
(d) Tracings made	1
(e) Blue prints taken	1
(f) Completion reports	32

The Estate Civil Engineer and the draughtsman conducted the following Theory and Practical classes in Civil Engineering :—

	Number.	Hours.
Lectures delivered to B.Sc. Ag. class I	26	35
Do. class II	17	17
Practical classes conducted to B.Sc. Ag. class I	39	99
Do. class II	19	57
Total	101	208

The Estate Civil Engineer with the assistance of the Electrical Supervisor is in charge of the Estate Fire Corps and Fire Drill practices were conducted on all Wednesdays.

24. *Health and Sanitation of the Estate*.—There were 13 births and 7 deaths in the Estate during the year and none of the deaths was due to any of the preventible diseases. Three cases of measles, 20 of chicken-pox and one each of enteric fever and diphtheria (suspect) were reported but none of these was fatal or otherwise serious. An experiment on the composting of the rubbish and nightsoil conserved on the Estate is being conducted by the Government Agricultural Chemist since May, 1944.

An outstanding feature bearing on the Health of the Estate was that the epidemic of plague which raged during the year in the Coimbatore town and suburbs and which threatened the estate literally from all sides was successfully prevented from entering the Estate by intensive and rigorous measures taken promptly in good time and maintained until Coimbatore was declared completely free from it. Continuous and sustained vigilance was organised and kept up throughout the pendency of the threat to exclude from the Estate all avoidable traffic both vehicular and pedestrian, as well as that of grains, stores and other commodities and personal effects. Such stores, commodities and personal effects as could not be so excluded were subjected to a process of disinfection. A fumigation shed and a drying floor was specially constructed immediately for this purpose. All gates leading to the Estate from outside, except two, were locked and protected and continuous watch was kept at the two gates. Entry into the Estate by anyone was regulated by means of system of pass issued by name under my signature. This worked very successfully and prevented undesirable persons entering the Estate. All residents on the Estate as well as such others as were in any way associated therewith were required to be protected by prophylactic inoculation and 2,179 cases were so protected in the Estate. The destruction of rats by trapping and baiting indoors was pursued with intensified vigour and all rat burrows in and around all buildings in the Estate were fumigated with cyanogas. All dead rats found in whatever parts of the Estate were examined for the presence of " *Bacillus pestis* " by the Agricultural Bacteriologist in the first instance and on the least suspicion by him the

duplicate smears were sent for further examination to the District Medical Officer, Coimbatore, and to the Director of the King Institute, Guindy, for further diagnosis. None of them was declared positive. It is gratifying to record that the College Estate with a population of about 1,700 people, was completely free from plague during a very anxious time.

Cholera was also raging in Coimbatore more than once during the year. It spread even to villages bordering the Estate. Preventive inoculation was immediately resorted to and the immunity of the Estate remained unaffected here also.

25. *Centralized activities.*—The following activities were continued :—

Allocation of quarters,

Supply of clerks within the unit,

Arrangements for essential commodities for the Estate residents, and

Dealing with enquiries from the public and others regarding matters connected with the College and Research Institute.

26. *Agro-Industries Committee.*—As a result of your inspection of the Malt Factory in May 1944, the administrative control of its working was entrusted to me and an Advisory Committee was formed with—

Government Agricultural Chemist,

Government Mycologist,

Government Entomologist,

Research Engineer,

Principal (Chairman), and

Superintendent, Malt Factory (Secretary)

to advise on the technical aspect of its working. The first meeting of this committee was held on the 17th and the 18th May 1944.

Committees were also formed with a view to advance the production of Agar-Agar and of Yeast. The first meeting of the Agar-Agar Committee was held on the 13th May 1944 and of the Yeast Committee on the 22nd May 1944.

27. *Board of Honorary Visitors.*—The members of the Board constituted as per G.O. No. 237, Development, dated 3rd February 1942, continued to pay periodical visits to the College and two meetings of the Board were held on 25th September 1943 and 7th March 1944. The proceedings of the meetings have been communicated to you.

28. *Visitors.*—His Excellency the Viceroy and His Excellency the Governor of Madras visited the College and Research Institute on the 22nd February 1944. The Director of Agriculture was also present here on the occasion.

The following eminent gentlemen visited the College and Research Institute during the year :—

Sir H. M. Hood, K.C.I.E., I.C.S., Adviser.

Mr. S. V. Ramamurthi, C.I.E., I.C.S., Adviser.

Sri K. S. Nair, Principal, Madras Veterinary College.

D. Rhind, Esq., Economic Botanist to the Government of Burma at Simla.

C. R. F. Williams, Esq., Conservator of Forests.

Dr. S. P. Ayyar, Soil Survey Officer, Imperial Agricultural Research Institute, New Delhi.

Mr. U. Hpu, Officer on Reconstruction (Agriculture), Government of Burma at Simla.

Dr. E. J. Vevai, Assistant Parasitologist, New Delhi.

Mr. P. T. Jinendradasa, Agricultural Staff Officer, Ceylon.

Lieut.-General Hutton, Officer on Special Duty in connexion with Post-war Reconstruction.

Dr. Pau, Dr. Ma and Mr. Chiu of the Chinese Agricultural Mission to India accompanied by Dr. Chona of the Imperial Agricultural Research Institute, New Delhi.

Dr. A. A. Khan, Chairman of the Mysore Sugars, Ltd.

The Director of Industries and Commerce.

Lieut. J. D. Berkeley Hill.

Some of the members of the Health Survey and Development Committee.

Capt. J. N. Chubbs, Educational Officer, Military Department.

Captain Webb, Officer on Special Duty, Government of India.

Dr. Ramanujam, II Economic Botanist, Imperial Agricultural Research Institute, New Delhi.

Dr. A. Aiyappan, Superintendent, Government Museum, Madras.

Mr. D. I. Gandhi, Agricultural Engineer to the Government of India.

Dr. Shaffi of Coonoor.

His Highness the Jam Sahib of Nawanagar and Party.

The Fruit Specialist, Kodur.

The Superintendent, Agricultural Research Station, Anakapalle.

The Headquarters Deputy Director of Agriculture, Madras.

The District Agricultural Officer, Chittoor.

Mr. P. V. Wagle.

Mr. B. T. Narayana.

Mr. M. Narayana Reddi.

Mr. B. G. Appadurai Mudaliar.

Mr. K. R. Sontakey.

Mr. M. Anantanarayana Rao.

For Univer-
sity Exami-
nation in
B.Sc. (Ag.),
1941.

Party of pupil teachers of Gandhi Secondary Training School.

The Senior Class students of the Indian Forest College, Dehradun.

Party of students of Forest Guards School, Satyamangalam.

Two post-graduate students of the Imperial Dairy Institute, Bangalore.

COIMBATORE,
17th August 1944.

P. VENKATARAMIAH,
Principal, Agricultural College.

ADMINISTRATION REPORT OF THE PADDY SPECIALIST FOR THE YEAR 1943-44 (FASLI 1353).

Charge.—I continued to be in charge of the Paddy Section, during the year, except for a period of four months from the 6th December 1943 to the 5th April 1944, when Sri T. K. Balaji Rao acted as Paddy Specialist. As in the previous year, I was in direct charge of the Agricultural Research Stations, Pattambi, Maruter, Tirurkuppam (Chingleput), and Mangalore and also exercised technical control over the Rice Research Stations, Buchiredipalem and Ambasamudram. Late in the year an area of 6.64 acres comprising dry and single crop lands, out of 25 acres proposed for acquisition for opening a Paddy Breeding Station, Mangalore was taken possession of, to commence construction work. Sanction was also accorded by the Government in G.O. Ms. No. 1414, Development, dated 29th March 1944 for the extension of the area of the Agricultural Research Station, Pattambi, to increase the seed production required for running primary seed farms in the district. In connexion with this extension scheme, Sri M. B. Venkatanarasinga Rao has been appointed as Assistant Paddy Specialist from the 15th of April 1944. For the second year in continuation, the Paddy Specialist was in charge of running the scheme for the maintenance of the cultures in paddy, gingelly and redgram of the Government of Burma.

2. *Season.*—At the Paddy Breeding Station, Coimbatore, though the total rainfall of 23.14 inches of rain received on 67 days was normal, yet its bad distribution coupled with the long break from the end of August to the third week of October and the consequent difficulty in obtaining water-supply into the tank, pulled down the yield of the crop under the Chitraichavadi anicut system. On the other hand, at Maruter, the total rainfall of 34.91 inches was in deficit by 10.99 inches and yet normal yields were obtained in the first crop as a result of even distribution of rain. At Pattambi the total rainfall of 103.45 inches was more or less the average record of rainfall for the station. But the ill-distributed South-west Monsoon rains reduced the yield of the first crop. The second crop harvest was however normal. The total rainfall of 81.85 inches on 64 rainy days at Tirurkuppam was nearly the double of the five-year average and hence the season was quite favourable for the cultivation of paddy in the Chingleput district in all the three seasons—*sornawari*, *samba* and *navarai*. At Buchiredipalem in the Nellore district, the season for paddy was very favourable. A total rainfall of 48.74 inches which is 13 inches in excess of the average, was recorded, while at Ambasamudram in the Tinnevely district, the total fall of 44.37 inches was in excess of the average by 6.24 inches and this excess fall during

the South-West Monsoon months adversely affected the growth of the first 'kar' crop. The second crop of 'pishanam', however maintained normal yields.

3. *Planting*.—At Coimbatore 10,542 experimental plots were planted and studied during the first and second crop seasons while at Maruter, Pattambi, Tirurkuppam and Buchireddipalem they numbered 6,361, 5,499, 4,237 and 2,164, respectively.

4. *Seed distribution*.—The total quantity of seed paddy distributed from all the Agricultural Research Stations in the Presidency put together, mainly to meet the needs of primary seed farms run in the districts, was 579,394 lb. as detailed in Appendix I of this report.

5. *Economic work—New strains under distribution*.—Among the new strains under distribution, MTU. '19 (*Sanna kusuma*) continued to maintain its merit in the Kistna district. In the Southern districts, Co. 19 is making a mark in all the centres where it was under trial. It is expected that it will soon replace ADT. 11, Co. 15, and Co. 16. It is also found to be comparatively resistant to stemborer and accommodative to irregular water-supply during its growth period. MTU. 15 (*Dalwa sannam*) has for the second year established its superiority over other 'kar' and 'kuruvai' strains tried in the 'navarai' (February-June) season in the Kulittalai and Musiri taluks of the Trichinopoly district. Co. 21 (*Arupatham samba*) and Co. 22 (*Manavari*) were tried with success in cold weather in the Salem district. The strains have recorded an increase of 12 to 25 per cent over the local unselected bulks.

6. *Strains released during the year*.—Culture 4677 in *Athikaraya*, the second crop variety of the South Kanara district, recording an increase of 18 per cent over PTB. 6 (*Athikaraya*) an earlier release and culture 4856 in *Chitteni* of North Malabar recording an increase of 23 per cent over the local, were released from the Agricultural Research Station, Pattambi as PTB. 18 (*Athikaraya*) and PTB. 19 (*Vadakkan Chitteni*) respectively. It is very pleasing to record that the selection work taken up at the Rice Research Station, Ambasamudram, in five of the important varieties cultivated in the Tinnevely district has resulted in the release of five strains for cultivation—culture 1055 in *Karsamba red* maintaining an average increase of 21 per cent over local and 12 per cent over Co. 9 an earlier release; culture 1916 in *Karsamba white* with an increase of 10.5 per cent; culture 2355 in *Veedhi-vadangan* recording 12.5 per cent increase; culture 21 in *Kuruvikalayan* with an increase of 33.6 per cent over the respective unselected bulks and culture 3224 in *Karthigaisamba* or *Poombalai* with 10 to 15 per cent increase over Co. 2 a strain very popular in all the Southern districts. Incidentally it will be seen, that in two cases, high-yielding strains over the strains isolated

in the same variety at Coimbatore, have been obtained by undertaking the selection work in the locality itself and this fact fully justifies the policy of establishing Rice Research Stations in each of the important paddy growing areas of this Presidency.

7. *Work on the isolation of strains resistant to blast*.—This work is in progress from the year 1938 at the Rice Research Station, Buchireddipalem, Nellore district, where the disease is noticed to be more or less endemic. Thirty-six cultures possessing varying degrees of resistance to blast disease and drought and good quality of rice were isolated from the local *Molagolukulu* variety of repute. All these cultures were maintaining higher yields consistently for the previous three years mainly by virtue of their resistant character to the blast disease which was affecting the local unselected bulk to a great extent. During the year under report, six of the cultures that possessed all the desirable characters, were tried in the district for the first time. The season being free from any disease, these cultures did not maintain the high yield they recorded in the previous years. All the same, their performance was better than the local unselected bulk. Each one of them was found to be the best yielding in each of the centres they were under trial. The trials conducted with the six cultures at Tirurkuppam, Aduturai and Palur also showed that cultures 2202, 2552, 2555 were on a par with Co. 19, the best yielding strain of the *Nellore samba* group. However, the final selection of a cosmopolitan strain combining all the desirable characters for resistance to the disease, drought and good cooking qualities of rice from among the materials on hand would take some years.

8. *Cultures under trial in the district*.—Three cultures in *Rangoonsamba*, maintaining an average increase of 12 to 15 per cent over the local unselected bulk were under trial in the second crop season in Erode. Culture 987 alone recorded an increase of 10 per cent over the standard. The results of the trial of the two promising cultures in *Tekkan* from Pattambi, and three cultures in *Atragada* from Buchireddipalem were inconclusive. Two cultures 2737 and 2927 in *Anaikomban* of Tinnevely showing an average increase of 12 per cent over Co. 8 and two cultures 4960 and 4963 in *Arikaravi* were under observation in the district and maintained their merit. The choice of one of them for release will be decided upon after giving them a trial for another season or two.

9. *Cultures under different stages of trial*.—At the Paddy Breeding Station, Coimbatore, 90 cultures in *Pudupattisamba* from Salem and *Bangarutheegalu* of Kurnool were selected to undergo further trials. At Aduturai two cultures in *Vadakathisamba* and *Poonsamba* of the upland taluks of the Trichinopoly district recorded an increase of 18 per cent over the bulk and await trial in the districts. At Pattambi, three cultures in each of *annachamban* and *valiachamban*, have maintained an average increase of 11 to 18 and 12 to 20 per cent over their respective bulks,

while five of the cultures in *vattans*, of Ponnani taluk recorded increases varying from 9 to 25 per cent. One culture in each of the three second crop varieties, kodian, vellakoli and arikaravi is maintaining an increase of 20 per cent. At the Agricultural Research Station, Taliparamba, one culture in each of the North Malabar first crop varieties, *thonnooran*, *keeripala* and *vadakkan* recorded increases varying between 14 and 16 per cent over the standard. At Maruter, five cultures in the three *kusuma* sub-varieties, thirteen in *gunmassari* and *prayaga*, and fifteen cultures in *konamani* are promising so as to make themselves fit for further trial. At the Rice Research Station, Tirurkuppam, two cultures in *kappasamba* recorded an increase of 24.8 and 12.8 per cent over the local bulk. It is also gratifying to note that 12 of the 97 promising cultures of *radansamba* selected for further trial recorded significant increases over ADT. 22, a strain already under distribution in the Chingleput area. In the *navarai* season 25 cultures underwent yield trials for the second year. Two of the *manakkattai* cultures also recorded an increase of 14 and 10 per cent over the unselected bulk. At the Anakapalle station 75 cultures and varieties were under yield trials. The best of the cultures in *ramagada* and *ramasagaram* showed increase of 14 per cent and *mypali* 355 yielded on a par with BAM. 9 and BAM. 10. At Samalkota 198 cultures in three varieties were under yield trial and the promising ones were transferred to Maruter for further work. As a result of the preliminary yield trial conducted at Ambasamudram 25 cultures in *thuyyamalli* and 16 in *avasarasamba* of the short duration varieties and 25 of *kolaralai* of the *pishanam* season were selected to undergo regular yield trial in the next season.

10. *Varieties taken up for selection.*—The study of the selection in ten varieties of Ramnad and seven of Gudalur at the Paddy Breeding Station, Coimbatore, resulted in the fixing of 399 cultures in the former and 273 in the latter group for preliminary yield trial. At the newly opened Rice Research Station, Tirurkuppam the examination of the crop grown with the local ryots' seed of the three rainfed paddy varieties of the tract, namely, *bairuradlu*, *pisini* and *sembalai*; five *samba* varieties, viz., *seevanasamba*, *kambansamba*, *palan samba*, *kittansamba* and four 'kar' and 'nerarai' season varieties, viz., *sornawari*, *giddakar*, *thellathokaradlu* and *manakkattai* was done and a large number of single plants have been selected for study. At Pattambi, in addition to the isolation of seventy-five selections in *bengala chitteni* for the second crop, pure line selection in four of the South Kanara varieties were multiplied for being transferred to the Mangalore station.

11. *Introduction.*—*Patnai* type T. 672, continued to grow in popularity in Erode and Dharmapuri taluks in the place of *Rangoon samba* and G.F.B. 21 respectively. S.R. 26 and T. 672 were also found to be promising when compared to *kappa samba* in

Tirurkuppam and MTU. 1 at Maruter. PTB. 2 has again maintained its superiority over *veedhivadangan* in the first crop and *kalmavari* in the cold weather at the Rice Research Station, Ambasamudram.

In the same station PTB. 15 is successfully competing with Co. 8 for the *pishnam* season. MTU. 4 and SLO. 3 at Tirurkuppam are also comparing favourably with *kappasamba*. The results of a large number of intervarietal trials of *kar* and *kuruwai* duration strains in the *navarai* and *swarnavari* seasons at the same station indicate the suitability of *karsamba* white selection for the *swarnavari* season and Co. 10 ADT. 18 for the *navarai* season. *Kar* and *kuruwai* duration strains as a rule are very poor yielding, when planted in December in the early *navarai* season of Chingleput. On the other hand medium duration *samba* strains like GEB 21, Co. 2 *Rangoon samba* are found to yield very well, when planted in December and mature in about 4½ months. *Kuruwai* duration varieties of 3 to 3½ months' duration like ADT. 3. ADT. 4, *swarnavari* and *chitrakali* are very poor yielders compared to four months' *kar* varieties like Co. 10, ADT. 18, and Co. 18. TEB. 1 of Travancore does not compare with the other saline resistant varieties like MTU. 1, S.R. 26 and T. 672. Further the husk is too thin and the rice occasionally gets fused. Hence the rice on milling contains a larger proportion of broken rice. It is not therefore suitable for our conditions.

12. *Hybridisation for crop improvement.*—At Coimbatore, three cultures, 3911, 3912 and 3919 isolated from a cross between Co. 4 and ADT. 10, continued to maintain their yield and resistance to the disease. During the year under report they are also observed to be relatively resistant to borer attack when compared to ADT. 10. The trial of the two disease resistant cultures isolated from ADT. 11, which was badly affected by the disease, showed their capacity to resist the disease and yield better than ADT. 11. Both at Aduturai and Buchireddipalem. Disease free selections made from the progenies of Co. 4 × *sirumani* types were sent to Aduturai for isolation of suitable types of ADT. 1 and ADT. 2. The study of the F-3 population of the progenies of Co. 4 and short duration and long duration Coimbatore strains was continued and 243 selections taken. Hybrid population of the inter-strain crosses between *samba* group of strains resulted in the carrying over of seventeen progenies yielding 15 to 20 per cent over the parent strains. It is gratifying to note that the cultures isolated from the *molagolukulu* and *kambansamba* crosses were found to be at their best during the year when much difficulty for irrigation was felt. It is proposed to grow them under rainfed conditions and confirm their relative resistance to drought. The final set of crossing between the F. 1s of multiple crosses between the short duration strains were completed. The study of the F. 2 population of these crosses were taken up and promising selections of varying durations were made. The programme of effecting multiple crosses

between long duration varieties was in progress. A beginning was made to effect crosses between two high yielding cultures isolated in a variety in order to find out whether the hybrid population which might not show much variation for flowering, height and size of grain will yield higher than the parent cultures. At Pattambi two cultures isolated from a natural cross spotted in PTB. 9 are not only promising to yield better but also are earlier than PTB. 9 by a week. Progenies of the crosses between GEB. 24 and *Kavinginpoothala* were studied and suitable selections comparable to the local strains have been taken for further study and purification. At Maruter, four of the progenies possessing *krishnakatukulu* type of fine grain and of *garikasannavari* duration were found to yield on a par with MTU. 9 and four of the progenies of the *khassipichodi* cross are quite promising. The progenies of the various sets of crosses between first crop varieties studied for some years past were classified according to their duration and type of grain. Twenty-five families of *akkullu*; thirty-nine of *krishnakatukulu*; 43 of GEB. 24; thirty of MTU. 16 (deep water type) and four of the Atragada group have been selected for trial under progeny-row-yield trial in the coming season.

13. *Agronomic studies—Spacing and number of seedlings planted per hole.*—At the Paddy Breeding Station, Coimbatore, the results of the year under report, in conformity with those of the three previous years, show that the short spacing of 4 inches by 4 inches closely followed by 6 inches by 6 inches recorded the highest yield and the widest spacing of 12 inches by 12 inches the lowest. In the matter of number of seedlings per hole, the trend was in favour of planting more than one and that was particularly so in the case of widely planted crop, where it may be anything between two to four seedlings. The results of similar trials conducted at Pattambi, Ambasamudram and Aduturai also point out to the advisability of planting close between 4 inches and 6 inches in singles and doubles respectively. If wide planting is found necessary for any reason such as shortage of labour, the number of seedlings planted per hole may be increased to two or even to four. At Maruter, however, planting between 6 inches and 8 inches in singles or doubles yield the maximum. There was no interaction between varieties and spacing in the trials conducted at Coimbatore and Aduturai.

14. *Miscellaneous studies in cultural practices.*—At Ambasamudram, it is found that seedlings from late sown nurseries for the *pishanam* crop yield comparatively poorer than seedlings from early sown nurseries for the same age. But it is found that when the nurseries are sown late, it is advisable to plant the seedlings when they are between three to four weeks old. *Pishanam* plantings done between the tenth and twentieth October yielded best irrespective of the age of seedlings. At Pattambi and Coimbatore, inter-cultivation of a broadcast crop in dry and in wet conditions

has not for the second time resulted in any increase in yield over the uncultivated plots. Double planting trials at most of the stations have not again resulted in any extra yield over the single planted crop. The results of the trials to test the relative effect of using PTB. 10 seed from the previous first, second and third crops do not lend support to the belief that the seed of the previous first crop contributes to enhance the yield of paddy over the seed obtained from the other season crops. However, the seed from the first crop is noticed to be more plump than the seed obtained in the two other seasons.

15. *Storage experiment.*—The rapid spread of Co. 3, which has been growing in popularity in South Kanara during the second crop season, is hampered by deterioration in germination during storage in the monsoon months (June-October). Previous studies in germination of seed stored in different receptacles had indicated that when well-dried seed is stored in metallic receptacles, its vitality is not impaired in any way until required for sowing in September and October. Further studies in this direction in the past two seasons have shown that varieties which do not possess a dormant period, i.e., those that germinate immediately on harvest lose their vitality on storage in the monsoon months. It is proposed to collect such varieties that possess the dormant character and try their suitability for the second crop season.

16. *Manurial trials.*—The results of the trial of three different oil-cakes (groundnut, castor and neem) at three levels of nitrogen (20 lb.; 40 lb. and 60 lb.) show that the differences in the yield between the kinds of cakes were not significant at Aduturai, Anakapalle and Pattambi, while neem cake yielded higher than the other two oil-cakes at Coimbatore and Pattukottai in the first crop only. But at Maruter, neem cake gave the lowest yield. This behaviour seems to indicate that neem cake responds in situations where the crops suffer from inadequate, irregular water supply. This aspect will have to be studied further. With regard to the levels of nitrogen in almost all the places proportionate increases in the yields of the crops were obtained with every higher dose of nitrogen, i.e., 20 lb. N. yielded higher than no manure; 40 lb. N. was better than 20 lb. N. and 60 lb. N. yielded higher than 40 lb. N. At Coimbatore, gingelly cake tried for the first time yielded as well as the groundnut cake for the same level of nitrogen. Similarly tobacco oil-seed cake tried for the first time as manure for paddy yielded as high as groundnut cake in the first crop, while its yield though higher than no manure was lower by eight per cent compared to the groundnut cake in the second crop. As regards the time of application of groundnut cake at planting, and three to six weeks after planting conducted at Maruter and Pattambi, it may be stated that there were no significant differences in yields between the varying times of application though an application of groundnut cake to supply 40 lb. nitrogen four

weeks after planting in the first crop and three weeks after planting in the second crop recorded the highest yields. There was no interaction between levels of nitrogen and varieties at Aduturai. In the same station there was no response to the application of either bonemeal or calcined bones even on a basal dressing of green manure, while at Coimbatore both the forms of phosphatic manures at the same level of P_2O_5 recorded significant increases over no manure only, when applied in conjunction with the green manure. It is interesting to note that the applications of ash with green manure and groundnut cake at Pattambi, were leading in yield but the differences were not significant. However, in the second crop season, the combination, i.e., groundnut cake and green leaf with wood-ash gave significantly higher yields over individual applications of the manures. In both the seasons the application of wood-ash at 4,000 lb. gave as good a yield as the application of 4,000 lb. green leaf or 400 lb. of groundnut cake. The application of fish guano at 400 lb. on a basal dressing of 2,000 lb. of green leaf responded well at Pattambi. Fresh green leaves were found to respond better than green leaves processed in the cattle shed as practised in South Kanara or cattle manure as conserved in Malabar. In an experiment to find a method of applying green manure to a broadcast crop of paddy with the help of the pre-monsoon showers it was found that green leaves obtained from outside and chopped immediately and applied before sowing paddy in the dry conditions contributed to increase the yield of the crops more than when green manure crops were raised mixed with paddy and trampled in six weeks after sowing. At Aduturai, the application of 100 lb. of sulphate of ammonia on a basal dressing of 4,000 lb. of green manure recorded an increased yield of 50 per cent over no manure. In the same station the complex manurial experiments to assess the value of the application of a mixture of organic and inorganic manures were continued. The results have been submitted to the Statistician, Imperial Council of Agricultural Research for interpretation. It is interesting to note that at the Rice Research Station, Tirurkuppam, the application of '*milagai poondu*' (*Croton sparsiflorus*) growing wild on tank bunds, waste lands and in the fallow paddy fields, at 4,000 lb. per acre resulted in an increase of 31 per cent over no manure in the *swarnawari* season. In the *thaladi* crop the results of an experiment to find out the relative effect of the application of the same plant against *indigo* and groundnut cake show the very high responsiveness of the application of *Croton sparsiflorus* plants to the paddy crop. Again a twenty per cent increase in the yield was obtained for every increase in the dose by 2,000 lb. per acre. These results have helped to dispel the belief among the cultivators of the village that its application is harmful to the crop. Ryots have begun to use the plants for manure instead of as fuel.

17. *Fundamental studies.*—One of the fifteen progenies obtained from the material treated with one per cent *Ceresan* for 18 hours

was found to possess more vigour than the parents. Twenty cultures from this progeny have been selected for the confirmation of the purity for **vigorous** growth character in the selections taken. Laboratory trials of alternating soaking and drying of paddy seeds indicated the capacity to resist drought in the resulting off-spring. However, the increase in the number of soakings and dryings was found to considerably affect the vitality of the seed.

18. *Irrigation experiments.*—During the year the treatments of the irrigation experiments were changed to include the instructions issued by the Chief Engineer from time to time. The quantity of supply varies from one inch to four inches and the interval was kept at $3\frac{1}{2}$ days and 7 days units. The supply was also adjusted with reference to the rainfall received in the interval. At all the three stations the differences between the various treatments were not significant. The combined effect of regulation of water-supply at 50 duty in the pre-transplanting period though helpful to shorten the transplanting period in the second crop at Maruter, yet seventy duty during the post-transplanting period as in the previous year affected the final yield over the entire area commanded by the regulated supply. If the yield of the second crop in the Godavari delta is to be increased, it seems necessary to regulate the supply to 50 duty uniformly both for the pre-transplanting and post-transplanting periods.

19. *Rotation trials at Maruter.*—One course of rotation with paddy, sugarcane and plantains for five years was completed during the year. It is seen from the yield data and profit and loss account that the cultivation of sugarcane in the heavy soils of Godavari with a bit of alkalinity about them is not profitable. Cultivation of plantain in high-levels lands in rotation with paddy is remunerative and it can also be ratooned with profit for the second year.

20. *Other crops.*—Co. 419 is found to withstand equally well both drought at Maruter and heavy rains at Pattambi. Dry paddy following a groundnut crop in the *modan* lands of Malabar is found to yield well. Redgram in *modan* lands dibbled in rows along with paddy is promising. The cultivation of a mixture of castor and cotton in *modan* lands delays the preparation of the land for the following *modan* crop. The trial of ragi and gingelly at Tirurkuppam as a cold-weather crop proved a failure.

21. *Fodder and green manure crops.*—The summer showers coupled with occasional supply from the Chitraichavadi channel was taken advantage of to raise green-manure crop at the Paddy Breeding Station, Coimbatore. The heavy rains during November at Pattambi completely spoiled the tender green manure crops of '*kolingi*' and horsegram in the single-crop area. The green manure crops of daincha sown with the pre-monsoon rains in the double-crop area, though not ideal, gave a cutting of green

manure varying from 3,000 to 4,000 lb. per acre. It is noticed that daincha offers itself as a useful green-manure crop for the transplanted double-crop area and wild indigo for the single-crop lands of Malabar. Sunnhemp sowing in the sugarcane stubbles at Maruter in April resulted in obtaining 8,000 lb. of green manure for paddy in June.

22. *Vegetables*.—In pursuance of the policy of 'Grow More Food' the cultivation of the vegetables for seed purposes formed an important item of work in all the stations under my control. In all, 1,336 packets of vegetable seeds (mixed), 1,730 oz. of seed were transferred to the District officers for sale from the taluk depots. *Tapioca* cuttings numbering 5,424 were sold out from the Agricultural Research Station, Pattambi.

23. *Petty construction and repairs—New works*.—Sanction was obtained for the construction of the office, store, threshing floors, cattle-shed, engine-shed at the Rice Research Station, Tirurkuppam. The tender rates obtained were far in excess of the sanctioned amount, the work was undertaken departmentally. So far, purchases of bricks, tiles, wood and iron materials have been done. The works are held up for want of lime, in the locality. Arrangements are in progress to obtain the same from Nandalur. The work at Paddy Breeding Station, Mangalore, could not be taken up for want of the area on which the buildings have to be constructed. Here again, the tender rates recently received were in excess of the sanctioned amount. Revised sanction is being sought for this work.

24. *Post-graduate students*.—The Economic Botanist of Cochin State underwent training in Paddy Breeding for three months. Assistant Sri M. K. Venkatasubrahmanyam obtained the M.Sc. degree of the Madras University for his thesis "Pollen and pollen tube studies in rice". Students of Class III were taken round the Paddy Breeding Station for the classes on the technique in plant breeding and genetics of rice were explained to them.

25. *Exhibitions*.—The section contributed exhibits to the various exhibitions conducted in the different districts and also partook in the War Services Exhibition at Madras held during the months of August and September, 1943.

26. *Visitors*.—The most notable visitors during the year to the Paddy Section were His Excellency the Viceroy and Governor-General of India and the Chinese Agricultural Mission led by Dr. C. L. Pan.

COIMBATORE,
10th August 1944.

C. R. SRINIVASAN.
Paddy Specialist.

APPENDIX I.

Seed paddy distributed from the Agricultural Research Stations of the Madras Presidency for the year 1943-1944.

Agricultural research station.	Sales.	Free transfer.
	LB.	LB.
1 Anakapalle	11,774	47,16
2 Samalkota	3,546	79,287
3 Maruter	9,427	66,277
4 Buchireddipalam (Nel'ore)	1,099	3,444
5 Gudiyattam	..	3,810
6 Tirurkuppam (Chingl'put)	1,526	24,788
7 Palur	..	9,798½
8 Ambasamudram (Tirunelvelly)	874	20,154
9 Aduturai (Tanjore)	1,969	94,672½
10 Pattukottai (Tanjore)	40	31,742
11 Central Farm (Coimbatore)	..	67,046
12 Paddy Breeding Station, Coimbatore	..	23,892
13 Pattambi (South Malabar)	8,551½	53,279½
14 Taliparamba (North Malabar)	..	15,031
Total ..	9,006½	540,387½
Grand total ..	579,394	

ADMINISTRATION REPORT OF THE COTTON SPECIALIST FOR THE YEAR 1943-44 (FASLI 1353).

Charge and staff.—Sri R. Chockalingam Pillai acted as Cotton Specialist during the absence of Sri Rao Bahadur V. Ramanatha Ayyar on leave till 9th July 1943 and Sri C. Vijayaraghavan, Millets Specialist, held additional charge from 21st August 1943 to 31st August 1943 when Sri Rao Bahadur V. Ramanatha Ayyar was transferred to Madras as Headquarters Deputy Director of Agriculture. On 1st September 1943, I took over charge from the Millets Specialist and continued to officiate throughout the remaining portion of the year.

Sri C. Jagannatha Rao relieved Sri R. Balasubrahmanyam as Assistant Cotton Specialist, Cocanada Scheme, on 23rd August 1943 when the latter was transferred to Coimbatore as Cotton Specialist. Sri G. Seshadri Ayyangar, a servant of the Indian Central Cotton Committee, was posted as Assistant Cotton Specialist, Mungari, and he took charge from Sri C. Jagannatha Rao on 17th July 1943. Sri S. M. Kalyanarama Ayyar was promoted and transferred to Siruguppa as Assistant Cotton Specialist in charge of the newly sanctioned Cambodia breeding scheme for the Ceded districts from 8th April 1944. One temporary post of Assistant Cotton Specialist at Headquarters sanctioned during the year remained unfilled.

Season.—Although the total rainfall of the year fell short of the average by about an inch, the unseasonal distribution adversely affected crop yields. The south-west monsoon was particularly weak and delayed the normal tillage operations. Cholan sowings in experimental blocks were belated and irrigation cotton sowings were protracted on account of inadequate water-supply in the well. The north-east monsoon rains were received in heavy downpours and thereby field washes became fairly frequent. The cold was less intense, the dewy period was very short and the onset of summer was early. All these weather factors tended to lower the yields of irrigated cambodia and other rainfed crops like cholam and bengalgram.

Work done during the year.—In addition to the normal problems of research on cambodia and salems cotton, work on two other items, viz., breeding of a Cambodia cotton for Ceded districts and breeding of a pyrethrum (*C. Cinerariaefolium*) variety suitable for cultivation on the plains were taken up. Two breeding schemes financed by the Indian Central Cotton Committee were run. Besides these, the cotton work in the Agricultural Research Stations at Koilpatti, Hagari and Nandyal continued to be under my technical guidance and close scrutiny.

The practice of raising two generations of irrigated cambodia cotton in one year was continued. There was however a slight elaboration of work in the summer of 1944 when the experiments were carried out in two places, viz., Palur and Srivilliputtur, instead of Srivilliputtur centre alone. The objects of this change were to find whether the breeding of the long-stapled cotton and the improvement of rainfed cambodia could be done at one and the same place. The indications were that the new station would fulfill the requirements and the yield data when available would further corroborate it.

Irrigated Cambodia.—The trials at Srivilliputtur consisted of yield tests for 36 cultures made up of 8 resistant to *Pemphres*, 11 having early habit, 13 possessing long staple and 4 representing reselections from Co. 3 and Co. 4. The common standard for comparison was Co. 4. None of resistant group equalled the control; four cultures, viz., X6113 F-1, X6113 F-2, X5682 B-VI and X6097 C-6 in the early lot proved to be highly prolific but extremely neppy; there was no better culture in the quality group but still X7682 11-B constituted definite improvement in earliness, boll opening, staple and strength over the present strain Co. 4; and all reselections were on a par with the standard. The sum total of the summer yield trials was the spotting of an early long-stapled quality cotton X7682 11-B derived from interspecific multiple hybrid involving reputed local and exotic varieties like Co. 4, 4456 and Sea Island as parents. Further village trials would be conducted during next year based on the information let in on its spinning values.

The cold weather trials at Coimbatore consisted of 62 cultures drawn from the same four main groups but the basis of comparison was X4463 for yield and Co. 2 for resistance to stem weevil. Nine Moco hybrid derivatives combined both yield and low mortality but were defective in other characters like lodging habit, bad boll opening, small bolls, and coarse lint. They would be unsuitable for multiplication in their present form and a programme for the elimination of the specific defects was already drawn up and partly carried out. The promising cultures in other groups were X7786 A, X7733 D-32, X7682 11-B and X8078 D. The last culture was short stapled while the first three maintained their good attributes. It was rather gratifying to note the cosmopolitanism of X7682 11-B which figured in the summer trials too. Subject to the availability of seed material district trials would be conducted for X7682 11-B and X7686 A.

Eighty-six biotypes tested at Srivilliputtur in replicated progeny rows did not disclose any new type suitable for the summer season. At Coimbatore nine families belonging to Moco hybrid derivatives recorded high yields and low mortalities. They were otherwise defective and required further improvement. Co. 4 B-40-2—a reselection from Co. 4—proved to be completely free from leaf

curl and jassid attack; and the best sib would be multiplied and used for replacing Co. 4 in 'masipattam' area. X7786 A, X7682 11-B, X7733 D-21 and X7733 D-32 recorded the same consistent behaviour in the progeny row trials also. In lint length they were longer by 3 to 4 millimetres, and in ginning percentage the best of them equalled the control X4463.

Hybridization work done so far had yielded a fair number of prolific types suffering from one or more specific defects and an equal number of less productive progenies which happened to combine a large number of good points. The next stage of the work was so planned as to utilize the available material for obtaining the best out of the two groups.

Rainfed Cambodia.—All biotypes tested in progeny rows and bigger yield trials in both red and black soils failed to equal the standard K-1. Three different interspecific hybrids from Surat were obtained and studied. The general yield level was poor and desirable single plants were selected. The percentage of fibre maturity was found to be high in all.

None of the cambodia types including Dharwar American already under cultivation tested against H-1 in the Cuddapah district approached the yield of control.

Salems.—A very large area under karunganni cotton is grown annually in the 'Salems' tract, and the primary object is to root out the inferior *uppan* and *nadam* varieties. Any recommended type should not be poorer than the quality of K-1 which had already spread in the area. The suitability of five strains was tested in three villages in Trichinopoly district using the local as control. Although the statistical tests were not satisfied in two out of the three trials, it was quite apparent that the unselected local could be immediately replaced with K-1 till a better type was found. This step would help the maintenance of purity of K-1 in the adjoining areas and incidentally improve the standard of quality cotton in Trichinopoly district.

At the Cotton Breeding Station, closer spacing did not improve the yield of Jarilla. Out of 520 biotypes from interstrain crosses tested in progeny rows, 15 were good for yield, staple and ginning. Their purity determination remained to be done. From 110 interstrain and intervarietal crosses in F₂ stage, 2,200 plants combining earliness, length and staple were selected. The best parents for hybridization as judged from their percentage selective values were the strains evolved in the Madras Herbaceum Scheme.

One hundred and sixty-six cultures were under progeny row trials on red soil in connexion with *nadam* cotton improvement. Thirty-eight were better yielders and 19 of these came from *nadam* X546 hybrids. Two families, viz., 1,127 and 1,134 from *nadam* X546 cross, and seven families from reselections in L₁ 3-4/4 proved desirable. One thousand and four hundred plants from 207 second generation interform and intervarietal crosses involving a

wide collection of Asiatic varieties in and out of India were selected for combination of attributes. A rough analysis disclosed that K. 1 and C. 7 as basic parents had wider selective variability than *nadam*.

Agronomic experiments.—During the year different preparatory tillages had no effect on cotton yield but in tenai well-cultivated plots recorded higher yields than plots least disturbed. The results were at variance from those recorded last season and the differential behaviour must be attributed to the limited opportunities that were available for carrying out the higher frequencies of cultivation at the proper time. In another experiment the combined effects of rotation and cultivation were studied. The cultivated plots in general yielded heavier crops though the statistical requirements were not satisfied in four out of the six crops sown. In the rotation experiments cotton after cholam was the best, cotton following cotton was the poorest and cotton in the wake of fallow came in between the two and these results might be said to be in general agreement with those of the previous season. The crop mixture experiment of cambodia-ragi once again proved that the association of ragi in any form was more remunerative than pure cambodia. Pretreatment of cotton seed with ammonium sulphate did not lead to increased yields but definitely depressed germination. Seeds of sixteen different sources of karunganni strain K. 1 were obtained from breeding plots, seed nucleus, plots, seed multiplication plots, seed farm bulk and ryots' bulk grown in Coimbatore and Tinnevely districts. Their yields were not different but a considerable percentage of off-types existed in advanced stages of multiplication beyond the breeding and seed nucleus stages. The results indicated that greater vigilance should be exercised from the seed multiplication stage onwards.

Other crops.—A new item of work started during the year was the breeding for a pyrethrum (*C. Cinerariaefolium*) variety fit for cultivation on the plains. The preliminary observations made so far at Coimbatore indicated that (1) seedlings raised and planted at Coimbatore established themselves better than those received from other places in Nilgiris, (2) planting slips separated from selected parent clumps proved generally disappointing, (3) the same size of flower heads as in Nilgiris could be obtained by applying selection for this character in the variable population, (4) there was no fall in the total pyrethrin content and therefore the insecticidal properties of Coimbatore product would compare well with that of Nilgiris quality, (5) Paris and white daisies resembled pyrethrum in floral make-up and would serve as suitable parents for hybridization work on account of their hardiness, drought resistance and profuse flowering, (6) among the three varieties received from Kashmir, *C. partheneum* was the most vigorous.

Cambodia Breeding Scheme for Ceded districts.—This is a new scheme sanctioned during the year for evolving quality cambodia

types suited for cultivation on irrigated and rainfed lands of the Ceded districts. The work is being done at three stations, viz., Siruguppa, Hagari and Nandyal. An area of 11.89 acres adjoining the farm lands was acquired for the experiments and the preliminary work regarding the layouts was started. The sowings under irrigation were done late at Siruguppa on the Agricultural Research Station and the material under tests consisted of a collection of 156 varieties from Madras, Bombay, Punjab, Hyderabad, Mysore, Sind, Indo China, Iraq, Persia, Russia, Africa and United States of America. The general indications were that (1) Coimbatore hybrids were generally more vigorous and disease resistant, (2) among the extra Presidency varieties Dharwar American and Mysore American types were promising, and (3) other varieties suffered from defects like red leaf or bad boll opening. The results were largely vitiated due to untimely sowings in November and a proper replicated trial in normal season would be necessary for culling out the best.

In spite of late sowings of cambodia varieties at Hagari, 21 varieties recorded over 200 lb. per acre compared to the season average of 190 lb. for H. 1. Red leaf was severe in American and African types. Varieties from Dharwar and Africa were early. The heavy rains of October and November at Nandyal were not conducive to normal growth and in seedling stage many varieties were attacked by black arm, red leaf, jassids and thrips. Shedding of flowers buds and young bolls were noticed in December. Only four varieties yielded over 200 lb. per acre and in general the percentage of bad kapas was high. The rainfed trials would require repetition in a proper layout.

Mungari Cotton Scheme.—The aim of the scheme is to eliminate the short stapled mungari cotton from the 'Northern' and 'Westerns' area which produce a large quantity of good medium staple cotton. The cotton crop in the breeding area suffered on two counts, viz., damage by red hairy caterpillar in the seedling stage and shedding of early buds during heavy rains in September. The district trials in nine centres with seven varieties indicated that (1) V. 434 was erratic, (2) H. 1 was unsuitable and (3) P. 710 was the best. An analysis of all the previous yield results of tested varieties would show that none of them could be recommended with a measure of confidence. Four cultures recorded higher yields than local in comparative trials but all of them were very late and unsuited for the tract. Twelve families tested in family block were found impure for all characters. Two progenies, viz., 2,939 and 3,244 exhibited uniformity in length and ginning per cent. Further programmes of hybridisation and selection would be based on earliness and the variability available in the hybrid material handled appeared to be considerable and sufficient to synthesise an early medium staple high ginning combination. Only 4 out of 54 varieties proved to be resistant to

stenosis disease. Neither mixing of Asiatic and American varieties nor variations in spacing and time of sowing reduced the incidence of stenosis.

Cocanada Cotton Scheme.—The object in this scheme is to isolate a type combining deep lint colour, medium staple, good ginning and yield. The trial of four cultures in the advanced stages of purification disclosed that 805 might suit the agricultural needs of the entire tract. In progeny rows 33 coloured biotypes recorded significantly higher yields than local. District trials with an improved type X20 showed that the distribution of this type could be recommended (1) in the inferior white zones of Nellore and Guntur districts, (2) in the Red Northern's area possessing a low ginning value, and (3) in the short staple red cotton region of Godavari and Vizagapatam districts. Survey of the 'chinna-pathri' area in Vizagapatam district was undertaken to evolve a type capable of replacing the inferior white component. Promising material with early habit was raised for selective purposes at the Agricultural Station, Anakapalli. Determination of fibre properties revealed that coarseness increased with deepening tinge and this would probably account for higher strength in coarse cottons. Other preliminary studies on colour aspect showed that (1) there was no major change during storage up to eight months, (2) mature lint developed colour quicker than its own immature counterpart, (3) rapid dehydration led to deeper and quicker colour expression, and (4) in spite of colour differences X20 was adjudged by the Director, Technological Laboratory, Bombay, to be as good as Palnad local in the matter of dye absorption and final tint.

Cotton work at the Agricultural Research Station, Hagari.—The breeding work on this station was entirely devoted to intensive hybridisation between H. 1 and other herbaceum strains. This step was considered necessary in view of the paucity of variability in the local bulks. Two hundred and six direct crosses and 706 back as well as multiple crosses were made using H. 1 as the basic parent. Subsequent observations showed that crosses with Jayawant, 1027 A.L.F., B.D. 8 and (1027 × 2919) Iran resulted in greater selective variability for the main economic characters. Seven hundred and eighteen hybrid biotypes from 32 different crosses were compared in progeny rows and their statistical analyses were not completed. Seventeen out of 97 hybrid families gave yields higher than H. 1 and most of these simultaneously tested in Preliminary Comparative Trials were fairly consistent and never lower than control. They in addition possessed high parental means for staple and ginning. The material on the whole was promising and was likely to lead to the evolution of a more remunerative quality strain.

Cotton work at the Agricultural Research Station, Nandyal.—Six hundred and fifty-eight selections mostly hybrids were under replicated progeny row tests. Yield analysis indicated that 71

were superior and 249 had the same yield as N. 14. The best material existed in crosses involving x1523 and N. 14. The former was a hybrid derivative of a multiple cross having the blood of N. 14 and it was possible that the large selective value in its hybrid progenies was its direct result. Fourteen families from this cross possessed a combination of good staple and high ginning. Thirty-two cultures from other hybrids were equally promising and they would be included for further tests. There was a good range of variability in the F. 2 generations of various crosses and one could look forward with optimism to the evolution of a medium staple high ginning variety suited to the entire Northern's area.

Among the pure families in preliminary comparative trials X4250, X4281, X425-25 and X425-28 were either better in yield or ginning value. District trials would be conducted if their spinning performance was satisfactory. A large portion of Northern's is being grown with a *herbaceum* variety named *gadag* especially in portions receiving less rainfall. Analyses of the previous yield results clearly showed that improved strain H. 1 was invariably as good as *gadag* in places where N. 14 had not spread. If the entire medium quality *gadag* area could be replaced with the superior H. 1 cotton, it would conduce to the maintenance of a high percentage of purity of H. 1 in the adjoining districts of Bellary and Anantapur. More district trials on cultivators' lands have been planned during 1944-45 to confirm and demonstrate the virtue of H. 1.

The data gathered on the behaviour of X20 on the farm and in the districts were in favour of the strain and as such it was freely used as a parent for increasing yield in fresh crosses done during the year.

Cotton work at the Agricultural Research Station, Koilpatti.—Season was quite favourable for cotton. Trials on the cultivator's fields were in favour of 4706. On the station, 4706 and 5090 (a re-selection from P.B. 72) were the best. Of the two, 5090 was definitely earlier than even K. 1. Culture 4829 was on a par with K. 1 in yield but better in ginning per cent and spinning quality. During next year village trials would be conducted with 4706, 4829, 5090 and other promising finds. Seeds of K. 1 from 16 different sources were compared in the same pattern as at Coimbatore and it was found that up to the stage of the inner seed farm the yield differences were not significant and that the percentage purity also remained very high except in the multiplication stages at Coimbatore. This would indicate the need for the maintenance of absolute purity in seed nucleus plot at Coimbatore by self-pollination or by importing pure selfed seed every year from Koilpatti. Among the various ameliorative measures adopted to offset the harmful aftereffects of cholam the practice of raising a mixed crop of indigo and irungu cholam and later ploughing in indigo would appear to be the least expensive and therefore most remunerative.

Two hundred and seventy-eight hybrid progenies in F. 3 and 14 other families were under yield tests as replicated row trials or family blocks. The results were not concluded. From 53 second generation crosses, 1076 single plants possessing early habit, medium staple and high ginning were selected. The pace of selection work was quickened by raising the F. 1 generation of the crossed material on the red soil during the offseason under irrigation. Many of the quality strains were subjected to re-selections. 4706, K. 1 and P.B. 72 responded fairly readily in the matter of ginning percent and staple. 5085-6 and 5086-5 were two such re-selection from P.B. 72 that proved better than K.1 in all respects including yield. Forty-five varieties were compared in replicated rows on wilt (*rhyzoctonia*) infested soil and only two varieties, viz., K. 546 and Mudukolathur nadam were cent per cent resistant. The year was one of low mortality even for control type K. 1 and as such any indication of wilt resistance should await full corroboration in a year of high incidence.

Miscellaneous.—I was nominated as a member of the Agricultural Research Sub-Committee of the Indian Central Cotton Committee, Bombay, Cotton Purchase Committee of the Central Jail, Coimbatore, Research Council, Coimbatore and Provincial Cotton Committee, Madras, and attended all the meetings. A large number of 'pulichai' plants and samples of seeds suspected to contain 'pulichai' were examined by me and reported upon for launching prosecutions as provided in the Cotton Control Act.

COIMBATORE,
15th August 1944.

R. BALASUBRAHMANYAN,
Cotton Specialist.

ADMINISTRATION REPORT OF THE MILLET SPECIALIST FOR THE YEAR 1943-44 (FASLI 1353).

I submit below the administration report of the Millet Specialist for the year ending June 1944.

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 91 days in the year, of which 15 were spent in inspecting the work of the Millet assistants posted in the district stations; 39 were for the investigation of the types of selections needed for various tracts; nine were for examining the possibilities of the extension of millets; 19 for fixing up sites for taking land on lease for millet improvement work; six were in connexion with seed multiplication schemes; and three for attending the meeting convened by the Deputy Director of Agriculture, N. Division, for the scrutiny of the annual and final reports of the Dry Farming Scheme at Hagari. Twelve members of the staff were away from headquarters for 123 days, mostly to help the district staff in the conduct of the trial of the strains in the districts.

4. *Education*.—The final year students of the B.Sc. (Ag.) Class visited the Millet Breeding Station in December 1944. They were given practical field instructions on the variation in sorghum and ragi.

5. *Research Council*.—The meetings of the Research Council held on eight occasions were attended. Besides, the programmes, the cropping schemes and the progress reports of the district stations which came in circulation were scrutinized. A glossary of terms used in plant-breeding was drawn up by the Millet Specialist and passed by the Research Council. Sri C. Vijayaraghavan, Millet Specialist, was the President of the Research Council till 30th March 1944.

6. *Publications*.—An essay on "A Study of the Maturity of Grain in Sorghum" was submitted for the Ramasastrulu Munagala prize. "A Review of Some Experiments on the Eradication of Nut Grass" was published in the Madras Agricultural Journal.

7. *Exhibitions*.—The section took part in the War Services Exhibition held at Madras. Millet exhibits consisting of charts and samples of strains were sent, and an assistant was deputed to represent the section. Samples of seed and ears of sorghum, *cumbu*, *ragi* and Italian millet were supplied to the District Agricultural Officer, Cuddalore, for exhibition in the South Arcot district.

8. *Improvement of millets at the district stations*.—The work of the Millet Assistants posted to the Research Stations in the Bellary, Kurnool, Guntur, Vizagapatam, South Arcot and Tinnevely areas will be found in the reports of the officers in charge of the respective stations.

9. *Sorghum*.—In the monsoon period of 1943 sorghum was grown in an area of 19.95 acres and in the following summer with irrigation in an area of 4.42 acres. Water in the wells being limited, an area of 2.5 acres was sown at the Central Farm with yield trial and seed multiplication plots. Conditions were very unfavourable for the dry land crop of sorghum. The south-west monsoon was a failure, and the major portion of the crop could be sown only in October with the onset of the north-east monsoon rains. Due to this late sowing, a number of diseases and pests appeared in the sorghum crop. The worst of these was the "ear-head bug" the attack of which resulted in poor or no setting in most of the plots.

10. *Improved strains*.—Of the thirteen strains evolved at this station and spreading in the districts, ten were in great demand, and a total quantity of 32,147 lb. of seed of these strains was distributed. The supply was limited to the area that could be grown as seed multiplication plots both at this station and the Central Farm.

(a) A.S. 29.—This is a grain sorghum strain of the Coimbatore *Periamanjil cholam*. It is also popular in the adjoining Districts of Salem, North Arcot and Trichinopoly for growing as fodder.

(b) A.S. 3313.—This is a strain of the *Talaivirichan cholam*. After successful trials in the cultivators' fields it is in general distribution in the Chittoor and Chandragiri taluks of the Chittoor district and also in the Dharmapuri taluk of the Salem district. It was found to be superior to the local variety in Punganur (Chittoor), Omalur (Salem), Vellore (North Arcot) and in the Tirukoilur and Vriddhachalam taluks of the South Arcot district.

(c) A.S. 2095.—This is a strain of the white grain irrigated sorghum popular because of its short duration (90 to 95 days). It is popular in the taluks of Palmaner and Puttur of the Chittoor district and also in the Wandiwash taluk (North Arcot). It has been found superior to the local variety of Madanapalle (Chittoor). It was tried in Srivilliputtur (Ramnad) and yielded 12 to 16 per cent more than the local variety. It was reported to be suitable to the three western taluks of the Ramnad district.

(d) A.S. 1543.—This is a strain of the white grain irrigated sorghum having a duration of 110 days. It is popular in the Coimbatore taluk due to its high yield of grain and straw. In the Salem district it yielded better than the local variety at Attur.

in the August-September sowings and at Omalur in the January sowings. In the Nilakkottai and Periyakulam taluks of the Madura district it yielded more than the local varieties.

(e) A.S. 1575.—This is another white grain irrigated sorghum of the "*Ennai-vellai*" variety having a duration of 100 days. It was found to be earlier than the local irrigated white sorghums of Periyakulam and Nilakkottai.

(f) A.S. 732.—This is an improved strain of the *Karurettu-vellai cholam* having a duration of 115 days. It was found to give 25 per cent more grain and straw than the local variety in the Bhavani taluk of the Coimbatore district. It is rapidly spreading in this area.

(g) A.S. 809.—This is an improved strain of the Coimbatore yellow grain irrigated sorghum. Its duration is 100 days. It is confined to the Coimbatore and Avanashi taluks only, and almost the whole area grown with this variety is occupied by this strain.

(h) A.S. 389.—This is a strain of the red grain irrigated sorghum. It is popular in the Musuri and Kulittalai taluks of the Trichinopoly district. It yields higher than the local variety in the Tiruchengode, Namakkal, Omalur and Rasipuram taluks of the Salem district. At Pulivendla (Cuddapah) the strain yielded 15 per cent more than the local variety. Yet the cultivators have not accepted it on a large scale, as they want a strain with a bolder grain. Attempts to replace it with a high yielding bolder grained type is in progress.

(i) A.S. 3355.—This strain combines the good tonnage of fodder of the *Periamanjai cholam* with the sweet, juicy stem of the Kurnool *Cheruku patcha jonna*. The reports of higher yield and better quality of fodder have been received from Avanashi, Gobichettipalayam, Palladam and Pollachi of the Coimbatore district and from Ialugudi (Trichinopoly), Mannargudi (Tanjore) and Sankarankoil (Tinnevely). At the Hagari station under rain-fed conditions it yielded 29 per cent more fodder than the T-1 sorghum. There is a large demand for its seed, but due to want of facilities for multiplication only limited quantities could be supplied.

(j) A.S. 3316.—This is a new strain of yellow irrigated sorghum grown for fodder, with a sweet, juicy stalk. In trials at Erode (Coimbatore) it yielded more fodder than the local sorghum. Seed has been supplied to Erode for multiplication and distribution.

11. The above have been some of the important strains of sorghum spreading in the districts. There have been attempts to spread them wider still. At the same time work was also in progress to evolve strains that are superior to the existing ones as well as to those suitable to tracts where the abovementioned strains have not been accepted.

12. In the main rain-fed season there were 1139 cultures which by their replication were in 3889 plots. In the irrigated crop 486 cultures were under study raised in 2050 plots including those grown at the Central Farm. Most of these were for the evaluation of the economic worth of the selections from various varieties.

13. *Periamanjai cholam*.—The strain A.S. 29 of this variety of sorghum is steadily spreading. Although a heavy yielder, it has not been popular in a few places because of its black glumes. Previous attempts to evolve a strain with red glumes yielding as high as A.S. 29 had not been successful. A fresh attempt was made in the year with 25 selections grown in compact family blocks with A.S. 29 as the standard. Five selections with black glumes were also under comparison with this strain. The trials failed due to the unfavourable season and have to be repeated. Crosses were also made between A.S. 29 and the best among the types having red glumes. To improve the grain size of the *Periamanjai* strain, A.S. 29 was crossed with the *S. caudatum* type.

14. *Periamanjai cholam* x *S. caffrorum*.—From crosses made between *Periamanjai cholam* and the very vigorous *S. caffrorum*, 133 selections were grown in the year in replicated row yield trials with A.S. 29 as the standard. These comprise five selections from each of three promising families of the family block trial of 1942 together with 118 from selections grown for purification. There was no seed setting in these plots. The trial has therefore to be repeated.

15. *Periamanjai cholam* for *Dharapuram tract*.—The dry land yellow grained sorghum grown in the Dharapuram tract and in parts of the Palladam taluk adjoining it though *Periamanjai* is different from the variety grown in the Coimbatore taluk. The strain A.S. 29 is not suitable to this tract; a shorter duration type with a looser panicle would be preferred here. Selection work has therefore been in progress among the Dharapuram varieties and promising selections have been under trial compared with the Dharapuram local bulk as the standard. Three of these selections have proved their superiority over the standard. They were tried again for verification in the 1943 rain-fed season, but the trial failed due to the unfavourable seasonal conditions.

16. *Periamanjai cholam* with sweet, juicy stalk.—Though with a pithy stalk, the *Periamanjai* is a popular variety for raising fodder because of its high yield. Attempts were in progress to evolve a type with sweet, juicy stem by crossing A.S. 29 with the Bellary sorghum having a sweet, juicy stalk. The selections isolated from these crosses were found to be poorer in grain although they gave higher straw yields. So, fresh crosses were made between A.S. 29 and A.S. 3355 (a long duration fodder strain with sweet, juicy stalk) and also between A.S. 29 and A.S. 4854, a juicy yellow grained type isolated from a cross between *Periamanjai* and T-12

sorghum of Bellary. The F-3 selections from the progenies of these crosses and back crosses were grown in 1942. Ten selections from each of nine pure families which were taken from these, were sown in the year in compact family blocks. They shared the same fate as the other dry land sowings and the trial has to be repeated.

17. *Talaivirichan cholam*.—In this variety of sorghum the strain A.S. 3313 has been the best yielder at the station. Having done well in the cultivators' fields it is being distributed in certain taluks of the Salem, North Arcot, South Arcot and Chittoor districts. But this strain has a chalky white grain whereas the cultivators of districts like Salem and Chittoor prefer a pearly white grain. Attempts were therefore in progress to evolve a pearly white grained strain and also to get at a chalky strain better than A.S. 3313. In 1942, three pearly white selections were tried in comparative yield trials with A.S. 6183, a selection from *Muthyala jonna* of Hindupur as a standard. None of the selections yielded significantly higher than the standard. The trial was repeated in 1943, the sowing being made in October. Due to the unfavourable season it failed completely. A second set of trials consisting of two chalky selections compared with A.S. 3313 and sown with the help of the scanty rains in August were poor in growth in the initial period, but after the rains in October they grew well and produced earheads with well set seeds. The yield data show that A.S. 3313 was unbeaten this year also. Besides these trials, there were four sets of family clock trials consisting of 25 families, 12 pearly grained and the rest chalky grained. These were the best of the selections from those collected in the districts of Chittoor, Salem and North Arcot, and also the families preserved from the previous collections. A.S. 3313 was the standard for the chalky grain comparisons and A.S. 6183 for the pearly. These were sown in October, and due to the unfavourable weather conditions the trials failed. They have to be repeated. The quality of straw of the *Talaivirichan cholam* is poor, and work has been in progress to evolve a strain having a sweet, juicy stalk. From the F-3 progeny of a cross between A.S. 1093 and a type of *Talaivirichan* isolated from a cross, 36 selections were tried in progeny rows. Twenty-four selections in four families chosen from these were grown in compact family block trials in the 1943 rain-fed season. These also failed due to the unfavourable season.

18. *Red grain sorghum*.—When the season is late, a variety of red grained sorghum is grown in the Dharapuram and neighbouring taluks of the Coimbatore district. Selection work was in progress in this variety, and selections were in yield trials since 1941. The two best of them chosen from the yield trials of 1942 were compared in the year with a ryot's sample of *Sen cholam*. The trial was a failure, and no grain weights could be recorded.

19. *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 lands. The strain A.S. 29 was found to be unsuitable to this tract, and selection work was in progress in these two sorghums. A large collection was made in 1941 and grown in the same year. Selections from these were in family block trials in 1942. Twenty further selections made from four promising families each of *Manja-makkattai* and *Vellai-makkattai* were sown in October 1943 in compact family blocks with the respective local bulk samples as the standards. Due to the unfavourable seasonal conditions no yield data could be recorded in these.

20. *Irrigated sorghums*.—Among the sorghums grown under irrigation, six improved strains, A.S. 2095 (white), A.S. 809 (yellow), A.S. 1575 (white), A.S. 1543 (white), A.S. 389 (red) and A.S. 732 (white) have been evolved at this station, and after trial in various localities they are spreading in the respective suitable tracts. As these do not cater to the needs of all localities, further work has been in progress in the following varieties:—

(a) *Mottai-vellai cholam*.—This is a short duration variety of the Palladam-Dharapuram tract with a compact panicle and bold, chalky white grains. Five selections of this variety were in comparative yield trials in the summer of 1943, with a Dharapuram local variety as the standard. Two of these selections gave significantly higher yields of both grain and straw than the standard. The trial was also repeated in the summer season of 1944 with four of the strains. Its results will be given in the next report.

(b) *Chitrai-vellai cholam*.—This variety is widely grown in the taluks of Palladam, Pollachi and Udumalpet. Its duration is 85 to 90 days. Three selections of this variety from the collections from Palladam were compared in a yield trial in the summer season of 1944. The results will be detailed in the next report. In addition to these, four selections from each of six families were in a compact family block trial with the strain A.S. 732 as the standard. None of them yielded more than the standard. A few of these selections have been carried forward for another trial with a local variety from Pollachi having a similar panicle as the standard.

(c) *Karurettu-vellai cholam*.—This variety is grown in parts of the Pollachi, Palladam, Udumalpet, Bhavani, Gobichettipalayam and Coimbatore taluks. Four selections from each of ten families taken from the collections of the *Karurettu-vellai cholams* of Bhavani, Gobichettipalayam, Coimbatore and Udumalpet were grown in the summer of 1944 in compact family blocks. A Palladam bulk sample of this variety was used as the standard. The results of this trial will be discussed in the next report.

(d) *Vellai cholam*.—Two families selected from the collections of *Vellai cholam* of the Coimbatore and Avanashi taluks along with 36 selections from six families obtained from the F-3 generation of crosses between A.S. 5142 (*Club kafir*) and A.S. 732 were tried in

1944 summer in family blocks with A.S. 732 as the standard. Three samples of fresh seed of another type of *Vellai cholam* collected from the Dharapuram taluk were sown in the progeny rows. The results of these trials will be dealt with in the next report.

(e) *Kittan cholam*.—Two selections of *Kittan cholam*, a variety suited to the Pollachi taluk were grown in the summer of 1943 in comparative yield trial with an unselected bulk of the same variety as the standard. Both of these selections yielded significantly higher than the standard.

(f) *Irrigated sorghum strains for the Madura district*.—The Madura district has a large, concentrated area of irrigated sorghum in the Nilakkottai and Periyakulam taluk. The varieties grown are: *Vellai cholam* of 100 to 105-day duration chalky grains in the Nilakkottai area and *Salangai-vellai cholam* of the same duration but with pearly grains in the Periyakulam area. A variety known as *Azukku-vellai* is grown in the Ayyampalayam tract adjoining Nilakkottai. Sixty-two selections of *Salangai-vellai* were sown in progeny rows with the strain A.S. 1543 as the standard. Eleven of them were found to be superior to the standard and nine from them were grown in a comparative yield trial with a local variety as the standard. The analysis of the yields has not been completed; the results will be discussed in the next report. Out of a total of 78 selections of Nilakkottai chalky compared during 1943 summer, 12 were found to be superior to the standard and five of them were advanced to a comparative yield trial grown in the summer of 1944. Out of the 32 selections of *Azukku-vellai* grown in 1943 summer, four were found to be superior to the standard (A.S. 2095), and the best three were grown in a comparative yield trial in the summer of 1944. The results of these also will be discussed in the next report.

(g) *Tella jonna for Chittoor*.—There are two groups among the irrigated *Tella jonnas* of the Chittoor district, one having 115 to 120-day duration and the other 100 to 105. Selections from both of these groups were tested in compact family blocks in the summer of 1942 and from these, three selections in the long duration group and three in the short duration group were grown in comparative yield trials in the 1943 summer. The long duration group did not set seed; the trial has to be repeated with an earlier sowing. In the short duration group the local variety used as the standard was found to be 10 to 15 days longer in duration than the selections compared, and therefore the yield data were analysed with the general mean as a standard. The differences in grain yield were significant. One strain, A.S. 7440, was the best of the three.

(h) *Chinnamanjal cholam*.—Work was in progress to evolve a strain better than A.S. 809, the popular *Chinnamanjal* of Coimbatore. Out of 32 selections in eight families compared in the summer of 1943, two selections were found to be superior to the

standard A.S. 809 in grain yield, and three selections in straw yield. These were not sown in 1944 summer for want of irrigation water.

(i) *Sen cholam (irrigated)*.—A.S. 389 is the popular strain in this variety of sorghum, but its grains are small. Two selections of *Sen cholam* with bold grain grown in comparative yield trial with A.S. 389 as the standard in the summer of 1943. One of these selections has yielded significantly higher than the standard. Of the collections from Salem, Tiruchirappalli and Coimbatore, 107 selections of *Sen cholam* (red grain) and 81 selections of *Makkattai cholam* (pink grain) were sown in row yield trials in summer 1944 with A.S. 389 as the standard. The results of these will be detailed in the next report.

21. *Economic crosses*.—(i) *Irungu cholam* is grown in the Madura district as a grain crop in the dry lands. It has small, enclosed grains. A bold grained type in this variety would be of value. From a cross made between a *Periamanjai* and an *Irungu* a bold grained *Irungu* type with yellow grain had been obtained. As a further improvement this type was crossed with the Chittoor *Tella jonna* in order to get a bold, white grained *Irungu* type. (ii) *S. conspicuum*, a species from Tanganyika is similar to the *Talaivirichan* but has very bold grains. This was crossed with the *Talaivirichan* strains to improve the grain size of the latter variety. (iii) The variety *Sufra* from Egypt also has very bold grains; but it is not a heavy yielder. This type was crossed with A.S. 389 the *Sen cholam* strain, A.S. 2095 the *Vellai cholam* strain and A.S. 7586, a *Chinnamanjal* selection in order to improve their grain size. (iv) The F-1 of a cross between M-47-3 and A.S. 3586 (double dwarf milo) was sown to isolate a short duration white sorghum strain for the Bellary district. (v) *Kaki jonna* is a pithy stalked fodder variety with quick growth, the latter asset being an important one in any good fodder strain. To improve its quality it was crossed with a sugar sorghum of America. (vi) From crosses made to get at juicy stem varieties in the irrigated sorghums, 16 selections were tried in family blocks in the summer of 1944. Seventeen selections were also grown for purification. Further crosses made with the same object in view have come to the F-2 generation.

22. *Evolution of Striga resistant strains*.—From the progeny of crosses between A.S. 29 and the striga resistant types *Bonganahilo* and *Bilichigan* 36 selections in nine families were tried in compact family blocks. Due to the unfavourable weather conditions the trial was a failure. The incidence of striga also was low. Fifteen selections from 11 families have been taken for repeating the trial. The F-2 generation of a fresh cross between A.S. 29 and *Bonganahilo* was also raised and five selections were taken from this for further work.

23. *Comparison of sowing of seed with the transplanting of sorghum seedlings.*—An experiment was conducted in the summer of 1942 to compare the practice of transplanting sorghum (as found in parts of Chittoor, North Arcot, Salem, Trichinopoly and Madura districts) with the common method of sowing the seeds direct. It was found that the sown crop was economically better than the transplanted crop. The experiment was repeated in 1943 summer adding two more variants as an improvement. The variants of the 1943 experiment were: (i) planting with three-week old seedlings, (ii) planting with two-week old seedlings, (iii) sowing on the date of planting (control), (iv) sowing three weeks before planting, and (v) sowing two weeks before planting. The analysis of the yields show that the control has given the highest outturn.

24. *Threshing experiment.*—The object of this experiment was to compare the practice of threshing *chulam* heads (i) soon after harvest and (ii) after drying. It was conducted in the summer of 1942 and was repeated in the summer of 1943. The variety used was A.S. 2095, the irrigated *Vellai cholam* strain. In both of these trials it was found that the dried heads required less time to thresh than the fresh heads.

25. *Fundamental studies.*—A study was made on the germination and growth of sorghum (*Periamanjai* type) raised from seeds collected at different stages of maturity. It was found that the seeds are able to germinate well and produce normal plants when harvested as early as 28 days after flowering. It was also observed that for grain purposes the ears can be harvested at the wax stage itself (40 days after flowering), about a week earlier than the usual time of harvest. In addition to this work a few characters like chlorophyll deficiency, striping of plants and purple colour of the peduncle were also under study.

26. *Cumbu (*Pennisetum typhoides*).*—The harvest of the crop grown in the summer of 1943 was completed in July 1943. Irrigation being limited, only 30 units in an area of 0.65 acre could be raised. In the rainfed crop that followed 387 cultures were raised in 1,188 plots grown in an area of 7.15 acres. In the summer of 1944, 56 cultures in 105 plots grown in 0.78 acre were under study. The 1944 summer crop is still in the field. The results of the irrigated and rainfed crops of 1943 are dealt with here.

27. *Improved strains.*—The demand for the three strains P.T. 700, P.T. 2229 and P.T. 367 has been on the increase. A total quantity of 5,569 lb. of seed was distributed in the year, all that could be obtained from seed multiplication plots of the Central Farm and this station.

(a) *P.T. 700.*—This continues to be a very popular strain as it does well both in rainfed and irrigated conditions and also because it is suited to the various tracts. Analysis has shown that

it contains 2.24 per cent more of fat and 1.95 per cent more of protein than the average varieties of *cumbu*. The strain was supplied for seed multiplication to Guntur and North Arcot to meet the demand in these districts. It was distributed in the districts of Coimbatore, North Arcot, Chittoor and also parts of Salem, Tiruchirappalli and Ramnad where its superiority over the local varieties has been established. During the year its suitability was tested in replicated trials at Srivilliputhur (Ramnad) where it gave a significant increase of 23.8 per cent in grain yield over the local variety. In Krishnagiri (Salem) it has reached the demonstration stage. In observation plots at Harur (Salem) and Tirumangalam (Madura) the strain yielded more than the local varieties. At Hospect (Bellary) it is found to be 15 days earlier than the local variety.

(b) *P.T. 2229.*—The popularity of this strain for irrigated lands is on the increase in the North Arcot district, and seed was supplied to Tirupathur for multiplication in seed farms. It is popular in the districts of Coimbatore, Trichinopoly and South Arcot. The strain was in observation plots at Gingee (South Arcot) where it yielded higher than the local variety.

(c) *P.T. 367.*—This strain evolved out of a Bombay variety was given the highest yield in the trials at the station. Its grain was analysed by the Government Agricultural Chemist and was found to contain 2.91 per cent more of protein than the average samples of *cumbu*. It was distributed in the Coimbatore and Chittoor districts where replicated trials have proved its superiority. Reports of higher yields than the local varieties were obtained from Tirumangalam (Madura) and Tiruchengode (Salem) where the strain was grown in observation plots. At Tiruchengode it was also earlier than the local variety by 10 days.

28. *Yield trials.*—There was no yield trial of irrigated strains at the station in the summer of 1943 due to the limited water supply in the wells. On the dry land during the monsoon there were three sets of trials. In the first set two selections of *Kattu cumbu*, one of Madanapalle *sajja* and P.T. 700 were compared for a third time with P.T. 367 as the standard. The yield differences were not significant. P.T. 734, *Kattu cumbu* which was equal to the control in 1941 and superior to it in 1942 was again found to be equal to it in this trial. In the second set of trials three selections from the 'Australian hybrid' were compared with the standard P.T. 367. As in the previous set this was the third year of comparison. One of the strains P.T. 730 gave a significantly higher yield than the standard. The third set of trials was with three short duration selections of 75 to 80-days duration, two from *Kuruwai cumbu* of Namakkal (Salem) and one from *Kullan cumbu* of Cheyyar. The standard was P.T. 760, a selection from a Rajampet (Cuddapah) variety. The differences in grain yield were not significant. One Namakkal selection gave significantly higher straw yield than the control.

29. *Compact Family blocks*—(a) *Varieties suited for both rainfed and irrigated conditions*.—Ten selections from two families that were very promising last year were compared with P.T. 367. These were of medium duration. Neither of the two families yielded significantly higher than the standard this year.

(b) *Rainfed varieties*.—Ten families consisting of 50 selections and belonging to Dharapuram (Coimbatore), Trichinopoly and Perambalur (Trichinopoly) were grown in three sets of family block trials. Four families from Perambalur were found to have yielded significantly higher than the standard. In addition to these, nine new families were under trial in two family blocks. None of these families gave a higher yield than the standard.

30. *Progeny rows*.—From the compact family block trials of 1942 rainfed season with X-rayed *cumbu* selections, six of the best were chosen and sown along with ten other economic selections from X-rayed material, in two sets of row yield trials using P.T. 367 and P.T. 700 as two standards. In the first set all the X-rayed selections were significantly superior to the standard P.T. 700 in grain yield and five of them in straw yield as well. In the second set the differences were not significant.

31. *Trial of mixture of strains*.—Being a facultatively cross-fertilised crop it was thought possible to improve the yield of *cumbu* by mixing high yielding strains and allowing them to get cross-fertilised among themselves. An experiment was accordingly started in 1942 in which the strains P.T. 367, P.T. 504 and P.T. 700 were compared alone and in mixture of varying proportions. The same mixtures were also sown in separate seed plots to obtain cross-fertilised seed. The experiment was continued this year with the same strains along with the hybrid seed from the seed plots of the various mixtures. It will be seen that this is the first year in which the hybrid seeds come into the comparison. The results show that the standard P.T. 367 remained unbeaten by any of the other variants.

32. *Crosses for hybrid vigour*.—Fifteen crosses were made in the rainfed season of 1943 to serve as material for hybrid vigour. These have been sown under irrigation in the summer season of 1944 for gathering data on the relative increase in height, head length, earhead weight, etc., induced as a result of heterosis.

33. *Comparison of transplanting cumbu seedlings with the sowing of cumbu seeds*.—An experiment was started in the summer of 1942 to compare the economics of raising a *cumbu* crop by transplanting as against the sowing the seed in the field. P.T. 2229, the irrigated strain was used for the experiment. It was found in the first year that the transplanted crop gave higher yields than the sown crop, but that the increased cost of cultivation was not compensated by the increase in revenue. The experiment was repeated in 1943 with two more variants, viz., (i) sowing 3 weeks

before the control and (ii) sowing two weeks before the control. The results show that the transplanted plots as well as the early sown plots have given a higher outturn in money than the sown crop.

34. *Fresh material*.—Ten ryots' bulk samples from the Chingleput, Trichinopoly, Tanjore and Madura districts were grown in the rainfed season. Three of these that were poor, were rejected and the rest retained for further study.

35. *Ragi (Eleusine corocana)*.—There was only one crop of *ragi* in the period of the report, the crop raised in the monsoon season of 1943. An area of 3.76 acres was sown, and there were 523 cultures which by their replications were grown in 3,296 plots.

36. *Improved strains*—(a) *E.C. 593*.—This continues to be the best strain of irrigated *ragi* in tracts where a 120-day duration is not an objection. It has been very favourably reported upon as a good strain for the dry lands of Chittoor and Salem adjoining the Mysore plateaux. In two places on the West Coast it yielded well as a rainfed crop. Though indents could not be complied with in full, a quantity of 8,209 lb. of seed of this strain was distributed in the year.

(b) *E.C. 3517*.—Being 110 days in duration and yielding as high as *E.C. 593*, this is the favourite strain of the Coimbatore district. A quantity of 7,133 lb. of seed of this strain was supplied in the year. It has been successful in the Salem, North Arcot, Chingleput, Tanjore and Madura districts also. In a trial at Aruppukkottai (Ramnad) it gave a significant increase in yield of 36 per cent over the local variety.

(c) *E.C. 3735*.—This is a 100-day duration mutant of *E.C. 593*. It is popular in the Chittoor and South Arcot districts and has been very well reported upon in district trials at Ariyalur (Trichinopoly). In the year 1,296 lb. of its seed was distributed.

37. *Yield trials*.—There were three sets of yield trials. In the first set five selections from X-rayed *ragi* were compared with *E.C. 593* as the standard. Two of these selections yielded significantly higher than *E.C. 593* without any increase in duration. In the second set, three selections from the Salem district and one, an early plant selected from *E.C. 3517* were compared with *E.C. 3517*. One of the Salem selections was found to have given significantly higher yields of both grain and straw than the standard *E.C. 3517*. The third set was for evolving a high yielding white grained *ragi* type, and five selections were under trial with *E.C. 1540*, the white grain standard. All the five selections gave higher yields than the standard but the differences were not statistically significant.

38. *Compact family block trials*.—Nine families consisting of 90 selections were compared in family blocks with *E.C. 3517* as the

standard. Four of these families yielded significantly higher than the standard. Eighteen of the best selections from these four families have been chosen for further trial.

39. *Progeny rows*.—There were ten sets of progeny row trials of which three were of brown grain selections and the rest of white grain. Of the three brown grain sets one consisted of selections from Salem, one of extracted types from economic crosses and the remaining one of the types tested for protein and vitamin B-1 contents. The seven sets of white grain selections were all from crosses between E.C. 1540 and other economic types. The results showed that seven selections in the brown grain sets and 29 in the white grain sets have yielded significantly higher than the respective standards.

40. *Hill ragi trials*.—Five varieties of hill *ragi* were grown in a comparative yield trial at the Agricultural Research Station, Nanjanad. Bulk selections were taken from the two best of these and were sown again as selected bulks at the Nanjanad Station. A collection of *ragi* from the Gudalur taluk was sown in comparative trials with the local *ragi* in the Cheerambadi village (Gudalur taluk).

41. *Fundamental studies*.—In crosses between very light brown grain and other types, the very light brown colour proved dominant. Four of these F-1's have been selected for a study of the F-2 generation. The F-2 generation of four economic crosses were grown and from each of these 25 promising selections were taken for the trial of the F-3 generation in compact family blocks.

42. *Italian millet (Setaria italica)*.—In an area of 3.6 acres 574 cultures were under study grown in 4,218 plots. There were two sets of comparative yield trials. In the first set S.I. 3223, the best among 164 selections from the Coimbatore collections, was compared for a second time in yield trials with S.I. 523, the standard. In this trial the new strain gave a significant increase in grain yield of 13 per cent over S.I. 523. In the second set 15 selections belonging to Salem district were in comparison with the strain S.I. 523. These selections were the best among 446 selections from this district grown in progeny row trials in the previous year. None of the 15 selections gave a significantly higher yield than the standard. In addition to these, there was also one set of family block trials and three of progeny rows. In the family block trial 14 families consisting of 140 selections taken from ryots' bulk samples of the Coimbatore district were compared with S.I. 523 as the standard. None of the families yielded higher than the standard. The three sets of progeny row tests were, one of Salem selections, one of Coimbatore and the third of short duration varieties. In the first set, 226 fresh selections collected from three taluks of the Coimbatore district were compared in 24 groups with S.I. 523 as the standard in each group. Eight of the selections have yielded significantly higher than S.I. 523.

In the second set, 59 selections of the Salem district were in comparison with S.I. 523, but none of them was found to be superior to the standard. The third set consisted of 50 short duration selections chosen from 128 tried in row yield tests in the previous year. They were grouped according to their duration from sowing to flowering :—(i) 41 to 45 days, (ii) 46 to 50 days, and (iii) 51 to 55 days. It is proposed to make crosses between the best selections from each of these groups and the strains S.I. 523 and S.I. 3223 in order to get at a high yielding, short duration strain.

43. *X-ray treated millets*.—(a) *Cumbu*.—The results of a row yield trial with 16 selections from X-rayed *cumbu* have been reported in the section on *cumbu*. Besides these, 20 selections that were taken as economic were grown along with P.T. 367. None of these proved better than P.T. 367. For a study of characters like sterility, duration, etc., 158 selections were sown, and from 63 of the No. 293 units were carried forward for further study.

(b) *Ragi*.—The results of a comparative trial of selections of X-rayed *ragi* have been discussed in the section on *ragi*. In addition to this, 61 selections from X-rayed *ragi* were under observation, grown in single plots. Owing to an adverse season they could not be judged properly. All of these units were harvested for sowing in a normal season.

44. *Pre-treatment of seeds with growth substances*.—A number of preliminary experiments were carried out to test if the yields of millets like *cholam*, *cumbu* and *ragi* could be increased by pre-soaking the seeds in different concentrations of 'growth substances' like cattle urine, B—indolyl acetic acid, acenaphthene, etc. Very encouraging results have been obtained in the trials with *ragi*. These indicate that pre-soaking of *ragi* seeds in dilute cattle urine does increase the yield of grain and straw besides hastening the flowering. The increases in yields observed in this preliminary experiment with *ragi* were 60 to 90 per cent of grain and 126 to 185 per cent of straw. The shortening in the duration was 3 to 8 days.

45. *Area under improved strains*.—During the year under report, 3,78,012 acres were sown with improved seeds of millets which have an estimated profit of Rs. 30,27,482. This is based on figures furnished by the District Agricultural Officers.

COIMBATORE,
5th August 1944.

C. VIJAYARAGHAVAN,
Millet Specialist.

ADMINISTRATION REPORT OF THE OILSEEDS SPECIALIST FOR THE YEAR 1943-44 (FASLI 1353).

Charge.—I was in charge of the Oilseeds Section during the year under report except for a period of one month and 14 days from 25th April to 7th June 1944, when I was on leave. Sri G. Venkatanarayana, Superintendent of Coconut Research Stations, Nileshtar, officiated as Oilseeds Specialist and held charge of the Section during my absence. I also acted as Geneticist from 21st August 1943 till 25th May 1944 when the post was abolished.

2. *Staff.*—Sri G. Venkatanarayana and Sri C. R. Seshadri continued as Superintendents in the temporary posts sanctioned for the Coconut and Groundnut Research Schemes. Assistant Sri M. Bhavani Shankar Rao was promoted as Assistant Oilseeds Specialist in the Gazetted post sanctioned for the scheme of research on storage of groundnuts with effect from 6th November 1943. Assistant Sri S. G. Aiyadurai officiated as Superintendent of Coconut Research Stations, Nileshtar, during the absence of Sri G. Venkatanarayana on other duty.

3. *Research schemes.*—The schemes of research on groundnut and coconut run with financial aid from the Imperial Council of Agricultural Research continued to be worked in the Section for the seventh and fifth year respectively. In addition to these, the undermentioned new schemes were started during the year :—

(i) Five-year developmental scheme for the multiplication and distribution of improved strains of groundnuts.

(ii) Three-year scheme of research on storage of groundnuts.

(iii) Two-year scheme of research on pests and diseases of groundnuts.

Detailed reports on the work done under these schemes are submitted separately.

4. *Season and rainfall.*—The seasonal conditions at the Groundnut Research Station, Tindivanam, were not altogether normal. The total rainfall for the year amounted to only 36.88 inches, as against the eight-year average of 42.16 inches. The distribution of rains both during the south-west and north-east monsoons was uneven resulting in low yields of short duration groundnuts. The hot weather period was practically dry except for a heavy precipitation of rain early in March. The summer crops had therefore to be irrigated at frequent intervals.

Rainfall at the Coconut Research Stations was a little below normal. The total rainfall at Kasaragod Station amounted to 125.12 inches as against the past five-year average of 134.72 inches.

Rainfall at Nileshtar Station totalled 136.57 inches as against the five-year average of 140.70 inches. The south-west monsoon started late, but the rains were fairly well distributed. The north-east monsoon rains were above normal, but unevenly distributed. The coconut palms at the different stations maintained their good condition.

At Coimbatore, seasonal conditions were unfavourable for oil-seed crops. The total rainfall during the year amounted to 23.23 inches. Crops of castor and minor oilseeds sown with July rains suffered greatly owing to the absence of subsequent rains in the months of August and September. Plant growth was rather meagre and the yields were considerably reduced.

5. *Groundnuts.*—(i) *General.*—The area under groundnut in the Presidency which was estimated at 3,260,600 acres in 1942, rose to 3,445,600 acres in 1943, thereby showing an increase of 5.7 per cent. The production for 1943 was estimated at 1,538,200 tons of unshelled nuts as against 1,304,180 tons of last year registering an increase of 17.9 per cent. The price of groundnut kernels which was indicating an upward trend and reached the peak level of Rs. 100 per candy of 531 lb. last year, steadied down to about Rs. 75 per candy. The demand for groundnuts, oil and cake continued to be keen and depletion of stocks for use within the Province was prevented by banning the export except under a permit.

A total area of 59 acres was under groundnut at the Groundnut Research Station, Tindivanam, during the year, of which about 40 acres were earmarked for multiplication of seeds of improved strains for distribution to the districts.

(ii) *Improved strains.*—There was keen demand for seeds of improved strains of groundnuts, viz., A.H. 25, A.H. 32 and A.H. 698 as in previous years both from within and outside the Presidency. It was possible to supply larger quantities of seeds of the strains this year than in previous years, owing to the starting of a five-year seed multiplication scheme, according to which seeds are to be multiplied and supplied for sowing about 280 acres of Primary Seed Farms to be run in Chittoor, Salem, North Arcot, South Arcot, Trichinopoly, Madura, Ramnad and Tinnevely districts from 1944-45 onwards. During the year, 35,091 lb. of picked pods and 1,270 lb. of kernels were distributed to the districts.

In addition, 4,867 lb. of seeds of improved strains were distributed to some of the constituent Provinces and States of the Imperial Council of Agricultural Research.

(iii) *Experiments and research.*—Isolation of single plants combining economic characters from among varieties and progenies of crosses and testing them for yields and qualitative characters, such as, shelling outturn, oil content, etc. formed important items of work. Besides these, cultural and manurial experiments and

46 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

investigations on the control of pests and diseases of groundnuts and storage problems were under way.

(a) *Yield trials.*—Thirty-four cultures with bunch habit of growth were compared with the standard A.H. 32 in the final yield trials. Four cultures gave significant increase in yield over the control. Twenty-four bunch and semi-spreading selections from progenies of crosses were under preliminary yield tests. Only one selection has given increased yield over the control (A.H. 32). It is also shorter in duration than the control by about ten days.

Twenty-two cultures with spreading growth habit were compared with A.H. 1 (Local Mauritius) and A.H. 25, the standard strain in final yield trials. Twelve cultures gave significant increase in yield over A.H. 1 and were on a par with A.H. 25. Among these, two cultures have given consistent increase in yield over A.H. 1 for the past three years and are definitely better than A.H. 25 in having a high outturn of kernels to pods. Twenty-one other spreading selections were under preliminary yield trials, out of which three gave better yields than the control and these await rigorous yield trials.

(b) *Hybridization.*—The F-1 population of 36 crosses made last season were raised and studied for habit of growth, pod characters, etc. From the F-2 and F-3 progenies of previous crosses 36 selections combining desirable economic characters such as, bunch habit of growth, high yield, dormant nature of seeds, etc., were made with a view to evolve a strain with short duration, bunch habit of growth and dormant nature of seeds for supplying the needs of the Guntur and Pollachi tracts.

(c) *Manurial experiment.*—The manurial experiment started last year was repeated with 2 levels of nitrogen, 4 levels of phosphoric acid, 4 levels and 2 sources of potash. Developmental studies showed that the growth and flowering of plants were appreciably better in the plots which received 75 lb. of K_2O per acre over a basal dressing of 5 tons of cattle manure. The results of statistical analysis of yield data have not yet been received from the Statistician to the Imperial Council of Agricultural Research.

(d) *Cultural experiment.*—The experiment conducted for the second time with four different tillage treatments, and two inter-cultivation practices as adopted last year, showed that "four ploughings with wooden plough" was the best tillage treatment for the red loam soils of South Arcot district for the dry crop of groundnuts. This treatment gave 1,625 lb. of pods per acre as against 1,310 lb. recorded for the treatment "ploughing once with wooden plough." There was no significant difference between the two inter-cultivation practices, viz., hoeing once and twice. The experiment is programmed to be continued for another year for confirmation of results.

(e) *Pure cropping of groundnut versus mixed cropping.*—The effect of raising a short duration bunch type of groundnut

mixed with crops like *cumbu*, *tenai*, *cholam*, redgram, cotton and castor was studied in relation to the yield and quality of groundnuts. *Cholam* depressed the yield of bunch groundnut to the maximum extent (25 per cent) and castor the least (11 per cent). However, the reduction in yield of the bunch variety due to mixed cropping is not so great as is the case with the spreading variety. Of the different mixtures tried with bunch groundnuts, castor-groundnut proved the most remunerative. The experiment is being continued for another year to confirm the results.

(f) *Deterioration of stored groundnuts.*—Under the scheme of research on storage of groundnuts, kernels of the Coromandel and Peanut varieties were stored in godowns at Cuddalore and Masulipatam ports. Storage was done to different heights on different bedding materials on *kacha* and *pucca* flooring and with fully and partially dried kernels. Samples are being analysed periodically for moisture, oil and free fatty acid contents, refraction and insect incidence. Though the study of the first batch of material will be completed only after another six months, observations made during the last four months indicate a general rise in the free fatty acid contents and insect incidence of the stored material. Groundnut stored as kernels show greater increase in acidity, damaged fractions and insect attack than groundnut stored as pods.

(g) *Control of pests and diseases of groundnut.*—Control measures against *Surul* pest (*Stomopteryx nerteria*) and tikka leaf spot disease (*Cercospora* spp) were studied. In the case of *Surul*, light traps proved effective in trapping large number of moths. The effective range of light traps using ordinary hurricane lights is about 50 yards. Fungicidal trials against tikka leaf spot disease showed that bordeaux mixture, colloidal copper and sulphur are effective in reducing infection and increasing the yield of groundnuts. Varietal resistance studies with 72 varieties did not show any variety to be resistant but 'Spanish Bunch Salisbury' in the bunch group and 'Kurumani' in the spreading group showed relatively low infection.

(iv) *District trials.*—The improved strains of groundnuts were under yield trials along with the locals at the Pattukkottai, Palur and Nandyal Research Stations. Although A.H. 698 has recorded the highest yield this year at Pattukkottai, the results of the last three years' trials show that A.H. 25 is more suited to the tract both for the rainfed and irrigated seasons. At Nandyal, A.H. 62 among the bunch selections gave an acre yield of 1,224 lb. of pods as against 954 lb. of the local bunch. Among the spreading selections, A.H. 698 gave 1,278 lb. of pods per acre as against 836 lb. of the local spreading variety. The trials at Palur did not give significant differences between the strains and the control.

The trials conducted with A.H. 25 and A.H. 698 in Madurantakam and Kancheepuram taluks of Chingleput district show that

A.H. 698 is most suited to the tract. It has given on an average 62 per cent increase over *Local Maurilius*. In Penukonda taluk of Anantapur district, A.H. 698 gave a significant increase of 27 per cent over the local, followed by A.H. 25 recording 24 per cent increase. In the trials conducted in Pulivendla and Jammalamadugu taluks of Cuddapah district, A.H. 25 gave an increase of 30 per cent and appears to be suitable to the tract in that it is a drought resistant strain.

6. *Gingelly*—(i) *General*.—The area sown with gingelly in 1943-44 was estimated at 697,300 acres and shows a decrease of 16.9 per cent when compared with the finally recorded area of 839,519 acres for 1942-43. The total yield for the Province for 1943-44 works out to 81,900 tons, which is about 16.1 per cent less than that estimated for 1942-43.

An area of 25.7 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. A total quantity of 2,155 lb. was distributed during the year. Strain X-6 evolved from a cross between 'Nagpur white' and local gingelly is particularly suited for cold weather cropping in having given an average increase in yield of 86 per cent over local in three years' trials. Besides, it is shorter in duration than local by about 10 days and possesses the desirable characters of white seed, high oil content and partial dehiscence of capsules which prevents shattering of seeds on maturity.

(iii) *Experiments and research*.—Research on gingelly was mostly directed towards the evolution of strains by extensive cross breeding work with a view to combine the desirable characters like, short duration, high yield, high oil content, white seed, etc.

(a) *Yield trials*.—Four selections from progenies of crosses and varieties were compared with local and S.I. 89 for the third time during the cold weather. Strain X-6 has for the third time in succession given outstanding increase in yield over the local and appears to be suited for cold weather cropping. Its performance for the last three years is summarized below :—

	Yield in lb. per acre.			Average yield.	Average oil content.
	1941-42.	1942-43.	1943-44.		
X-6	230	435	303	330	53.3
Local	115	195	185	175	51.1
Percentage increase over local	58.3	133.5	66.4	86	..

The seeds of this strain are being distributed for district trials.

Out of four cultures that were under trial during the summer season, three were found to yield only on a par with S.I. 89.

Forty cultures were under replicated row tests during the cold weather and 14 of them gave significant increase in yield over the control.

Three hundred and fifty-three cultures from progenies of crosses and varieties were compared in row tests. Of these, 30 have been singled out for further trials.

(b) *Phyllody or green leaf disease*.—A batch of 12 selected varieties was under replicated trials for assessing varietal resistance. All the varieties were found to be affected by the disease, the percentage of infection being greatest in 'Jessore' (31 per cent). Some varieties showed only feeble infection ranging from 0.4 to 2.4 per cent. These will be further tested.

(iv) *District trials*.—At the Agricultural Research Station, Anakapalle, 4 strains were under yield trials along with the local variety during the Pyru season. S.I. 89 has given a significant increase in yield of 27 per cent over the local.

In the trials conducted in Rapur taluk, Nellore district, strain X-6 gave the highest yield of 809 lb. per acre, recording an increase of 16 per cent over the local.

7. *Castor*—(i) *General*.—The area under castor in the Province in 1943-44 was estimated at 252,000 acres showing a decrease of 7.8 per cent when compared with the acreage of last year. The yield was estimated at 24,400 tons as against 23,000 tons estimated for 1942-43.

A total area of about 11 acres was under experimental cropping during the year.

(ii) *Improved strains*.—Seeds of improved strains of castor were multiplied both at Tindivanam and Coimbatore to provide material for distribution to the districts. Strains R.C. 59-2-1-1 and R.C. 59-8-1 evolved by hybridization are liked by the ryots on account of their high yield and short duration. A total quantity of 2,100 lb. of seeds of the strains was distributed during the year.

(iii) *Experiments and research*.—Castor improvement work has as its main objective the evolution of early maturing types combining high yield, high oil content, non-shattering nature of capsules, etc., by cross breeding work as these economic characters are found distributed among different varieties.

(a) *Yield trials*.—Three strains evolved under the All-India castor improvement scheme at Hyderabad (Deccan) were compared with our strains for the third year. The Hyderabad strains proved longer in duration and yielded less than the strains evolved in the Section.

Out of 13 cultures isolated from progenies of crosses and varieties, 11 gave significant increase in yield over the control. The percentage of increase ranged from 40 to 108. Some of the extracts from crosses appear very promising.

50 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

(b) *Purity studies*.—Castor being a highly cross fertilized crop, purity studies of selected cultures were continued. Out of 79 cultures, 12 have been found to be pure and were marked out for yield trials.

(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 observed for various characters. Type plants were selfed and seed material gathered for maintaining the pure lines.

(d) *Hybridization*.—The F-1, F-2 and F-3 populations of crosses made for combining earliness, high yield and non-shattering nature of capsules were studied in detail. The progenies of the cross between 'Namakkal irrigated'—a long-headed type—and 'Kumbakonam'—a very early maturing type—appear very promising. Selfed seeds from 122 families of the above cross were secured for further work. From the progenies of crosses made between improved strains and types with coloured fruit clusters to impart distinct colours to the strains for easy identification in ryots' lands, 188 plants with the desired combination of characters were selected. Inheritance studies showed that dehiscent and popping nature of capsules were partially dominant over non-dehiscent character.

(e) *Spacing trials*.—In the trials conducted to determine the economic spacing for a pure crop of castor, 3 feet spacing either way, gave the highest yield. Developmental studies showed that closer spacing increased plant height, delayed flowering and reduced branching, length of inflorescence, number of capsules and yield.

(f) *Quality of produce in relation to method of harvest*.—The ryots generally harvest castor heads when a few capsules show signs of drying and heap them up for about a week before drying and shelling. The effect of this practice on the quality of the seeds was studied for a second time. Harvesting of the heads just before maturity and heaping them for a week was found to reduce the oil content and increase the free fatty acids. This confirms last year's findings.

(iv) *District trials*.—The scheme of district trials of three promising strains of castor, viz., R.C. 215, R.C. 59-2-1-1 and R.C. 59-8-1 in Anantapur and Salem districts with a special staff of two fieldmen for each district was in progress. Out of the 16 centres where the trials were laid out, the crop failed in 7 centres due to adverse seasonal conditions. Strain R.C. 59-8-1 proved the best in Kadiri taluk of Anantapur district and gave an acre yield of 1,430 lb. as against 800 lb. of the local as a pure crop, recording an increase of 70 per cent. In Namakkal taluk of Salem district, where castor was raised as a mixture crop with groundnuts, R.C. 59-2-1-1 gave an acre yield of 626 lb. as against 464 lb. of the local, showing an increase of 35 per cent. The trials are being continued for a second time in 1944-45.

8. *Coconuts*—(i) *General*.—The area under coconuts in Madras is estimated at about 6 lakhs of acres and shows a tendency to increase owing to the attractive prices now prevailing for coconuts and coconut products.

(ii) *Improved planting material*.—There was keen demand for selected seednuts and pedigree seedlings from all over the province for underplanting or raising new plantations. Due to limited stock only about 25 per cent of the indent could be supplied. During the year, 5,880 seednuts and 2,962 selected seedlings were distributed. To enable the Department to supply more of the selected seedlings for which there is keen demand, a coconut nursery scheme has been prepared and submitted for sanction.

(iii) *Experiments and Research*—(a) *Manurial experiment*.—Manurial experiment on coconuts with graded dose of ammonium sulphate, viz., $1\frac{1}{2}$, 3 and $4\frac{1}{2}$ lb. per tree per year was continued. Significant difference in yield due to the treatments was not obtained though a dose of $4\frac{1}{2}$ lb. appears to increase the yield of coconuts.

Experiments to determine the possibility of substituting groundnut cake for ammonium sulphate and also to find out the best manure for sandy soils were in progress for the second year. The effect of the manures is expected to be felt in coconuts only after about three years.

The usefulness of burying coconut husks and leaves in trenches in between rows of trees for improving coconut gardens under dry cultivation, was well established from experimental data. The beneficial effect continued to be maintained in the sixth year of the operation. The yield during the year averaged to 65 nuts per tree as against the pre-treatment yield of 38 nuts per tree.

(b) *Cultural experiment*.—The experiments to study the effect of different systems of cultivation, such as, digging with mamooty, ploughing with iron plough in different seasons and the rate of deterioration due to the absence of cultivation were continued during the year. The effect of the different cultivation practices has not yet been reflected in yields as it was started only late in 1942.

(c) *Button shedding*.—Selected trees belonging to the different yield groups of the ordinary variety and world varieties were observed for the shedding of 'buttons' or female flowers from the date of stigmatic receptivity. It is found that shedding is maximum during the third and fourth weeks after stigmatic receptivity and that it is practically absent after two months. Among the world varieties, the percentage of shedding is found to range from 77 to 98. Maximum shedding occurs in Fiji and Cochin China varieties and minimum in Ceylon and Laccadives.

(d) *World varieties*.—All the 14 world varieties of coconuts were studied for the rate of production of leaves, female flowers,

yield of nuts and setting percentage. Cochin China, Andaman dwarf, Java, Laccadive small and Laccadive ordinary are found to be promising varieties.

(e) *Hybridization*.—To produce superior types of palms by combining desirable characters such as, early bearing, high yield of nuts, good quantity and quality of copra, a number of inter-varietal crosses were effected among desirable world varieties. In all, 151 inflorescences were cross pollinated and 669 crossed nuts were obtained during the year.

The hybrid trees of Tall × dwarf crosses which combine the earliness of the dwarf and the nut characters of the tall parent, continued to give satisfactory yields. To meet the increasing demand for these hybrid seedlings, extensive crossing work has been undertaken and 227 inflorescences were cross pollinated. A total of 200 hybrid seedlings from previous crosses was distributed to various applicants.

A comparative study of seedlings obtained from different yield groups by self, natural and cross pollination showed that casualties were maximum in the seedlings obtained from selfed nuts and from low yield groups. This confirms the observation made previously from nursery studies that seedlings obtained from selfed nuts and from low yield groups are the least vigorous.

9. *Cashewnuts*.—The manurial experiment on cashewnut started in 1942 was continued. The yield from individual treatments was very low and erratic due to unfavourable seasonal conditions. A total of 983 lb. of selected cashewnut seeds was distributed during the year.

10. *Oil palms (Elaeis guineensis)*.—Observations on leaf and spadix production in the West African oil palms planted at Kasaragod, Pilicode and Nileshwar were continued and recorded.

11. *Minor oilseeds*.—District collections of linseed, niger, safflower and mustard were made and grown at Coimbatore. No serious work could be done on these crops as the season proved entirely adverse.

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

Groundnut	..	..	..	—	..	6,485
Gingelly	...	...	...	...	...	126
Castor	...	...	...	...	...	142
Copra	...	...	...	...	...	1
Total						6,754

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

13. *Teaching*.—I was in charge of the teaching of Genetics to the B.Sc. Ag. students of the college from 21st August 1943 to 25th May 1944. I gave 27 lectures and took 9 practical classes.

14. *Miscellaneous*—(i) *Enquiries*.—Numerous enquiries connected with the cultivation and other aspects of oilseed crops were received and replied to.

(ii) *Exhibitions*.—Suitable exhibits of oilseeds were sent to almost all the important exhibitions held in various parts of the Province. The section also took part in the War Services Exhibition held at Madras in September 1943 and deputed an assistant for explaining the various exhibits.

(iii) *Committees and meetings*.—I attended the meetings of the Research Council and served on the Annual Reports Scrutiny Committee. I was elected as President of the Research Council from 1st April 1944.

15. *Seed distribution*.—There was increased demand for seeds of improved strains of oilseeds. The following are the quantities supplied during the year:—

	LB.
Groundnut seed pods	39,958
Groundnut seed kernels	1,270
Gingelly seeds	2,661
Castor seeds	2,100
Cashewnut seeds	983
	NOS.
Coconut seednuts	5,880
Coconut seedlings	2,962

16. *Publications*.—The following publication was issued from the section:—

Mixed cropping of groundnuts—by C. M. John, C.R. Seshadri and M. Bhavani Shankar Rao.

Materials on "Coconut cultivation" with suitable illustrations were supplied to the Military authorities for publication in the "Fauji Akbar".

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

COIMBATORE,
10th August 1944.

C. M. JOHN,
Oilseeds Specialist.

ADMINISTRATION REPORT FOR THE YEAR 1943-44 OF THE PULSES SPECIALIST (FASLI 1353).

Charge.—I was in charge of the pulses section throughout the year. The regional stations at Vizianagram 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 83 days in Vizagapatam and Salem districts mainly to establish the regional stations, and to initiate the lines of work in those two stations. The assistants were on tour for 129 days. They were engaged in survey and collection of pulses in the concerned districts.

3. *Main station—Coimbatore.*—The block of land taken at Pudur on lease was quickly laid out to take up the experimental sowings. It was rather late for the early pulses and from the time of taking over the land in July to October there was hardly any rain. Hence the collection of redgram, blackgram, greengram, cowpea and lablab sown late with available moisture failed. The cold weather crops of bengalgram and horsegram were successfully grown. Twenty-five samples of bengalgram were sown with regular spacing and replicated with local as control. Observations on the crop were made. Based on growth, earliness, freedom from disease and yield, 121 single plants were selected. These will be put under yield trials in the next season. Similarly 169 single plants have been carried for further work in horsegram.

MATERIALS FROM COTTON AND MILLET BREEDING STATIONS.

Redgram.—Twenty strains were put under comparative trials with the strain 1723 as control. Out of the three sets, two completely failed due to wilt and adverse seasonal conditions, and in the third set the results were not significant. Twenty cultures were tried under preliminary comparative trials in three sets. The results of the first and the third sets were not significant. In the second set, though the results were significant, none of the cultures were better than the standard 1723. Eight strains, viz., 1723, 2900, 2745, 2515, 2840, 2424/1, 3009 and 1969/2 were raised for seed multiplication. A quantity of 1,939 lb. of seed was secured for distribution.

Bengalgram.—Five cultures were again tried under comparative trials with 468 as standard. Cultures 2965-a and 2965-b were equal to control. But these have more attractive colour and better size of grains. Two strains 468 and 482 were multiplied and 2,000 lb. of seed obtained for distribution.

Field lablab and cowpea.—Five strains in cowpea and three in

cowpea 63 cultures were studied in detail. Out of them 30 in lablab and 29 in cowpea were carried forward for further work. Twenty economic varieties in kitchen garden lablab and 20 varieties in cluster beans were also raised for study and multiplication. One hundred and fifty pounds of seed for vegetables were produced for distribution.

Sub-station at Vizianagram.—An area of 11.52 acres was leased very near Vizianagram for the location of the sub-station. Crops tackled are redgram, greengram, blackgram and horsegram. Lands were taken on lease from 1st September and the early pulses could not be sown in right time. A detailed survey of the pulses grown in the district of Vizagapatam was made and samples collected. Twenty-five samples in each of the pulses blackgram and greengram including the local varieties were sown with regular spacing in a replicated trial for selection work. But the season being very unfavourable and due to the out of season sowings no useful material could be collected. In horsegram the twenty-five district samples collected were sown under similar trials and hundred single plants were collected for further trial.

Sub-station at Salem.—The sub-station at Salem was opened in a block of land of 11.50 acres taken on lease very near Salem for a period of five years. Crops tackled are redgram, lablab and horsegram. As the lands could be taken over only from 1st October, work on redgram and lablab could not be started. A detailed survey of the horsegram sown in the district was made and seed samples collected. Thirty-five district samples along with D.B. 7 were sown with regular spacing in a replicated trial. From these 194 single plants were selected. Strain D.B. 7 was multiplied and 300 lb. of seed was obtained for distribution.

COIMBATORE,
4th August 1944.

SAMUEL JOBITHA RAJ,
Pulses Specialist.

ADMINISTRATION REPORT OF THE FRUIT SPECIALIST,
KODUR P.O., CUDDAPAH DISTRICT, FOR THE YEAR
1943-44 (FASLI 1353).

This forms the third administration report of the Fruit Section.

2. *Charge*.—I continued to be in charge of the section throughout the year except for a period of $2\frac{1}{2}$ months on earned leave from the forenoon of 10th January to forenoon of 26th March, during which time Sri S. Madhava Rao officiated as Fruit Specialist from forenoon of 10th January to forenoon of 25th March 1944 and the Bio-chemist, Kodur, was in additional charge on 25th March 1944.

3. *Staff*.—Consequent to the sanction of the Banana Fibre Scheme in G.O. Ms. No. 1522, Development, dated 19th July 1943, the work under the scheme was started with the appointment of Sri R. Shanmukhasundaram, Assistant, and Sri C. N. Subramanyam, Fieldman, who reported themselves for duty on forenoon of 29th November 1943 and forenoon of 21st March 1944, respectively. Sahib K. Fazlullah Khan, Assistant, 'Eat More Fruit' campaign was posted at Mettupalayam as Assistant, Kallar and Burliar Fruit Stations and he joined duty on forenoon of 22nd November 1943. Sri K. Ranga Rao reported himself for duty in his place at Coimbatore on forenoon of 15th November 1943. Sri A. G. Antony, Second Artist, 'Eat More Fruit' campaign joined duty on forenoon of 4th September 1943. On termination of this scheme Sri K. Ranga Rao, Assistant, Messrs. K. Govinda Nambiar and A. G. Antony, Artists, were relieved on forenoons of 22nd March 1944, 3rd December 1943 and 31st October 1943, respectively. The post of the Senior Assistant on I grade at the Fruit Research Station, Kodur, remained vacant during the year till 31st March 1944, but was filled up only by an Assistant on III grade. The post of the Farm Clerk, Fruit Research Station, Kodur, was abolished with effect from 1st April 1944.

The Fruit Products Scheme, Kodur, was separated from the Fruit Section with effect from the 14th February 1944 in G.O. Ms. No. 420, Development, dated 1st February 1944, and the College Orchards and horticultural teaching at Coimbatore from 3rd June 1944.

4. *Tours*.—I was out on tour for 82 days and the acting Fruit Specialist for 29 days during the year under report. In the course of these tours the Pomological Station, Coonoor, Fruit Stations at Kallar and Burliar and the College Orchards at Coimbatore were inspected four times each, and the centres of fruit work at Taliparamba and Guntur once each. The annual audit for the period 1942-44 of the Fruit Nursery, Kodur, Fruit Research Station, Kodur and the Fruit Preservation Work, Kodur, was completed.

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

- | | |
|----------------|--------------------|
| I. Advisory. | IV. Horticultural. |
| II. Teaching. | V. Miscellaneous. |
| III. Research. | |

I. ADVISORY.

1. *Enquiries*.—A total number of 139 enquiries on several aspects of fruit production and nursery practices was received and attended to. Besides the above, an average number of 30 enquiries regarding supply of plants and plant material alone was dealt with in every month. As usual, several enquiries were also received in person in the course of the tours and these were also attended to on the spot.

2. *Inspection of private gardens*.—Fifteen private orchards and sites selected for orcharding and one private nursery were inspected during the year and necessary advice given to the owners.

II. TEACHING.

1. *Degree course*.—Students of the final year B.Sc. Ag. course were given 24 lectures each of one hour duration. Practical classes extending over 29 hours were also held.

2. *Short course on Horticulture and Vegetable Gardening*.—Students attending this course were given lectures for 52 hours and practical classes for 96 hours; and observation classes for 26 hours were also conducted.

3. *Post-graduate course in Horticulture*.—Sri K. S. Venkataramani, B.Sc., Post-graduate student at the College Orchards, Coimbatore, pursued his studies on vegetables throughout the year under report.

4. *Non-stipendiary students*.—The total number of persons including coolies under training in the various fruit stations was 16, excluding those mentioned above. Of these, 13 underwent training at the Government Fruit Nursery, Kodur, and three at the Fruit Station, Kallar. The period spent by the different candidates varied from one to three months.

III. RESEARCH.

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

1. *Fruit Research Station, Kodur, Cuddapah district*.—A total rainfall of 45.82 inches was recorded on 71 rainy days. During the year, Sathgudi orange trees on Kichili and Jamberi rootstocks showed the greatest amount of disease incidence, while those on pummelo, Billikichili and chinee exhibited the least. At the end of 62 months of orchard life, observations show that acid lime possesses the largest scion stem and tree height and jamberi the largest rootstock stem and tree spread. In the case of pummelo,

Gajanimma and Kichili rootstocks the stock-scion ratio has progressively decreased from the date of planting, and the same is found to be highest on Kichili, Gajanimma and Jamberi. Chinese trees on *Feronia elephantum* continue to exhibit precocious and heavy-bearing tendencies. In the acid lime rootstock trial, no significant differences are revealed between the various treatments in regard to tree height and spread after 63 months of orchard life. Trees on Gajanimma have produced during the year yields much heavier than those on the other two rootstocks and the unworked seedlings, the mean yields on Gajanimma amounting to about ten times that on unworked seedlings. The futility of selecting Kichili and Jamberi seedlings according to stem size in the nursery beds for use as rootstocks for Chinese orange or selecting Jamberi seedlings in the seedbed on the basis of their period of germination or the extent of polyembryony, is once again revealed from the year's results. The year's cropping records continue to show that trees on Gajanimma bear crops earlier and those on Kichili attain the bearing stage relatively slowly than on Khatta and Jamberi. During the year, two varieties in each of sweet orange and grapefruit and one of citron have shown themselves to be of promise, besides those already reported to be promising in the previous year. Seedlings of lemons, limes and citron have produced some crop during the year. Of these, the latter two had attained the bearing stage during the previous year itself.

In the mango propagational trials no significant differences were revealed between tree size among the various treatments, 60 months after planting the trees. The number of trees that flowered during the year was greater in Bangalora than in Neelum. At the end of 61 months of orchard life Neelum trees on older rootstocks have failed to produce larger sized trees than those on younger rootstocks thereby confirming the previous findings. A larger number of trees has flowered on 10½ and 13½ months-old rootstocks than on 16½ months-old ones. Neelum trees on polyembryonic rootstocks have maintained their superiority in size and vigour over those on monoembryonic rootstocks of the same or of slightly higher age. In the double-working trials, till the end of 44 months after planting, the treatments have not revealed any statistical or visible differences between tree sizes; but early and fairly good bearing tendencies were exhibited within about four years after planting on the double-worked trees included in this trial which are ordinarily shy-bearers. On the whole, 953 mango flowers were hand-pollinated during the year, of which only 257 have set fruit. In the variety collection plot, sixty-seven varieties have flowered during the year, of which 23 have produced a second crop of flowers immediately after the first was destroyed by hoppers.

Lukfata variety of grapevine continues to be free from downy mildew, while White and Red Muscadell varieties displayed a high degree of resistance to powdery mildew during the year. Paper Shell, Musket Red and Spanish Ruby varieties among pomegranates, Allahabad and Smooth Green among guavas, Pala among sapotas,

custard apples, cashewnut, falsa and rose apple trees have once again shown good performances. In cashewnuts, a tendency to produce off-season crops was observed on 23 trees. Sidegrafting fig on *Ficus glomerata* and sapota on *Bassia longifolia* was found feasible, though the take is yet low.

2. *Pomological Station, Coonoor*.—A total rainfall of 64.58 inches was recorded on 135 rainy days during the year under report.

The year's study on apple varieties growing at the station has enabled the selection of six promising dessert and two culinary types for extensive multiplication and cultivation on the Nilgiris. Among propagation methods, the process of bench or root-grafting has given over 80 per cent success. Pruning trials with one of the promising varieties of apple, viz., Winterstein, have given indications that an annual tipping back of leader and lateral branches induces greater flush and blossom activity in the trees. Thinning of blossom and fruit in the commercial dessert variety, Irish peach, entails heavy loss of fruit yields, disproportionate to the slight increase in size of individual fruits. The training of apples as espaliers and cordons has shown promising results.

In plums, as many as thirteen different varieties have been isolated as promising. In propagation trials by two budding methods, viz., shield and flute, the former has produced a higher take. Fruitthinning trials have yielded fairly conclusive results, showing that thinning to leave one inch to two inches between fruits in an overbearing variety like Rubio increases the size, reduces natural shedding and improves the colour of the fruit without material loss in gross yield.

In pears, Kieffer has been found to be of some promise, deserving extension of area under it. It is high-yielding, maturing fruits in September. High success (exceeding 80 per cent) has been recorded in grafting trials with this scion variety on quince stock. Efforts to top-work trees of the China pear with Kieffer have given a success of 89 per cent with both whip and cleft grafts.

In peaches, Killikrankie has been placed as the most profitable variety. In the trials by budding on common peach in June instead of winter, a very high take of 80 per cent has been secured.

Dai Dai Maru and another unnamed variety have been classed as the most profitable among the persimmons. Pruning trials with the former variety over two years have proved that annual tipping back of one-year old wood promotes early and good flush with increased fruit production. A valuable though simple method of curing persimmon fruits, which are normally astringent, has been evolved. The process consists of harvesting mature fruits, wrapping each singly in paper, and keeping them in single layers in a closed chamber with Kieffer pears. The fruits become mellow, soft and non-astringent in the course of two or three days, and are then ready for use.

Work one prune, apricot, walnut, cherimoyer, mulberry, strawberry, Cape gooseberry, cherry, raspberry, blackberry, quince, fig,

etc., was limited to the maintenance of variety collections and making a study of their growth, bearing habit, etc. The incidence of a new pest on fruit trees at Coonoor, viz., the San Jose scale has proved a highly disturbing factor.

Work on English vegetables formed an important activity at the station. As many as 103 varieties of 26 different kinds of vegetables were under study, and 58 of them have been isolated as promising. From sowing trials, three suitable seasons for vegetables have been determined for Coonoor, viz., March to June, July to October and November to February. A grouping of varieties suited to each season has been made. Trials on control of cut worm attack, in curing tomato fruits which usually rot on the vine at Coonoor before ripening, in growing peas in winter months, in the choice of associates in mixed cropping, etc., have all yielded information of some practical value. A promising strain of cauliflower, named Pomocol, was isolated and is now under study. Preliminary trials in seeding of cabbage have met with success, and the optimum means for seed production have been tentatively determined. Nearly 150 pounds of seed of various vegetables were gathered.

The receipts of the station showed a sharp increase to Rs. 4,825 for the period under report, from an average annual receipt of Rs. 2,200 for the preceding five years.

3. *Fruit Station, Kallar.*—The rainfall recorded during the year was 46.23 inches received on 102 rainy days. The precipitation during the north-east monsoon was far below the average, although the distribution throughout the year was generally favourable.

The clearance of jungle on 11.83 acres was commenced. The new plantings included 510 suckers of *Musa textilis* and other promising fibre-yielding bananas, and 80 Honey-dew papaya seedlings.

The successful mangosteen side-grafts of the previous year have put on good growth. Re-working on aged rootstocks of *Garcinia* species has failed to give any successful take.

Harvests from mango, litchi, pummelo, grapefruit and mango-steens were very favourable during the year, while a crop reduction in loose jacket oranges has been recorded.

Queen has been found to be the earliest pineapple to fruit at Kallar among the seven varieties under trial. The fruits were gathered from this variety in about 11 months and were very superior in quality, but with a mean fruit weight of 2 lb. only.

Peaty soil has shown to be more suitable than sandy loam as a sowing medium for mangosteen seeds. An earlier and higher germination was recorded in the former. Seedlings of *Garcinia morella* and *Calophyllum inophyllum* were found to be easier to transplant, possibly because of a shorter tap root in seed beds than those of other *Garcinia* spp. The unsuitability of February for

mangosteen side-grafting is confirmed, while on the other hand, a high take of 75 per cent in September denotes the suitability of that month.

Among overaged rootstocks of Citrus, Gajanimma has given the highest take with loose jacket orange buds.

4. *Fruit Station, Burliar.*—A total rainfall of 49.61 inches was recorded on 115 rainy days. The rains were markedly in defect in all seasons, although the distribution was favourable.

The new plantings in the year included 475 cardamom suckers, 202 suckers of banana and a few plants of cacao and vanilla.

Arecanut, nutmegs, grapefruit, durain, papaya, jackfruits and loose jacket oranges have recorded good harvests, while litchi, avocado and clove have given relatively low yields. Over 30 per cent of mangosteen trees, 50 per cent of cloves and all langsat trees failed to crop during the year.

Yields on cherimoyer trees grafted on bull's heart are promising.

Fairly encouraging success has been achieved by inarching mangosteen on *Garcinia tinctoria*, jack on jack, litchi on litchi, clove on clove, cherimoyer on bull's heart and by layering of avocado and cacao.

5. *College Orchards, Coimbatore.*—A total rainfall of 21.84 inches was recorded on 76 rainy days during the year under report.

Establishment of variety collection plots for teaching purposes was in progress. In the plot of miscellaneous fruits planted in September 1942, custard apple, strawberry guava, Poona fig and *Embluca officinalis* have produced a small crop, although no fruits matured in strawberry guava. Citrus trees in the newly established plot suffered severely from leaf miner. Observations show that in this plot grape fruits showed the least incidence of this pest. From the older trees good harvests have been gathered from guavas fall through the year, except from October to February, from pummelo mainly from December to February, from sapotas except in November and April to June. The April crop from grapevine was a failure but an average yield of 10½ lb. per vine was gathered from Krishnagiri variety in September.

In view of the large variation even among the inbred strains of papaya an attempt was made to select individual trees of merit, each possessing one or more desirable characters such as dwarfness, high yield, optimum spacing between fruits, good branching habit, desirable fruit size, shape, etc. In all, 17 tree selections have been made. Analyses of the papaya yields show that the period to attain bearing varies from about seven months to 16 months, the yield from 27 lb. to 167 lb. or 12 to 110 fruits within the first 23 months, with an average of 31 fruits or 62.8 lb. per tree, working out to an acre-yield of 42,840 lb., if all the trees in the acre are females. Fifteen different sex forms have been noted in papaya, but no correlation was found to exist between the type of inflorescence and fruit shape. The papaya collection has been enriched

by obtaining and planting 82 seedlings from nine different sources under the label of alleged distinct varieties. About 70 oz. of crude papain was collected and supplied to the King Institute, Guindy, for the preparation of Cholera bacteriophage.

Although Peter and Banganpalli mangoes produced off-season blooms in September, fruit set failed to occur. The establishment of a new banana area in wet lands with nearly 70 varieties was completed, along with a plantation of 25 culinary and dual purpose varieties in garden land. Observations on desuckering confirm the previous experience that Ney Poovan and Kao are the most shy sucker producers. A large variation between plants in Vaman-keli and Giant Governor varieties has been observed in regard to the period of attaining flowering stage, the variation ranging to four months seven days between the first and the last flowering dates in the former variety and three months four days in the latter. Fruits were harvested in the former variety for the first time in nine months and 29 days after planting, when a net weight of 31 lb. of hands was recorded. In garden land the performance in general of all bananas except Nendra Padathi and Enna Benian, have been superior to that in wet land. In Kao the differences were specially large as the net fruit weight in garden lands was 30.8 lb. as against 11.25 lb. in wet land. Indications are also strong that bananas in garden land fruit earlier than in wet lands, excepting in Nendran and Nendra Padathi. Selection of garden land for the crop seems, therefore, preferable to that of wetland.

Vegetables.—Studies on different aspects of vegetable research formed the most important feature of the activity of the post-graduate student at the College Orchards. The important crops tried during the year included 45 different types of brinjals and 34 of bhendi.

The results achieved are summarised below :—

(1) Tentative keys classifying the above crop varieties based on certain distinct morphological features of plant and fruit, were prepared.

(2) Of the brinjals, Vellore Blue, Raviya, Neeti Vanga, Gobi, Purple Beauty and Round Purple were found to be desirable in respect of yield and resistance to diseases.

(3) The extent of damage by bud worm on brinjals was found to vary from 10.1 to 42.0 and 38.8 to 98.5 per cent in March-April and September-December respectively. The infestation of the pest was found to be greater on days after some rains and also during rainy days.

(4) Vellore Blue, Raviya and Neeti Vanga types of brinjals showed some amount of resistance to budworm attack.

(5) Observations were recorded to the effect that the opening of the flower and the dehiscence of the anthers tend to go together and also that all the anthers of a flower do not dehisce at the same time in brinjal.

(6) The receptive stigma was observed to be shiny green in colour and the receptivity was observed to be present for a period of two days from flower opening in brinjal.

(7) Longer time for anther dehiscence was observed in the case of bagged flowers than in those free in brinjal.

(8) Brinjal pollen grains were found to be viable for two days.

(9) Though artificially self-pollinated flowers do set fruits, self-pollination in nature has not been observed.

(10) The possibility of fruit set in brinjals by induced parthenocarphy, by smearing the receptive stigma with latex of papaya plant, was indicated.

(11) Studies in the inter-varietal crosses in brinjal revealed a definite increase in percentage of seeds in crossed fruits over the naturally set fruits of either parent.

(12) An acreage yield of 3,000 to 7,500 lb. of pods in bhendi was recorded, and the highest yield was observed in April to July crop.

(13) A considerable extent of resistance to attack of jassids was observed in Gobichettipalayam and Tiruttani varieties of bhendi.

(14) Abnormality observed in two bhendi flowers was recorded.

Vegetables formed the main intercrop in the College Orchards and were also raised in all the available space in plots not planted to fruit. Among the new introductions a variety of ribbed gourd from Salem, a perennial type of redgram and two types of climbing chillies are either promising or deserve to be kept under further observation. The seed collection was intensified, and a total quantity of 2,604 oz. of vegetable seeds were sold or transferred. Information collected in the course of the year show that for yield, April and June sowings seem to be well suited, and September sowings result in reducing the picking season by about a month in cowpea. The June sowings in cluster beans have yielded the maximum crop, almost confirming the previous observations. April sowings in bhendi have also proved to be the best as in last year for yield. In snake gourd the December sowings have produced a record yield of about 16,100 lb. September has shown to be a good sowing season for ribbed gourd, almost in conformity with the experience gained in the previous year.

6. *Other centres*—(a) *Anakapalle.*—A preliminary survey of sapota varieties in Jami, Bobbili and Vizianagaram taluks was carried out. An area of 75 per cent under ratoon crop and 94 cents under first crop of bananas was established with 19 varieties under each crop. In addition, suckers of banana were planted on a fresh plot of 75 cents. Guavas in general were in normal bearing. In mangoes, while the flowering was satisfactory the fruit set was poor. A few citrus trees died due to root and bark disease and a few others due to the cyclonic weather in April. Propagation work extended to citrus, mango, sapota, jack, roseapple, fig and grapevine.

and a total of 199 grafts, 197 seedlings, 145 budded plants, 51 cuttings and 48 layers were sold to the public. The alleys of trees in the orchard were used for 38 brinjal varieties and other indigenous and exotic vegetables. Seeds worth over Rs. 1,000 were produced.

(b) *Guntur*.—The orchard trees at the Lam Farm are now roughly five years old. Among the 22 citrus varieties under trial, Blood Red, Coorg Orange and Chinese orange seem promising from the view-point of yield, for precocity, budded limes and lemons seem outstanding, as they have been producing fruits from about the second year of planting. Grafted and budded Vadiapudi oranges have produced distinctly earlier crop than seedlings. As at Kodur, Chinese trees on Gajanimma seem unhealthy, though producing heavy crops, while those on Jamburi though healthy seem to be slow in attaining bearing stage; and those on Kichili seem to be healthy, vigorous and prolific.

Of the 17 mango varieties in the collection, only two are yet in a non-bearing stage. Crop on most of the varieties was good for the tree age, being over 80 fruits per tree on Firangiludva, Banganpalli, Chinnasuvarnarekha, Ramani, Cherkurasam, Panakalu and Mundappa. The off-season mango from Tenali has produced a few fruits in the normal season and a second crop of flowers towards the close of May.

Shedding of immature fruits in Turkish Red fig continued to occur as against the normal fruit development in Poona fig. In guavas, Allahabad variety seems the most promising. Pomegranates and grapes produced little or no crop.

Vegetable growing was undertaken on 1.65 acres; and 265 lb. of seeds were produced, besides the sale of 4,600 tomato and 1,125 brinjal seedlings.

(c) *Taliparamba*.—During the year 1,500 mango grafts were prepared at Kanhangad and 1,460 at the orchards of the Agricultural Research Station, besides 1,450 at the latter place for experimental purposes. The successful take at the two centres in these has been 67 and 80 per cent, respectively. Only 2,500 grafts were sold during the year, in addition to 711 arecanut seedlings and 1,827 other fruit plants.

Of the eight Nendran varieties planted at this centre, Chengal-kodan has taken eight months to flower, while all others flowered in about 7½ months. A trial on the planting of fresh vs. dry suckers of Tiruvodan banana has indicated that growth is more robust in the latter planting than in the former. Jackals and crows have been a serious menace to pineapples. However, 3,047 suckers were sold and 20 lb. pineapple fibre was supplied to the Ordnance Laboratories, Cawnpore.

Crop in mangoes and cashewnuts was poor in the year under report, while a good harvest was recorded in jack with 4,252 fruits from 235 trees, which fetched Rs. 439 in auction. A small crop of mangosteen was harvested, but during rains the fruits showed a heavy incidence of gamboge disease.

The monthly mango inarching trials with Neelum and Kalapadi varieties on one and two-year old monembryonic stocks have recorded high takes in Neelum, grafted in March and June and separated in June and September respectively, while with Kalapadi the takes have been encouraging in lots grafted in March, June and October and separated in June, September and January respectively. A trend towards higher takes seems to characterise the grafts on one-year old, rather than on two-year old stocks in most of the months. Since August and September were shown to be the optimum months for inarching in the previous year, seasonal conditions may perhaps be exerting a marked influence on the take. Inarching in November and February for Neelum and the same months and January for Kalapadi have proved to be unsuitable.

Trials on side-grafting mangoes by insertion and Nakamura methods with Kalapadi and Bennet Alphonso varieties from July to October on monembryonic stocks of different ages have given generally higher takes with the insertion methods, the take being specially high in second half of July and September for Bennet Alphonso insertions and the former period for Kalapadi insertions as well.

Observations on the use of mud, hill grass and bamboo containers for one-year old mango seedlings inarched to Bangalore in August show that the latter two containers are cheaper and lead to higher percentage of graft survivals. The cost of production per graft in the latter two containers is only Re. 0-3-2 as against Re. 0-5-3 in the former, while the survivals were over 65 and only 43 per cent respectively.

Two-years' trials on nursing methods of separated grafts seem to confirm the previous observations that grafts potted and kept in shade give larger number of survivals than those kept in the open dry ground. Those kept in wet land in grass containers specially seem to have developed better growth.

No advantage in delaying the separation till December seems to be apparent in Mulgoa grafts inarched on Puliyan in August over those separated in November.

(d) *Pattambi*.—About 0.43 acre under Nendran, Poovan and Attunendrum varieties of banana and 3.10 acres under pineapples represented the fruit area at this centre. The sales included 5,304 lb. of pineapples and 945 lb. of banana. The pineapple crop grown on the dry lands (Modan lands) was very successful, while Nendran and Poovan varieties of bananas in wet lands failed partially.

7. *Classification of fruits*—(1) *Mango*.—The study of the off season bearing mangoes was commenced, and eight fruit specimens and 18 flower specimens from the Northern Circars were described during the year. A list of over 450 varieties of South Indian mangoes was prepared and sent to the Chairman, *Ad hoc* Committee on mango classification.

(2) *Citrus*.—Forty-eight fruit specimens mostly obtained from rootstock and variety collection plots at the Fruit Research Station, Kodur, were described. One of the specimens, however, consisted of sweet lime sent for identification from the Orange Research Station, Pollibetta, Coorg.

(3) *Hill fruits*.—Six fruit specimens of plums, one of peach, two of apples and one in each of Cape gooseberry and passion fruit were described.

(4) *Other fruits*.—Descriptions of guavas, pomegranates, zizyphus and grapevine were continued and fruit descriptions of six, five, two and seven varieties of these respectively were recorded.

IV. HORTICULTURE.

1. *Banana Fibre Scheme*.—At the instance of Ordnance Laboratories, Cawnpore and to meet the needs of the Defence Department, a scheme for the development of banana fibre industry in the Province including the multiplication of *Musa textilis*, which yields the Manila hemp, was sanctioned in G.O. Ms. No. 1522, Development, dated 10th July 1943. Work under the scheme commenced with the posting of one Assistant at Coimbatore on 29th November 1943. The following represents a summary of work done under the scheme from about the beginning of December 1943 to the close of the period under report.

(1) *Extraction*.—From trials on the hand-extraction of fibre from 150 pseudostems of 31 banana varieties and *Musa textilis*, the following indications have been obtained :—

(a) The number of sheaths vary markedly between varieties.

(b) Elavazhai, Karivazhai and Mauritius have yielded largest mean fibre weight per pseudostem.

(c) Extraction of fibre from Elavazhai is more time-taking than that of any other variety.

(d) Percentage of fibre per pseudostem was maximum in Karivazhai, Kunnan, Mauritius, Pannabenian, Kulan, Pedda Pacha Arati and the wild banana from the Anamalais.

(e) Karivazhai was the easiest to extract fibre.

(f) The quantity of fibre seems to be the largest when the extraction is done at the flowering stage of the plant.

(2) *Fibre tests*.—Tests carried out at Coimbatore and at the Indian Central Jute Committee's Laboratory, Calcutta, have furnished the following information :—

(a) Kapur, Monthan, Poovan, Krishnavazhai, Kali, Pacha Nadan and Kaluvazhai possess the largest strand lengths with Pedda Pacha Arati and Giant Governor having the least.

(b) The coarser fibres appear to be from Ayyaranka Rasthali, Suganthi, Nendran, *Musa textilis*, Karivazhai and Pacha Nadan, while the finer ones are from Elavazhai, Vamanakeli, and wild banana from Anamalais.

(c) The tensile strength seems largest in Giant Governor, *Musa textilis*, Krishnavazhai, Karivazhai, Ney Mannan, Kapur, Monthan, Pacha Nadan and Rasthali.

(d) The general quality seems superior in Giant Governor, Krishnavazhai, the wild banana from Anamalais, Ney Mannan, Kapur, Poovan and Rasthali, while it is inferior in Booditha Montha Bathees and Suganthi.

(e) Sheaths in central folds of the pseudostem appear to yield stronger fibre than others.

(f) Tensile strength seems to be at its maximum when the fibre is extracted at the flowering stage.

(g) Manila hemp from plants grown in South India are of poor quality, being inferior in many characters to the fibre from several banana varieties. This is possibly due to the inferior *Musa textilis* varieties under cultivation.

(h) No appreciable influences were observed on fibre strength by treatment in water and saline solutions.

(3) *Miscellaneous*.—(a) Over 500 suckers including 115 of *Musa textilis* were planted at Kallar.

(b) From a survey it was gathered that *Musa textilis* is not found in Lower Palnis, Lower Nilgiris, Wynad and Anamalais.

(c) *Musa textilis* seeds failed to germinate with or without acid or water treatments, possibly because of loss of viability in storage.

(4) *Other fibres*.—(a) Plants of *Phormium tenax*, *P. variegatum* and *Moraea iriodides* were planted at Coimbatore for trial as sources of fibre.

(b) At Kodur, fibre from *Sanseveria zeylanica* was extracted and 45 lb. of this supplied to Ordnance Laboratories, Cawnpore. The Inspectorate of General Stores have reported that the yarn have been made satisfactorily and the cordage and yarn from this fibre show great promise and require to be encouraged.

(5) *Fibre extractors*.—The Special Officer for designing machinery reports satisfactory progress in the designing of improved Proudlock model fibre extractors.

2. *Nursery Scheme, Kodur*.—Total receipts during the year amounted to Rs. 5,917-11-9, while the total expenditure under all items and heads amounted to Rs. 6,390-13-8. To this has to be added the value of plants transferred free and those utilized for training the students, all of which totalled to Rs. 1,181-5-0.

Taking all these, the net profits from the scheme works out to 11-12 per cent, during 1943-44 as against 24-72 per cent for the corresponding period during 1942-43. This decrease in the net profit is due to general increase in wages, cost of packing material and payment of dearness allowance to the members of the staff and coolies, which alone worked out to Rs. 465-15-0, while the sale price of plants remained stationary. The value of the stock of

plants in the nursery is estimated at Rs. 15,000 at the close of the year. The Fruit Nursery has again, therefore, definitely proved to be a commercial success.

The sales effected during the year consisted of 5,258 budded citrus plants, 1,514 mango grafts and 1,898 other plants.

Trained budders were deputed to four private nurseries and the Panagal Demonstration Farm, Kalahasti, where a total number of 3,080 plants were budded. The nursery afforded facilities for training of three non-stipendiary students and 10 coolies.

3. *Botanical Garden, Coimbatore.*—The new introductions include two *Passiflora* creepers, two *Hibiscus* varieties, six of crotons, one of *Leora*, two of *Thevetia*, two of *chrysanthemums*, one of *Thunbergia* and a mosaic type of *Mirabilis jalapa*, besides a number of annuals. By the orderly alignment of annual beds, this section of the garden has been greatly enlivened. A new plot for shrubs was established by the planting of 108 plants of 53 varieties of 14 kinds. The ornamental vegetable park has afforded scope for a trial of new groupings and combinations. Topiary work with a dozen different trimming methods on the *Eupatorium* hedge over a running length of 7,200 feet has further brightened the look of the garden. A separated fodder tree plot was established with six kinds of plants. To enliven the garden in the off-seasons, potted flower plants of a number of kinds were raised and distributed. Three more cheap designs of stands for potted plants were evolved. The sales included over 270 oz. of flower seeds, about 100 oz. of avenue tree seeds, 647 *Canna* bulbs, over 1,700 dozen of flower seedlings, over 450 avenue plants, nearly 300 shrubs, about 300 creepers and 40 other potted plants.

V. MISCELLANEOUS.

Works.—In addition to the annual repairs to the buildings, the following new and special works were undertaken and completed during the year.

(a) A watchman's hut at the Pomological Station, Coonoor, at a cost of Rs. 300.

(b) A gate at the Fruit Station, Kallar, at a cost of Rs. 175.

(c) Special repairs to the Farm Manager's office at the Fruit Research Station, Kodur, at a cost of Rs. 254.

(d) Sales room at the College Orchards at a cost of Rs. 1,119 (up to March 1944) constructed by the Estate Civil Engineer.

(e) Special repairs to the coolie hut at the Fruit Research Station, Kodur, at a cost of Rs. 360.

2. *New Schemes.*—Among the schemes submitted during the year were the following :—

(a) A scheme for giving immediate relief to Vadlapudi orange seedling plantations in Vijayavada.

(b) A detailed scheme for establishment of fruit nurseries for sale of plants to ex-soldiers.

(c) A detailed scheme for the development of fruit industry in the Ceded districts.

(d) A scheme for the improvement of hill fruits.

(e) A scheme for re-organization and development of fruit work in the Province.

3. *Exhibitions.*—Exhibits containing mainly fruits, vegetables, plants, placards and posters were sent to 15 different exhibitions from Kodur, 6 exhibitions each from Kallar and Burliar, 14 exhibitions from Pomological Station, Coonoor, and 16 exhibitions from the College Orchards, Coimbatore.

4. *Eat More Fruit Campaign.*—Three regional fruit shows were organized under the scheme. The first was held at Rajampet on 27th and 28th December 1943, the second at Trichinopoly on 31st December 1943 and 1st January 1944 and the third at Mangalore on 30th and 31st May 1944. All the three shows proved a success, attracting over 5,000, 7,000 and 5,000 visitors, respectively. A decorated stall and a fruit bar formed the special features of the Rayalaseema show held at Rajampet. A good collection of off-season mangoes and fruit dishes from many parts of Tamilnad formed the main features of the Tamilnad show, while a variety of dishes prepared from jak formed the star attraction of the Second West Coast Show.

Seven sets of cinema slides containing six slides in each set, with artistic illustrations of the varied uses and benefits of fruit diet were prepared. These were exhibited in eight houses in Rayalaseema and six in Tamilnad for 14 and 28 days, respectively. It is gratifying to record that as many as seven theatres displayed the slides free of cost to the Government.

Under the orders of the Government, "Eat More Fruit" campaign posters and placards were also exhibited along with the departmental fruit stalls during the annual flower show at Ootacamund.

Five show cases of 15 c.ft. each containing attractive illustrated posters on the dietetic value of fruits and with wooden and clay models showing the number of fruits of each to be consumed by an adult every day to meet his normal vitamin requirements, were prepared and fixed on the South Indian Railway platforms at Calicut, Coimbatore, Egmore, Trichinopoly and Madurai. The illustrated posters inside these show cases are prepared in English and in the local languages.

5. *Posters and publications.*—Seven pictorial posters, a set of six slide enlargements and a large poster on "Eat More Fruit" campaign were prepared. A special "Fruit Number" of the South African Farming was reviewed. An article on guava cultivation in the Circars was revised.

The following papers on original research were published or accepted for publication during the year :—

(i) Studies in Blossom Biology and Pollination in Mangoes (*Mangifera indica*, Linn.) by K. C. Naik and M. Mohan Rao in *Indian Journal of Horticulture*, Vol. I, No. 2, December 1943.

(ii) Dehydrated Banana Products and their Food Value by K. C. Naik in the *Madras Agricultural Journal*, Vol. XXXI, No. 12, December 1943.

The following were the popular articles prepared or published during the year :—

(i) An article on "Eat More Fruit" by K. C. Naik, was abridged for publication in the *Madras Agricultural Journal*.

(ii) Some Special Features of South Indian Horticulture by K. C. Naik; *The Indian Journal of Horticulture*, Vol. I, No. 1, June 1943.

(iii) An article on the Value of Fruit Diet in the Villagers' Guide and Calendar for 1944.

(iv) An article on Government Fruit Stations in the Villagers' Guide and Calendar for 1944.

(v) Leaflet No. 117 on banana recipes.

(vi) Leaflet No. 118 on some hints on planting of young plants and after-care of young fruit plantations.

(vii) The following articles were sent for publication in the departmental journal :—

(a) The importance of vegetable, by Sri K. S. Venkataramani.

(b) Promising fruit, by the staff of the Fruit Research Station, Kodur.

(c) Cultivation of banana, by Sri R. Shanmukhasundaram.

(d) Some hints for improvement of Orchards, by the staff of the Fruit Research Station, Kodur.

(e) Strawberry, by Sri U. Narasinga Rao.

6. *Lectures*.—Two lectures on the "Value of Fruit Diet" were delivered, one at the Rayalaseema Fruit Show at Rajampet and the other at the Tamilnad Fruit Show at Trichinopoly. Another lecture was delivered on "Fruits and Our Duty" at the Second West Coast Fruit Show at Mangalore.

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

Sri V. Kalyan, ex-Overseer, Kallar Fruit Station, has been selected to serve in His Majesty's Land Forces as a Viceroy's Commissioned Officer.

Sri G. Chandra Paul, ex-Farm Clerk, Fruit Research Station, Kodur, was relieved on the forenoon of 27th November 1943 to join the communication branch of the Royal Indian Navy.

Sri P. G. Kurup, Ex-Assistant, Fruit Research Station, Kodur, is working as Assistant Industrial Planning Officer in the Directorate of Foodstuffs, New Delhi.

Saheb Oosman, peon in the office of the Fruit Specialist 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.

Sri M. Satyanarayana, Store-keeper, Nursery Scheme, has applied for the post of Havildar Clerk in the Railway Military units and as a clerk under S.O.R.E, Madras.

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.

A sum of Rs. 38 towards Defence Provident Fund and Rs. 14-1-0 towards Governor's War Fund formed the monetary contribution by the members of the staff in addition to the individual contributions to Defence Savings Certificates. A sum of Rs. 41-12-0 was also contributed from the hundi collections.

Active help was given in the establishment of a vegetable park, orchard demonstration plots and in the display of fruit, vegetable and fruit products exhibits at the War Services Exhibition at Madras. The services rendered in this exhibition were acknowledged and highly commended by the Military Authorities.

Assistance was given in the matter of arranging fruit supply to the military through the Kodur Fruit Growers' Co-operative Society, and arrangements have also been made for supply of fruits from Kallar and Burliar Fruit Stations to the Army.

KODUR P.O.,
CUDDAPPAH DISTRICT,
4th August 1944.

K. C. NAIK,
Fruit Specialist.

ADMINISTRATION REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST, COIMBATORE, FOR THE YEAR 1943-44 (FASLI 1353).

I submit herewith the administration report of my section for the fasli year 1943-44.

I was appointed to officiate as Government Agricultural Chemist *vice* Sri P. Venkataramiah appointed as whole-time Principal, Agricultural College, and took charge of my duties on the forenoon of the 19th August 1943.

The work of the section is, as usual, reported under three main heads, viz., I. General (including Analytical and Advisory), II. Teaching and III. Research.

I. GENERAL.

Weather.—Meteorological observations were recorded daily at the Institute observatory, but the figures were not published owing to wartime restrictions. The total rainfall during the year, as received from both the monsoons, was below normal. The month of September was particularly droughty, and the paddy crop suffered in consequence.

Analytical and advisory.—Two thousand two hundred and ninety-two samples, consisting of soils, manures, irrigation waters, foodstuffs, fodders, sugarcane, dairy products and miscellaneous agricultural products were analysed during the year and reported to the parties concerned. Of these, 290 related to the research activities of the section, 717 were received from other officers of the Agricultural department, 1,201 from other Government departments, and 84 from ryots and other private parties. A sum of Rs. 937.8-0 was realised as analytical fees from ryots and other private parties.

II. TEACHING.

Two hundred and fifty-three lectures of one hour's duration each were delivered and 184 practical classes of 2 hours each were held for the classes of the B.Sc. Degree Course. A course of lectures on malt and malt making, with practical demonstration of the preparation of malt food and malt extract, was given to the short course students in September 1943. A similar course of lectures and demonstrations on jaggery making was given to them in February 1944.

III. RESEARCH.

A. Soils.

Fundamental studies on the origin and properties of black and red soils of the Madras Presidency.—This investigation was continued during the year with samples collected from the Udampalpet and Gobichettipalayam areas. The clay fraction from the Udampalpet red soil was found to contain a high amount of silicate calcium which was almost wholly exchangeable CaO. Analysis of fine sand fractions of the red and black soils of this area showed that (1) the CaO in the black soil sand exists mostly as calcium carbonate with very little silicate Ca, while the red soil sand contains calcium and magnesium carbonate at the lower layers, but none at the top-layer; (2) red soil sand contains more bases than the black soil sand, the greater decomposition being probably due to the irrigation which the soil had received; (3) the difference between hydrochloric acid digestion and fusion methods is the same in both the sands, and (4) the lower depths contain less of soda and potash in both cases, probably due to loss by leaching.

Microscopic examination revealed the presence of more hornblende and less leucoxenes in the black soil sand, the red soil sand containing only stray bits of hornblende but more of leucoxenes. In both cases, quartz constitutes more than 50 per cent.

Dehydration studies of the black and red soil clays from Udampalpet showed that the curves of black soil clay are similar to those of Scolecite (Ca. Zeolite) and those of red soil clay resembled kaolin curves.

Examination of samples from the Gobichettipalayam area revealed the origin of red soils from calcium amphibolite, indicating that even rocks containing calcium silicate in the absence of sodium decompose into red soil and CaCO_3 (which is present in abundance here), as CaCO_3 by itself will not bring about a high pH required for the formation of black soil. The $\text{Si}^2\text{C}^2\text{R}^2\text{O}^3$ ratio which is the characteristic of black and red soils seems to depend on the pH during the process of soil formation. Two red soil clays, one formed from mica granite and the other from calcium amphibolite gave the same $\text{Si}^2\text{C}^2\text{R}^2\text{O}^3$ ratio although the contents of CaO and K_2O vary in the two cases, the red clay from mica granite containing more of K_2O and less of CaO, and that from the calcium amphibolite containing more of CaO and much less of K_2O .

2. Reclamation of soils of the Vaipar area in the Tirunelveli district.—This area is a flat saline waste, the low-lying portions of which are subject to inundations from the sea on one side and the jungle stream Vaipar on the other. With a view to investigate the possibility of reclaiming this waste and utilizing it for Soldiers' Colonies, soil samples were taken at different depths from profiles in three places and analysed. Though the soil was in

general a sandy loam, the high water table and absence of plentiful supplies of fresh water were factors that operated against cheap and speedy reclamation.

3. *Studies on the soils of the Godavari delta.*—Profile studies were made on samples of soils collected from near the Gowthami and Vasishta Branches of the river and from the central portion of the delta. Physical and chemical analysis of such samples showed that near the two branches of the river layers of fine sand alternate with layers rich in silt and clay. The soils near the Gowthami Branch are more fertile than those near the Vasishta Branch. The total salt content of the soils in the deltaic area is generally low and the top 4 feet are found to be rich in lime and nitrogen.

4. *Dry Farming experiments.*—The headquarters of the Soil Physicist was shifted from Hagari to Coimbatore in February 1944.

(a) *Soil moisture work.*—Field distribution of moisture was studied in experimental plots which received different types of ploughing—deep inversion, light inversion and no inversion (country ploughing). It was found that deep ploughing resulted in desiccation, the deep ploughed plots usually showing the lowest amount of moisture. The plots which received country ploughing were found to contain a slightly higher amount of moisture than the control plots. In another set of plots, the effect of bunding on soil moisture was studied. Bunding as usual has shown its superiority over the control (unbundled).

(b) *Studies on surface run-off.*—Run-off studies were continued to the two plots set up at Hagari during 1937. One of the plots was kept clean and fallow while the other had a crop of setaria for a short period. 15.6 per cent of the rain water received during the rainy season was lost as surface run-off in the fallow plot. There has been a steady decline in the amount of run-off taking place from this plot within the last four years owing to the undisturbed nature of the soil.

(c) *Studies on soil tilth.*—Soil tilth was studied by sieving tests in the set of plots under ploughing trials at Hagari and in the cultural experiments in the red and black soils of the Cotton Breeding Station, Coimbatore. Deep ploughing usually resulted in a low figure for surface area due to the presence of a larger proportion of the bigger aggregates. During the dry period, the weathering action tends to reduce the larger aggregates into smaller particles and this is shown by an increase in the surface area of the particles.

B. Manures and manuring.

Permanent manurial experiments.—(a) *Old permanent manurials.*—In these plots, fodder cholam was raised as a rain-fed crop as irrigation facilities were not available. The yields of dry fodder on the whole showed that (1) the complete manure (N+K+P) plot

gave the highest yield, and (2) nitrogen alone or in combination with phosphoric acid or potash gave higher yields than P_2O_5 or K_2O alone, and (3) cattle manure gave yields almost as high as the nitrogen series.

(b) *The new permanent manurials.*—The 31st crop (panivara) was grown in this series. Comparing the yields of the eastern and western series, it has to be inferred that this crop on the whole did not derive any special benefit from the basal dressing of cattle manure. The yields of grain from the different plots showed that the phosphoric acid series alone or in combination with nitrogen or potash or both gave higher yields than the rest.

2. *Studies on the nature and extent of decomposition of organic materials of varying carbon/nitrogen ratios in black soils.*—(a) *Pot culture experiments.*—Estimations of various fractions of organic matter and nitrogen derived from added materials such as green manure (sunhemp), paddy straw, groundnut cake and farm-yard manure at different stages of decomposition in black soil up to a period of 60 days under pot culture conditions were carried out during the year. The results indicate the possibility of enriching the organic matter and nitrogen contents of the black soil under irrigated conditions to the maximum extent by a judicious incorporation of oil cakes and straw or green leaf so as to maintain the lignin+cellulose and protein in the ratio 3:1 or 4:1.

A substantial increase in the total exchangeable bases was also observed at the end of two months after the application of these organic materials to the black soil. Arranged in order of influence on the exchange capacity, cattle manure stands first, closely followed by paddy straw, green manure and groundnut cake.

3. *Field experiments at Siruguppa.*—Data collected in connexion with this investigation which has been in progress at the Siruguppa Research Station for the past four years have confirmed the previous observation, viz., (1) a reduction in the average carbon/nitrogen ratio of treated soils to below 20; (2) increase up to 20 per cent in total nitrogen, particularly in the irrigated plots under green manure; (3) accumulation of comparatively more organic carbon (10–20 per cent) particularly in the fallow irrigated plots under green manure; and (4) close agreement of 'oxidation values' expressed in terms of carbon with absolute organic carbon figures, showing the presence of well decomposed organic matter free from other reducing substances.

4. *Conversion of municipal waste into compost.*—A Senior Health Officer from the Public Health department and an Assistant Agricultural Chemist from the section were deputed for training in the composting of municipal wastes under the Chief Bio-chemist, Compost Scheme. After the course, the Assistant Agricultural Chemist trained 18 Sanitary Inspectors and two Agricultural Demonstrators at Bezvada and resumed his duties in the section after handing over charge to the Health Officer.

As information on the crop producing value of this type of manure is meagre in this Province, it is proposed to conduct field trials with compost made out of nightsoil and sweepings of the Agricultural College Estate. Composting is being done in Field No. 37, Central Farm, where six pits have been filled so far.

5. *Comparative studies of green manures.*—The investigation on the relative merits of the four green-manure crops, viz., dhaincha, sunnhemp, pillipesara and cowpea, in point of yield of green matter and effect on paddy yield, was continued. Field experiments again showed that in green matter production dhaincha stood first, followed in descending order by sunnhemp, pillipesara and cowpea. In respect of paddy yield also, dhaincha had the first place, but pillipesara stood second, sunnhemp third and cowpea last. Tests on decomposability of organic matter, however, showed that cowpea was the most readily decomposed, sunnhemp coming next, pillipesara third and dhaincha last. This aspect will be taken up again for confirmation.

6. *Experiments on the storage of farmyard manure.*—The relative crop producing power of farmyard manure stored under different systems forms the subject of this investigation. Experiments have been started in collaboration with the Millets Specialist. Equal quantities of manure (dung and urine) are placed under three systems of storage; (a) open heap, (b) open pit and (c) covered pit, by collecting the voidings of four selected animals and dividing each day's collection into three equal parts which are stored separately under the three systems. The intensity and course of fermentation in each case are being noted, and when sufficient quantities have accumulated field trials on their relative crop-producing powers will be started.

C. Plant chemistry.

Study of quality in chewing tobacco from Jaffna and Meenampalayam.—This study was concluded during the year, the last stage being the growing of both the varieties in the Central Farm and curing both by the Jaffna method as reported in the Ceylon publications. It was observed that neither of the varieties yielded good chewing tobacco even after prolonged periods of curing. The general conclusions arrived at from these experiments are—

(1) An examination of both the varieties as received from their respective places of origin showed that the Jaffna variety contained less of nicotine than the Meenampalayam,

(2) when grown under Coimbatore conditions, there was no difference in the nicotine content of the two at all stages of growth and curing,

(3) bacterial flora had nothing to do with the quality of the two types.

(4) curing the two varieties by the two different processes did not show great differences, the Jaffna tobacco cured by the Meenampalayam method yielding something resembling a low grade Meenampalayam tobacco, while curing did not proceed to completion in either case by the Jaffna method, and

(5) soil and climatic conditions appear to be the chief factors that influence the quality of the two types, each developing its characteristic quality in its native soil if cured by the local method.

2. *The mineral composition of sugarcane as influenced by increasing quantities of manurial nitrogen and by quality of irrigation water.*—This is a continuation of the previous year's work on nitrogen intake by sugarcane. Results of chemical analysis of juices indicated that—

(1) in the manured series, chlorine and potash in juice increase with increasing doses of manurial nitrogen, while P_2O_5 remains unchanged,

(2) in the unmanured series, irrigation with brackish water caused an appreciable increase in the chlorine and potash content as compared with rain water irrigation, and

(3) application of nitrogenous manure appears to depress phosphate absorption by the cane plant. Heavy nitrogenous manuring coupled with irrigation with brackish water thus yields a juice of poor quality with a high chlorine and potash content and a correspondingly low P_2O_5 content.

3. *Storage and quality of rice.*—It has already been observed that, as a result of three months' storage the starch in the rice kernel underwent changes which related on the one hand to its molecular size and phosphorus content, and on the other to its cooking quality and marketability. Further observations made on the changes resulting from storage for a period of nine months confirm the tendency to form larger molecular sizes. The phosphoric acid content increases in the hot water soluble and insoluble portions, while it decreases in the cold water soluble portion. This and the fact that there is a reduction in the amount of soluble starch in the stored grain indicate that the larger sizes built up during storage have probably resulted from a process of slow phosphorylation of smaller polysaccharide units.

D. Animal nutrition.

Study of fodder grasses with respect to their hydrocyanic acid content.—The four varieties of fodder grasses in which hydrocyanic acid was found to be present at different stages of growth were given six different manurial treatments each with a view to observe the effect of such treatment on their HCN content. As far as results are available, manurial treatment has had no effect on their HCN content at any stage of growth. This observation is being confirmed by fresh experiments.

Feeding trials with Giant Star grass.—To assess the toxicity of the hydrocyanic acid in this variety of grass (cyanodon Plectostachyam) at different stages of growth, feeding trials have been started with a pair of bullocks. The experiments are in progress.

E. Micro-biology.

Study of the changes in the micro-biological population of black soils as a result of irrigation and manuring.—Analysis of the second round of samples from blocks under different treatments at the Sirugappa station showed a slight decrease in the physiological group numbers, excepting in the case of the nitrogen fixing organisms. This may be taken to mean that there is a gradual stabilization with respect to the various kinds of organisms in conformity with the treatments to which the soil is subjected. This view is confirmed by the total bacteriological population in the different fields which were found to be so grouped as to be indicative of the treatment given to the fields.

2. *Nitrogen fixation in paddy soils.*—Pot experiments with soils inoculated with azotobacter, clostridium and a mixture of these two bacteria showed that the yield of paddy (G.E.B. 24) was highest in the Azotobacter Series (more than double that of the other treatments). The Clostridium and Clostridium + Azotobacter Series gave yields even lower than the molasses treated controls. The experiments were inconclusive, and need repetition.

F. Agricultural industries.

The preparation of agar-agar from sea-weed.—Further work done on this subject aimed at the reduction in manufacturing cost as well as in operational time. By substituting Coimbatore town supply water for distilled water which was hitherto being used for soaking and extraction, it was possible to prepare at much lower cost a product which still conformed to the British Pharmacopoeia Standard in ash content. Trials are also being made to reduce to the minimum the quantity of hydrochloric acid used in washing the raw weed, or dispense with the use of this acid altogether. The minimum steeping period required for the purification of the jelly is also being worked out as a means of saving in operational time.

2. *Dehydration of potatoes.*—It has been found that by utilizing the tips, each containing one of the buds, for propagating the potato crop, about 75 per cent of the tuber now wasted as seed could be saved for domestic consumption. By suitably dehydrating these cut tubers, it would be possible to preserve them or send them to distant places without fear of deterioration. The process consists in peeling and slicing thin, blanching in boiling salt water, chilling in a stream of cold water and drying in a draught oven at about 150° F. for eight hours or more. Potato chips prepared this way have been found to keep indefinitely and retain the flavour

and quality of fresh potato if soaked in cold water for an hour and cooked. The District Agricultural Officer, the Nilgiris, has been instructed in this method of dehydration which could be adopted as a Cottage Industry in the potato growing areas of that district.

3. *Malting of cholam.*—Work on this subject was mostly confined to attempts at preservation of the bottled food from deterioration caused by rancidity and insect infestation. Rancidity is caused by the high fat content of the cholam grain. Attempts at eliminating it consisted in (1) defatting the grain by steeping in weak alkali, (2) choosing varieties with low fat content or (3) blending cholam malt with less fatty malt foods like that from paddy. Steeping the grain in alkali was not found to be successful as a weak alkali did not remove the fat to any appreciable extent, while stronger solution inhibited germination of the grain. It is proposed to treat cholam kibblings in weak alkali and study its effect on the fat content of the malt. The alternative of choosing a variety of cholam with a low fat content appears to be a more useful line of investigation. M. 47-3 is a variety of cholam that lends itself to this work, and preliminary experiments with it have given promising results.

Carbon dioxide treatment of the bottles prior to screwing on the lid has not so far been found to be efficient in preventing insect infestation or preserving the food in its original state of purity. On the other hand, by raising the temperature of the food to 50° C. it has been found possible to prevent the breeding of insects at all stage of growth without at the same time impairing the keeping quality of the product. For this it is necessary to keep the bottles in an oven at about 95° C. for an hour, or at 75°—85° C. for longer periods.

4. *Preparation of cocoa powder from indigenous pods.*—Trials were made on the preparation of cocoa powder suitable for beverage from pods obtained at the Kallar Gardens. The beans were removed with the adhering pulp, and after fermentation were dried and roasted at 130° to 140° C. They were then shelled and the kernels crushed and pressed hot in a hydraulic press to remove the fat—Cocoa butter. The residue was powdered and passed through a 60 mesh sieve. For solubilizing the Cocoa treatment with 3 per cent sodium carbonate and autoclaving appeared to be the most promising method. The 'soluble cocoa' obtained this way was analysed and the figures compared with values obtained for imported soluble cocoas, viz., 'Van Houghtens' and 'Rowntree'. The local preparation contained less of protein and cold water extract and more of fat than the imported patent products, indicating the need for more effort to bring it up to the standard of the latter.

5. *Preparation of biscuits from Gingelly cake.*—The possibility of utilizing surplus quantities of gingelly cake for the preparation of biscuits was investigated by a few laboratory experiments.

With its high protein content, the cake by itself was not suitable for this purpose. Trials were, however, made with varying quantities of cake meal mixed with American flour. With more than 4 oz. of cake in 10 oz. of flour, the biscuits obtained were tough and had an unpleasant flavour which could not be masked even by the addition of Cocoa. The presence of the husk was probably responsible for these defects. Sand and other impurities usually found in the cake also detract from its value as a human food. With a clean cake prepared from husked seed it should be possible to prepare biscuits of good quality.

6. *Preparation of alkali from 'Choudu' or Washerman's earth.*—This investigation was taken up with the aim of cheap production of alkali for the activation of Carbon. When a water extract of 'Choudu' (or Washerman's earth) is treated with quicklime, the Sodium Carbonate in the former forms Sodium Hydroxide and Calcium Carbonate is precipitated. The weak Solution of Sodium Hydroxide is decanted off, concentrated and purified into Caustic Soda. Bulk trials made locally were successful, but the process was not economical as the local deposits were poor in Carbonate Content. Samples received from certain areas in the Cuddapah and Bellary districts were found to be rich in Carbonate, and such deposits might be profitably utilized for the preparation of alkali.

COIMBATORE,
13th August 1944.

H. SHIVA ROW,
Government Agricultural Chemist.

ADMINISTRATION REPORT OF THE GOVERNMENT ENTOMOLOGIST FOR THE YEAR 1943-44 (FASLI 1353).

I. CHARGE.

I continued to be in charge of the Section as Entomologist.

II. ADVISORY.

Eight hundred and fifty-three enquiries from different parts of the Presidency were received and attended to. Of these 341 were dealt with by the headquarters staff and the rest by the Entomological-cum-Mycological staff stationed in the districts. Most of the enquiries related to insect pests of crops and their control and bee-keeping. A short account of this is given under the item "Propaganda and Campaign" in the detailed report.

III. TEACHING.

Sixty lectures and thirty practical classes were held for B.Sc. (Ag.) Class I and thirty-five lectures and thirty-one practical classes for Class II. Seventeen lectures and seventeen practical classes were held for the short course in insect pests and ten lectures and eleven practical classes for the short course in bee-keeping.

IV. SPECIAL INVESTIGATIONS ON CROP PESTS AND THEIR CONTROL

1. *The cotton bollworms* (Platyedra and Earias).—Studies on the control of the bollworms by liberating the Trichogramma egg parasite were continued. Parasites at the rate of 10,000 per acre were liberated in two fields and two fields were kept as control. In all 21 liberations were made. Trends of reduction in bollworms incidence were noted in the released plots.

2. *The cotton stem weevil* (Pempherulus affinis).—The seasonal incidence of the crop was studied. As in the previous year the incidence reached cent per cent in the last three months—April to June. There was no case of parasitism. Studies on the alternate host plants were continued. Of the seven species examined, viz., *Triumfetta rhomboides*, *Sida acuta*, *Sida spinosia*, *Malvastrum* sp., *Hibiscus ficulens*, *Hibiscus vitifolius* and *Abutilon* sp., the first four alone showed infestation. *Triumfetta rhomboides* showed high degree of infestation. Three species of parasites *Entedon* sp., *Dinarmus* sp., and *Spathius labdacus* were noted.

3. *The cotton leaf roller* (Sylepta derogata).—During the year under review the incidence of the pest was light and hence no control measures were attempted. Parasitism was also scarce.

4. *Sugarcane borers* (*Argyria*, *Diatroea* and *Scirpophaga*).—The percentage of infestation by borers was lower with an average of 15.7 as against 25.6 of the previous year. *Argyria* was prominent in the earlier stages of growth whereas *Diatroea* was more pronounced in later stages. *Scirpophaga* was found throughout the growth of the cane but the percentage of infestation was insignificant. During the year under review the following parasites were recorded. *Telenomus* and *Trichogramma* on eggs of *Argyria* and *Diatroea* and *Telenomus* and *Tetrastichus* on *Scirpophaga* eggs; *Stenobracon deesae* and *Apanteles flavipes* on larvae of *Argyria*; *Rhaconotus* and *Apanteles flavipes* on *Diatroea* larvae and *Rhaconotus scirpophaga* and *Elasmus zehntneri* on larvae of *Scirpophaga*. Studies were made on the incidence of borers on alternate host plants. About 28,500 *Saccharum spontaneum* plants were examined, the percentage of infestation of *Argyria*, *Diatroea*, *Scirpophaga* and *Busscola sacchariphaga* being 0.6, 1.4, 4.8 and 17.6 respectively. In 845 sorghum plants examined 79 borer stages were recovered and all of them with the exception of a solitary specimen of *Diatroea* were *Chilo zonellus*. A few specimens of *Shirakia* parasites were reared from *Scirpophaga* on *Saccharum spontaneum*. Control trials were conducted at Nelukuppam. The egg parasite—*Trichogramma*—was bred in large numbers and liberated in the experimental fields at the rate of 8,000 per acre per liberation. The effect of six and twelve liberations was studied. Reduction of borer incidence and consequential higher yield are noted in the 12 and 6 liberation fields as against the control. The money value of the former works out to Rs. 46 per acre and that of the latter to Rs. 248 at Rs. 24 per ton inclusive of bonus paid to the ryots. The cost of treatment was Rs. 12 and Rs. 24 for the six and twelve liberations of parasite respectively.

5. *The chillies thrips* (*Scirtothrips dorsalis*).—Studies on the varietal resistance to thrips were continued. Twenty-five varieties were tested during the year. The nursery was sown on 29th June and the seedlings were transplanted on 19th August. In the earlier stage the crop suffered badly from drought and later in October November suffered a set back due to continuous wet weather and water logged conditions. There were five counts of thrips population and four pickings for yield. The data collected were analysed statistically and the results have shown that (1) no statistical significance was obtained for population of thrips among the different varieties tested and (2) with regard to yield, though a selection of Kathiawar gave higher yields than the local, it was statistically on a par with the local and seven other varieties.

6. *The paddy stem borer* (*Schoenobius incertellus*).—Having found that light trapping with hurricane lights is effective in reducing the stem borer incidence, studies were made to determine the flight range of moths by marking them and releasing them from known distances. Moths released at distances of 50 yards and 100 yards were attracted to hurricane and petromax lights respectively. Further trials with longer distances are in progress.

7. *The paddy mealy bug* (*Ripersia oryzae*).—The seasonal incidence of the pest ranged as follows:—Kuruvai—0.6 per cent to 0.9 per cent, Thaladi 1.5 per cent to 6.0 per cent and Samba 0.3 per cent to 2.0 per cent. Infestation in Kuruvai varieties Adt. 3, Adt. 18 and Adt. 20 showed 0.9 per cent, 0.6 per cent and 0.8 per cent respectively. In Thaladi crop Adit. 2, Adt. 11, Adt. 17 showed 3.5 per cent, 6 per cent and 1.5 per cent infestation respectively. The incidence in Samba varieties were 2 per cent, 0.5 per cent, 0.5 per cent, 0.3 per cent, 1.4 per cent and 0.7 per cent in Adt. 1, Adt. 2, Adt. 8, Adt. 13, Adt. 17 and Co. 16 respectively. Experiments were laid out at Aduthurai to test the effect of scorching of the nursery bunds prior to sowing and planting out the seedlings therein as a measure of control against the pest. There was less incidence of the pest in the treated plots than in the control but no significance for yield was established due to the low incidence of the pest during the year.

8. *The citrus leaf miner* (*Phyllocnistis citrella*).—Control trials have confirmed the superiority of tobacco extract as a toxic agent against the leaf miner. As a deterrent fortnightly sprays of *Thevetia* extract at a strength of one ounce in one gallon of water have given good results. The comparative effect of fortnightly and monthly sprays is being studied. Of the 17 varieties of citrus under observation, Sathgudi and Pomello showed less incidence of the pest than the rest.

9. *The mango hopper* (*Idiocerus* spp.).—The two treatments—sulphur dusting and fish oil rosin soap spraying—have given increased setting of fruits as against that of the controls. As between the treatments, no perceptible differences in setting or fruits were noted. The hopper attack was mild this year while hrips was found in some numbers. Increased setting of fruits as against that of the controls. As

10. *The apple woolly aphis* (*Eriosoma lanigera*).—The parasite—*Aphelinus mali*—introduced on the Nilgiris for the control of the woolly aphis continued to be effective against the pest. An examination of the orchards in Kodaikanal has shown the presence of the pest there. As there was no evidence of the parasite in this area arrangements have been made to send a consignment of the parasite.

11. *The san jose scale* (*Quadraspidotus perniciosus*).—A survey of the newly recorded and much dreaded pest of fruit trees—the san jose scale—was made in the Nilgiris, Kodaikanal and Shevroys to study the extent of spread of the pest. Various fruit trees and other plants were examined and the scales collected were mounted on slides and examined. So far, apples and peaches alone are found affected in small numbers in Coonoor and Kotagiri. These trees are being treated against the pest.

12. *The castor semi-looper* (*Achæa janata*).—Control of the pest was attempted by releases of the egg parasite—*Trichogramma*. The

trials have given satisfactory results. There was very little incidence of the pest in the treated plots. Possibility of keeping parasitised *Coreyra* eggs in cold storage and using these for emergencies was indicated on the basis of the studies made so far. The eggs can be kept in cold storage for a period up to 50 days without unduly impairing the percentage of emergence of the parasites. Two more host plants *Euphorbia hypersifolia* and *Cardiospermum haledacabum* of the pest have been noted for the first time.

13. *The gingelly caterpillar* (*Antigastra catalaunalis*).—In the insecticidal trials undertaken at the Agricultural Research Station, Tindivanam, spray of acorus alone gave promising results while the rest, viz., *Bordeaux mixture*, *Calcium arsenate* and oil emulsions gave indifferent results.

14. *The coconut caterpillar* (*Nephantis serinopa*).—The pupal parasite, *Trichospilus pupivora* was reared in numbers at the insectary and liberated in the infested gardens in the villages of Nandjundapuram and Ramanathapuram. It is gratifying to note that the introduced parasites were recovered from the gardens and the pest has subsided in the locality. A maximum of 539 parasites have emerged from a single parasitised host pupa.

15. *The coconut beetle* (*Oryctes rhinoceros*).—Trials with the green muscardine fungus parasitic on beetle grubs were continued at the insectary, Coimbatore and the West Coast Coconut stations. At the pits the fungus was recorded for all the twelve months but the number of affected grubs was few. In the caged pit all the 50 grubs introduced each month succumbed and in some months, infection was complete within a fortnight. The insectary cage pit material served as a reservoir of culture manure for fresh inoculations elsewhere. In the West Coast stations the fungus attacked specimens were few in number and so the culture material from all the four stations was tested at the insectary in pots and pits. It was found that the fungus is present in the material from all the stations. In pots the response was seen in the course of a month while in pits the response is rather slow. The pits are under further observation.

16. *The brinjal budworm* (*Phthorimoea blapsigona*).—The maximum per centage of incidence of the pest in the brinjal crop transplanted in July 1943 was 58.4. In the crop transplanted in February 1944, the maximum percentage of incidence was only 16. Control treatments against the pest consisted of fortnightly sprays of (1) *Calcium arsenate* plus lime, (2) tobacco decoction, (3) *Bordeaux mixture* and (4) *Thevetia* extract with suitable controls. The yields in different plots are recorded to judge the effect of the treatments. Shed buds are also being examined to note the percentage of incidence. Observations are also made on the effect of the different treatments on other pests of brinjal. The trials have not been concluded. So far, *Calcium (arsenate)* plus lime and *Thevetia* have given better results than the rest.

17. *The sweet potato weevil* (*Cylas formicarius*).—A serious outbreak of the pest in the Central Farm was investigated. There were two varieties of sweet potatoes—one red and the other white. The damage was found to be 86 per cent in the white and 93 per cent in the red variety. Control experiments were started. Dusting the plants with *Calcium arsenate* and lime was effective against the adult beetles. Old emulsions as deterrents did not give satisfactory results.

18. *The coffee white borer* (*Xylotrechus*).—As a result of the investigations conducted in the Palney-Bodi-Sirumalai hills in the Madura district, it was found that the white borer is a very serious pest of coffee in Lower Palneys and Sirumalai groups. The pest was found in a severe form in estates where the coffee plants were in a poor condition due to poor soil, dry surroundings, want of shade, proper manuring and general neglect. One of the methods of reducing infestation is by pulling out attacked plants and destroying them by burning.

19. *The fluted scale* (*Icerya purchasi*).—The Nilgiris and Kodaikanal areas were surveyed for noting the incidence of the pest. In the Nilgiris the spread of the pest in Ootacamund and Coonoor taluks is confined so far to the area connecting Naduvattam in the west, Avalanche in the south, Coonoor in the east and Tuneri in the north with another belt along the Coonoor-Kotagiri road up to Kotagiri. In all 14 localities were marked out for immediate clause of the predator. In the Kodaikanal taluk the pest was noted along the contour of 6,000 feet and above, with Kambam in the west, Kukkal in the north, Koranur in the east and Mariashola in the south. The pest has recently been found in the citrus gardens of Perumalmalai at an elevation of 4,500 feet. Outside Kodaikanal there is stray occurrence of the pest at Top station in Perivakulam taluk. The scale is found on acacias and citrus along the Kodaikanal-Cochin road up to Munar and Devicollam area in Travancore State. Mass breeding for liberation of the predator—*Rodolia cardinalis*—was done both on the Nilgiris and at Kodaikanal for the control of the pest on wattles. During the year under review 5,350 beetles were liberated in different affected areas on the Nilgiris and 3,000 in the Kodaikanal area, the rest being used for breeding purposes in the laboratory. As a result of the liberations there is reduction in pest incidence. Three new icerya plant hosts—*Oenothera biennis*, *Senecio wrightianus* and *Impatiens chinensis* were recorded. Plant quarantine stations were established at Mettupalayam and Gudalur for the Nilgiris and Shenbaganur and Top station for the Kodaikanal area and the scheduled plants were allowed only after the fumigation with HCN (hydro cyanic acid gas).

20. *The potato tuber moth* (*Phthorimoea operculella*).—Dusting the tubers with pyrethrum, acorus, derris and tobacco dusts with suitable controls was under trial. Each treatment tray had 125 tubers and was replicated six times, the variety tested being *Great Scot*. Pyrethrum, acorus and derris have been very effective in controlling the pest.

56 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

21. *Pest of cholam malt (Tribolium sp.)*.—The following are the results of the studies made so far on the malt pest—*Tribolium sp.*—and its control:—(i) In bottles filled with malt and charged with CO₂ for 1, 5, 10 and 15 minutes and closed with screw caps as was done previously at the malt factory the different stages of the beetles were not killed due to the poor retention of the gas in the bottles. (ii) In the case of the bottles filled with malt and charged with CO₂ for ten minutes and closed with screw cap and paraffined up to the neck of the bottle, CO₂ retention ranged from 17 per cent to 30 per cent. In bottles examined after one day (17.02 per cent) and after two days (22.2 per cent) complete mortality of the different stages of the insect was not obtained. Bottles examined after five days (30 per cent), eight days (29.9 per cent), 12 days (26.5 per cent) and after 15 days (27.9 per cent) showed complete mortality of the different stages of the beetle while in the control (without CO₂) most of the insects were alive. Retention of CO₂ is therefore essential for giving cent percent mortality. (iii) Heat treatment was also tried with successful results. A series of trials with different temperatures have shown that 55° C for ten minutes was the lethal temperature for the pest. All the stages of the pest are killed at this temperature. (iv) Paraffining of the metal caps up to the neck of the bottle was also effective in preventing infection from outside. (v) Life cycle, longevity and fecundity of the pest were also studied. The life cycle of the pest ranged from 39 to 49 days. The maximum longevity of the beetle is about eight months and the maximum egg laying 300. It will be seen that even a small number of beetles present in the malt food bottles at the beginning will give rise to a large number to infest the food.

22. *Pests of rice: (Calandra, Rhizopertha and Tribolium)*.—Incidence of pests in rice under natural conditions of storage was studied. Trials were conducted in the Central Farm with raw and parboiled rice of both handpound and milled series in gunny bags with 25 lb. of grain replicated four times. CO₂ was used for the test. Population counts of insects infesting stored rice were taken once a fortnight from one pound sample each. It was found that (1) raw rice is more heavily infested than parboiled rice, (2) the second and third milled rice have less of pests than first milled and handpound and (3) the first milled rice carries strikingly a much higher population of *Rhizopertha* than handpound rice.

23. *Pests of cholam Calandra, Rhizopertha and Tribolium*.—Studies on the storage of cholam in silo were taken up. A preliminary fumigation was given to the silo to ensure it was insect free. Four charges of fumigated grains (492 bags) were stored in silo. Samples of grains are taken fortnightly to test (1) insect infestation, (2) germination and (3) moisture content and acidity. The Research Engineer is making arrangements for aerating the grains at intervals. Preservation of cholam earheads free from insect attack for purposes of seed was tried by dusting the earheads with Acorus powder, Pyrethrum powder Derris powder and spraying

with kerosene extract of Pyrethrum and storing the treated earheads in galvanized iron bins loaned from the Millet Specialist. The results show the acorus and pyrethrum extract afford protection from insects.

24. *Pests of stored wheat*.—In the course of the fumigation of infested Australian wheat a study was made of the pests. It was found that *Calandra oryzae* and *Rhizopertha dominica* were the most important pests. *Tribolium* was found in small numbers. Studies on the new technique of carbon-di-oxide estimation to find out the extent of insect infestation and to judge the effectiveness of fumigation were made.

25. *Pests of stored groundnut: Necrobia, Dermestes and Ephestia*.—Biology of the three pests—*Necrobia rufipes*, *Dermestes cordatus* and *Ephestia cautella* was studied. In the first two, both adults and grubs attack the kernels and reduce them to powder; in the case of *Ephestia* the caterpillars do the damage. A parasite—*Microbracon hebetor*—was found parasitising *Ephestia* caterpillars. The female wasps live for 12—14 days laying on an average 125 eggs. The eggs hatch in 24 hours and the grubs attain full development in 36 hours. The full-grown grubs spin light cocoons, the adult parasites emerging in five to six days. Five bags each of Coromandel, Khandesh and Pollachi varieties were kept in storage at Cuddalore under warehouse conditions in February 1944 to study their relative susceptibility to insect pests. Samples were drawn from these bags in May. Since only one examination has been completed it is too early to draw any conclusions regarding varietal resistance. Small-scale trials with a fumigant—Chlorosol were conducted. At the rate of 10 lb. per 1,000 cubic feet and an exposure of 24 hours, it is fatal to the adults and larval stages of *Necrobia* and *Ephestia*. Further trials are in progress. There is very little insect damage to groundnut when stored in the form of pods even when kept for long periods. So the shorter the interval between decortication and storage, the lesser the chance for the incidence of the pests in the stored kernels.

26. *Pests of stored pulses: Bruchus analis and B. chinensis*.—Biology of the two important pests of stored pulses—*Bruchus analis* and *B. chinensis* was studied. Life history studies have shown that *Bruchus analis* takes 35 days for completion of one generation in December while *B. chinensis* takes 25 days. The average longevity for *B. analis* and *B. chinensis* was ten and five days, respectively, the fecundity being 56 and 52 eggs, respectively. Bengalgram imported from North India and kept in large scale storage in Madras was found infested by a Dermestid pest—*Trigoderma granarium*—along with the *Bruchids*. It was however found to attack only pulses damaged by *Bruchids*; it is a pest of wheat in the Punjab. Experiments on the control of *Bruchids* showed progress. Small-scale trials have shown that spreading a 1-inch layer of sand and oiling the top 1-inch layer of the grains are

effective against the pest. Germination was not affected by oiling. Mixing the pulses with red earth was better than the controls but not so effective as the first two treatments. Further trials are in progress.

V. STUDIES ON INSECTICIDES.

A very important item of work of the section is the study of insecticides especially indigenous ones. Considerable progress was made in these studies. (a) *Indigenous insecticides*—(1) *Lobelia excelsa*.—This is a plant growing wild in the Kodaikanals. The leaves were cured and the leaf decoction were tried against soft-bodied insects like *Aphids*, *Tingids* and *Phenococcus* on brinjals and *Aphids* on snake gourd with good results. In the hills where it is difficult to get tobacco refuse *Lobelia* should be regarded as a good substitute. (2) *Cured tops of tobacco*.—Tobacco tops are generally thrown away. Trials made during the year have shown that the decoction prepared from the cured tops of tobacco are effective against *Aphis* on *lablab*. Now that the price of tobacco refuse has increased, every endeavour should be made not to waste this source of valuable insecticide. (3) *Acorus calamus*.—This is yet another indigenous plant whose underground rhizomes possess pronounced insecticidal properties. Like tobacco it can be used both as a dust and as infusion. Aqueous extract of *Acorus* at a strength of one ounce in one gallon of water with the addition of soap was effective against the brinjal mealy bug. Further trials with *Acorus* powder have confirmed its usefulness as a preservative for woollen fabrics against the clothes moth and poultry lice. (4) *Thevetia nerifolia*.—Trials with the kernels of this common hedge plant were continued. Oil emulsion at a strength of one ounce in one gallon of water was tried against mealy bugs and *Tingids* on brinjal with good results. (5) *Oil emulsions of castor, neem and groundnut*.—These emulsions at concentrations of $\frac{1}{2}$ and 1 oz. in one gallon of water were effective against *tingids* and mealy bugs on brinjal and *Aphis* on cotton. (b) *Erotic insecticides*.—Under this head *Derris elliptica* received some attention. Roots of this plant were dried and powdered. In the dust form it was effective against brinjal *Tingitids*. Water extracts of *Derris* at one ounce in one gallon of water gave good control when sprayed against *Eupterote* caterpillars on *moringa*, *lablab aphids*, mealy bugs and *Tingitids* on brinjal and against adult mosquitoes in an enclosed space. Attempts at the cultivation of *Derris* in a few centres of this Presidency are proving successful. (c) *Fumigants*.—Due to the difficulty in getting *Calcium cyanide* and *Carbondi-sulphide* tests were carried out with two others—*Cymag* and *Chlorosol*. *Cymag* is a powder which on contact with air produces HCN like *Cyanogas*. *Chlorosol* unlike *Carbondi-sulphide* is non-inflammable and non-toxic to human life. In the trials carried out, these two gave encouraging results against the stored product pests of cholam.

VI. LIFE HISTORY STUDIES AND PEST CONTROL WORK AT HEADQUARTERS.

Life history and habits of the insects received from outside and also collected at headquarters were studied. Of the more important insects which were studied, the following may be mentioned:—The pulse bruchids—*Bruchus analis* and *B. chinensis*; *Tribolium* in malt food; the sweet potato weevil—*Cylas formicarius*; the Indian mealworm—*Plodia interpunctella*; *Trogoderma granarium* attacking wheat; *Cecidomyia* causing galls on mango leaves; the cotton aphid and its natural enemies; the pumpkin beetles—*Aulacophora* spp.; Snake gourd pests—*Margaronia* and *Plusia* and their parasites; *Maruca* in field beans and its parasites and parasites of *Epilachna* beetles. Pests reported from the Central Farm, Orchard, Breeding stations and from villages in the vicinity of the Institute received attention. The more important pests dealt with were *aphids* on *lablab cluster* beans, *bhendi* and mango flowers; mealy bugs on *bhendi*; scales on custard apple, sapota and neem; *Parasa* on mango, *Eupterote* on moringa, the paddy case worm; the castor semilooper and mites on curry leaf.

VII. BEE-KEEPING.

Bee-keeping as a cottage industry is gaining popularity. During the year under review there were 10,267 hives working in this Presidency, the increase over the previous year being 1,598. "The Entomology section of Agricultural Research Institute has given a practical stimulus which might provide for the expansion of the production and raising of honey bees and production of honey industry in this country", said Rao Bahadur B. Viswanath Garu, Director of Agriculture, Madras, presiding over the Seventh Annual Honey Week Celebration organized by the section at Coimbatore on 5th May 1944. The apiary at the Institute was a centre of attraction for visitors. An average strength of 40 colonies was maintained throughout the year. From November onwards colonies began yielding honey. The maximum amount of honey was extracted in December. The maximum record for a hive this year was 12 lb. 12 oz. A total of 157 lb. of honey was extracted from 30 colonies. Research work on various aspects of bee-keeping was continued. During the year three flowering plants, viz., *Coccinia indica*, *Porana volubilis* and *Bauhinia anguina* were noted for the first time. Studies were made on the bee-hunter wasp—*Vespa cincta*. The wasps were active in July, August and December. Foraging activity of the bees is affected due to the presence of the wasps. Application of *Calcium cyanide* to the nests killed all the wasps. Comparative merits of two methods of swarm prevention were studied. The first one was dividing the colonies having queen cells and keeping the divided colony with the old queen a few furlongs away from the original place. The second one was by shifting the parent colony with queen cells a few feet apart and placing a new hive with the old

queen along with the two combs in the original place. A swarm preventive trap was devised and preliminary trials have been successful. The maximum longevity of the worker in a colony with queen has been found to be 54 days; the maximum longevity of a queenless colony was however 106 days. Studies on the flight range of bees were continued. The distance bees travel due to homing instinct was studied by marking the bees and shifting the colony to different distances. It was found that some of the workers returned to the original place even from a distance of 14 furlongs. Studies during the previous year had shown $8\frac{3}{4}$ furlongs as the maximum distance bees went out for foraging. For improving the colonies by selection, ten selected colonies were under observation. Of these four continued to show uniform good record and the best of these will be selected for purposes of rearing queens to improve the general condition of the hives. To popularize bee-keeping as a cottage industry the section did intensive propaganda. Out of the total of 273 enquiries 110 were received at headquarters. The bee-exhibition held in connexion with the Honey Week Celebration was a great success. A short course in bee-keeping was conducted in February. Under the auspices of the Rural Recreation Organization classes in bee-keeping were held at different centres in Coimbatore district. Arrangements have been made for giving training for the students of the Government Higher Elementary Training School, Coimbatore.

VIII. FUMIGATION.

The year under report has been a very remarkable one for the large number of fumigations and also large scale fumigations done by the section. The Government Entomologist was in Madras in July, in connexion with the fumigation of 53,245 bags of infested Australian wheat held by the Commissioner, Civil Supplies. The stock was fumigated in the stationary godown (5,62,000 cubic feet of space) pumping in 1,700 lb. of cyanogas powder. It took ten hours for gassing by means of the gunniting machine with the help of air compressor and 29 hours for degassing. This is the first time that such large-scale fumigation has been done in Madras and probably in the whole of India. Later—in March and April—the Government Entomologist visited Madras and 18,180 bags of infested wheat with the Commissioner of Civil Supplies were fumigated in two lots of 8,820 and 9,660 bags in the stamp godown. Again in Madras 500 bags of tamarind seeds infested with *Caryoborus* beetle were fumigated for the Buckingham and Carnatic Mills. At Coimbatore also, fumigation work was heavy. Two hundred and twenty-four articles had to be fumigated for the different heads of sections as anti-plague measure. About 500 bags of cholam were fumigated for the Superintendent, Malt Factory. Besides these 24 packet including seeds were fumigated and pest-free certificates issued.

IX. SYSTEMATICS AND COLLECTIONS.

Due to pressure of economic work there was not much time to be devoted for systematic studies. However as time permitted studies on termites and *Chalcids* were continued. Though a number of insects have been collected, these could not be sent to foreign countries due to war conditions. During the year two pests unrecorded in this Presidency were intercepted. These were the granary weevil—*Calandra granaria* and the *Khapra* beetle—*Trogoderma granarium*. A very dangerous pest of fruit trees—the *San jose scale* was noted for the first time in Coonoor and Kotagiri.

X. PROPAGANDA AND CAMPAIGN.

In Coimbatore and Nilgiris districts, propaganda was done by the headquarters staff; in all other districts the Entomology-cum-Mycology Assistants attended to this work. Demonstration of remedial measures against pests and popularization of bee-keeping industry formed the major portion of their work. In addition they were in charge of Pest Act operations and studied insect problems peculiar to the tract. The more important pests tackled by the staff are mentioned in the detailed report.

XI. SCIENTIFIC PAPERS PREPARED.

The following papers were prepared during the year:—(1) On a new species of *Cryptotermes* from South India, (2) a note on the identity of *Trichogramma evanescens* West and *T. minutum* (Riley), (3) studies on the effect of temperature and humidity on the different stages of *Platyedra gossypiella* Saunders, (4) further trials with *Trichogramma* parasites for the control of the cotton bollworms (*Earias* and *Platyedra*) at Coimbatore, (5) preliminary studies on the flight range of the Indian bee (*Apis indica*), (6) the longevity of the Indian bee (*Apis indica*), (7) the fluted scale and its control, (8) "Hints on bee-keeping", for the months of July to December 1943, (9) two radio talks on paddy grasshopper and its control and "Vegetable insecticides and their uses" and (10) "Methods of pest control" for publication in Tamil and Telugu Journals of the Agricultural Department. The first six papers were presented before the Indian Science Congress held in January 1944.

XII. MISCELLANEOUS.

Artists' Section.—The following items of work were executed during the year:—Ink drawings 188; photographs and prints 641; enlargements 27; lantern slides 48; charts 63; paintings and posters 129; graphs 14; maps 27; retouching prints 74; retouching negatives 76; pencil sketches 59; and labels 994.

Training in entomology.—Mr. Jones, Entomologist, Travancore, was given training in Entomology from 27th September to

the end of December 1943. Mr. Shumsher Singh from the Department of Agriculture, Burma, reported for training on 9th June 1944.

Imperial Council of Agricultural Research.—I attended a meeting of the Special Sugarcane Entomological Sub-Committee and a Conference of Entomological Workers at New Delhi convened by the Imperial Council of Agricultural Research.

University examinership.—I was Internal Examiner in Agricultural Zoology of the B.Sc. (Agr.) degree examination of the Madras University.

Research Council.—I attended several meetings of the Council.

War effort.—I acted as Deputy Controller, A.R.P. Organization, Agricultural College. The members of my section also served the organization in other capacities and contributed to the Defence Savings Funds. The last but not the least contribution is the saving of considerable quantities of foodgrains—especially wheat—to the nation by proper and timely fumigation.

COIMBATORE,
13th August 1944.

M. C. CHERIAN,
Government Entomologist.

ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST FOR THE YEAR 1943-44 (FASLI 1353).

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

2. *Staff.*—There were several changes in the staff during the year. Assistants Messrs. C. Krishnan Nair and Vishnu Somayajulu retired from service as from 17th March 1944 and 1st March 1944, respectively. Assistant Sri C. S. Krishnaswami was promoted to Madras Agricultural Service from 16th July 1943. Assistant Sri K. Krishna Menon was temporarily promoted to the Madras Agricultural Service from 16th June 1944. Laboratory Assistant Sri I. L. Narasimhalu was promoted as upper subordinate from 15th November 1943. Officiating Assistant Janab Muhammad Ibrahim was deputed for work as Mycology Assistant in the Groundnut Pests and Diseases Scheme at Tindivanam and relieved on 31st January 1944. Officiating Assistant Sri T. V. Subrahmanyam was relieved on 17th April 1944 to join duty as Assistant in the Ergot Production Scheme, Ootacamund. Fieldman Sri K. Narayana Rao was deputed to Poona to join duty as Junior Research Assistant, Wheat Rust Scheme, where he held that post from 12th January 1944 to 31st March 1944. Sri R. Ardhanari was appointed as Laboratory Assistant from 20th April 1944. Sri N. Ramalingam was appointed as Officiating Assistant from 9th June 1944. Mr. I. C. Michael, first clerk, was transferred to the office of the Millets Specialist and Sri C. S. Sambasivam joined the section as officiating first clerk as from 15th October 1943.

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

- (i) Research on diseases of food crops.
- (ii) Research on diseases of industrial crops.
- (iii) War efforts and Agro-industrial research.
- (iv) Quarantine services and legislative measures.
- (v) Propaganda.
- (vi) Teaching.
- (vii) Advisory work.
- (viii) Microtomy.
- (ix) Miscellaneous.

RESEARCH ON DISEASES OF FOOD CROPS.

4. *Rice (Blast disease—Piricularia oryza)* —(a) *Varietal resistance—Field trials.*—In an air-borne disease like blast which does not lend itself to fungicidal and other preventive measures, the most obvious course is the utilization of inherent resistance of

varieties directly as a means of avoiding the disease and utilizing resistant varieties as parents for evolving resistant hybrid strains. One hundred and fifty-one cultures of paddy collected from all over the Province were tested for their susceptibility to blast. To obviate the seasonal factor and differences in the duration of the cultures in assessing resistance to the disease, the cultures were sown in two series. In the first, all cultures were sown at the same time, while in the second, they were sorted out into three categories according to their duration and sowings so arranged that flowering was more or less simultaneous. From the results recorded, 24 cultures were selected out as promising resistant types showing less than ten per cent infection as against 42 and 52 per cent infection of two controls. Nine out of the 24 cultures represent strains released from the Paddy Breeding Stations of the Province.

5. Rice ('Foot rot') (*Fusarium moniliforme* var *Majus*)—(a) *Varietal resistance—Field experiments.*—Forty-eight cultures of rice were tested for their relative susceptibility to foot-rot infection which is most conspicuous in the nursery. Thirteen cultures proved resistant showing less than 10 per cent infection as against 81 and 56 per cent infection respectively of two controls.

(b) *Fungicidal trials—Field experiments.*—The disease being amenable to seed treatment with fungicides, the relative efficacy of 19 fungicides which included six organo-mercury preparations made in the Chemical Research Laboratories of the Andhra University, was determined. Fourteen treatments were highly effective in controlling 'foot-rot'; five proved superior to control, but less effective than the 14 treatments. Among the 14 preparations, nine were proprietary preparations, four preparations of the Andhra University laboratories and one a local preparation made out of formalin and charcoal dust.

6. Ragi 'Blast' (*Piricularia* Sp.)—*Field experiments.*—'Blast of ragi' being another disease which does not respond to direct control measures, varietal resistance was explored. Twenty-one cultures of ragi tested under field conditions showed that no variety was immune to blast. E.C. 155, however, showed a commendable degree of resistance in conditions under which other varieties failed. 'Blast' of ragi once again proved to be a seasonal disease under Coimbatore conditions. Crops transplanted in July completely escaped the disease while plantings in September and October are invariably attacked irrespective of the variety planted. The surest means of avoiding the disease consists in early planting in July under garden land cultivation.

7. Sorghum 'smut' *Sphacelotheca sorghi*.—The unavailability of sulphur as a seed dressing against Sorghum smut necessitated the search for alternative methods of seed treatment. Laboratory studies with villagers' practices in some parts of the province showed that cow's urine and asafœtida did not exercise

control over the germination of smut spores, but copper sulphate which was used as an ingredient of seed steepers, had the well-known effect of killing smut spores. Trials with Burmah method of soaking sorghum seeds in water for four hours and drying them in the sun and Prof. Luthra's modification of the Burmah methods of drying the soaked seeds in the shade were tried as against the sulphur dressing method. The results were not significant as smut infection in the experimental plots and control was negligible. Compared to sulphur dressing other methods of seed treatment proved laborious and time-consuming, while the efficacy of other methods still remain in doubt.

8. *Sorghum siriga*.—Field experiments were conducted to assess the relative merits of growing 'trap crops' like maize and sorghum, growing groundnuts and also 'wet' and 'dry' ploughing as a means of reducing infection from this parasite. Analysis of the results showed that none of the methods was significantly better than the rest.

9. *Wheat 'rusts'*.—Though wheat is not a crop of importance in the province, the section collaborated in an All-India scheme of rust control firstly by assisting in the suspension of the first crop of wheat and barley in the Nilgiri and Pulney hills and secondly in collecting data on the first appearance of rusts within the province and estimating the incidence and destructiveness of rusts in the cold weather crops of wheat and barley. Miniature plots of wheat varieties, barley and oats were raised every month at Coimbatore from June onwards. Black rust made its first appearance on the 21st of January 1944 while brown rust was observed on the 4th January. To see whether either of these rusts could over-summer under Coimbatore conditions, a series of pot experiments was started. The experiment is in progress.

10. *Redgram Fusarium Wilt—Field experiments on varietal resistance.*—Ninety-three cultures of redgram including the progeny of crosses made with resistant varieties like Pusa 80 and Thadagam selections were laid out in a wilt-sick plot at the Cotton Breeding Station. The results showed that 27 cultures showed between 3.2 and 11.6 per cent infection as against 95 per cent of the control.

11. *Orange 'Mottle leaf'*.—Experiments were conducted at Panyam (Kurnool district) and Kodur (Cuddapah district) on the control of the deficiency disease of citrus known as 'mottle leaf' or 'frenching'. Among six spray treatments, viz., zinc sulphate, magnesium sulphate, ferrous sulphate, manganese sulphate and copper sulphate and a combination of all these salts (all neutralized with lime) and two soil treatments, viz., zinc sulphate and magnesium sulphate, zinc sulphate spray and combination mixture spray showed the best recovery from the disease proving the efficacy of zinc sulphate as a cure for the disease. One important

observation was that the effects of the spray are not lasting pointing to the necessity of repeating the treatment at least once a year.

DISEASES OF INDUSTRIAL CROPS.

12. *Cotton*—'Black arm'.—This disease is on the increase but is practically confined to the exotic cottons. Seed treatment as a means of eliminating the disease was observed to be effective as far as primary infection of cotton seedlings was concerned, but air-borne secondary infection from plant to plant was uncontrollable at a station where cotton is a standing crop almost throughout the year. The experiments conducted during the year showed that the use of formalin as a steep, spray and a dust with charcoal powder as a carrying medium are more effective than other fungicides though the figures were not statistically significant.

13. *Tobacco*—'Broom rape' *Orobancha cernua*.—This being the most important menace to successful growing of tobacco in Guntur and the Circars, its control received concerted attention.

(a) *The use of sunflower in inducing germination of broomrape seed*.—Field experiments designed to study the relative merits of (1) growing a sunflower crop *in situ* and incorporating the green crop into the soil, (2) incorporating into the soil a fresh crop of sunflower grown elsewhere, and (3) incorporating *Pillipesara* (*Phaseolus trilobus*) grown elsewhere, were conducted at Guntur. The results showed that there was no special virtue in sunflower as an agent in the eradication of broom rape seeds from an infested soil. Plots where sunflower was grown *in situ*, however, showed significantly less number of parasites in the following tobacco crop, but the growth of the tobacco crop was distinctly poor thus nullifying the beneficial effect of reducing broom rape emergence. To obtain more precise information on the reported beneficial effect of dried and chopped sunflower plant material on the germination of broom rape seed, a series of pot culture experiments were tried with *pillipesara* (*P. trilobus*) as control. Both materials were incorporated with infested pot soil at three levels, viz., 30 grammes, 45 grammes and 60 grammes per kilogramme of soil and the application of the material was done at intervals of two, three, four, five and six fortnights before the transplanting of tobacco seedlings in the pots. The three levels of *Pillipesara* and 60 grammes level of sunflower material gave significantly higher levels of broom rape emergence than all the other levels of sunflower material and the control, thereby disproving the special property claimed by Russian workers for dried sunflower material. The effects of varying intervals between incorporation and transplanting of the crop were so erratic that no conclusion could be drawn from the results. One remarkable feature was that the experiment was conducted in pots which were used for a very similar experiment during the previous season and

the regular emergence of broom rapes on a second crop of tobacco shows that even two successive treatments were ineffective in ridding the soil of viable broom rape seed.

(b) *The effect of dry and fresh solanaceous plant material*.—Pot experiments as described above conducted with fresh and dry plant material of brinjal, datura, tobacco and tomato with sunflower for comparison showed that there is no beneficial effect in the application of plant material of solanaceous crops.

(c) *The use of chemicals in the destruction of broom rapes*.—The following chemical weedicides were tried against broom rapes:—Copper sulphate, ferrous sulphate, a mixture of copper sulphate and ferrous sulphate and agri tree killer. It was found that both copper sulphate and ferrous sulphate solutions and their mixture were able to kill the tender broom rape shoots and the tops of mature shoots. Agri tree killer kills both young and mature shoots alike but it sometimes exercised a deleterious effect on the tobacco plant itself. From the viewpoint of fresh emergence after treatment, chemical treatments are superior to mechanical removal of broom rapes, though chemical treatments did not completely prevent further emergence.

(d) *The effect of preceding crops on Orobancha of tobacco*.—Italian millet, groundnut, sorghum, maize and sajja (*Pennisetum typhoides*) were put down as crops immediately preceding tobacco in broom rape infested soil with no crop (fallow) as control. The results were not significant as far as broom rape emergence was concerned though from the point of view of yield, fallow, maize and Italian millet gave the best returns in the order of mention.

(e) *Role of domestic animals in the dissemination of broomrape seeds*.—Cattle, buffaloes and goats are known to feed on orobanche shoots. Voids collected from animals fed on orobanche shoots containing mature seeds were mixed with sterilized soil in pots and tobacco planted in the pots. In the case of goats viable seeds were present in the voids up to the third day after feeding while in the case of cattle calves and buffaloes viable seeds remained in the voids up to the fifth day after feeding thereby proving the absolute necessity of cultivators desisting from feeding collected broom rapes to farm animals or allowing them to graze on orobanche in tobacco fields.

(f) *Germination studies on orobanche seed*.—The failure of orobanche seeds to germinate under different conditions of moisture and temperature is attributed to the absence of the roots of a suitable host plant which exercise a stimulating effect on seeds coming in contact with them. Extracts of roots, leaves and stems of tobacco, brinjal and sunflower and soil extracts failed to stimulate germination. Treatment of seeds with chemicals like sulphuric acid and ammonium hydroxide also proved ineffective. But preliminary proof was obtained that the seeds can germinate if they are placed in proximity to, but not in actual contact with

growing roots within periods ranging between 5 and 19 days. In the case of seeds in contact with growing roots, germination was observed on the sixth day.

(g) *Host range of Orobanche cernua*.—The following host plants have so far been found to be parasitised by orobanche. *Solanaceae*, *Solanum melongena*, *S. xanthocarpum*, *S. trilobatum*, *Nicotiana tabacum*, *N. rustica*, *N. glutinosa*, *N. affinis*, *Datura stramonium*, *D. fastuosa*, *D. fastuosa* var *alba*, *Lycopersicum esculentum*, *Petunia* sp., Compositae, *Helianthus annuus*. Among solanaceous plants tried *Solanum seaforthianum*, *S. jasminoides* and *Capsicum annuum* have so far remained free. Among solanaceous hosts, *Datura fastuosa* var *alba* is remarkable in that it stimulates the germination of the seeds of the parasite as many as 500 being recorded from one plant. With a view to study the possibilities of utilizing *D. fastuosa* var *alba* as a trap crop, field experiments were started towards the close of the year under report.

14. Tobacco 'Damping off' in nurseries—(a) *Identity of organism*.—Examination and isolation of the fungus from 'damped off' seedlings showed that the organism responsible is *Pythium aphanidermatum*.

(b) *Control experiments*.—Field experiments designed to devise one or more suitable methods of controlling 'damping off' were laid out in typical black soil and sandy areas of Guntur district. Provision was made in the experiments to assess the relative merits of raised beds as against flat beds, heat sterilization of the surface soil and no sterilization, and the use of copper fungicides like Bordeaux mixture, Bouisol and home-made colloidal copper. As the disease appeared in a very mild form in the black soil area, no results were obtained in that series. But in the sandy area, the following conclusions were drawn from a statistical analysis of the figures—

(1) There is no significant difference between raised beds and flat beds.

(2) There is no significant difference between heat sterilized and non-sterilized beds.

(3) Among fungicides, Bordeaux mixture gave better protection than control, Bouisol and colloidal copper. There was no significant difference among the latter three treatments.

Working out the economics of fungicide treatments, it was found that Bordeaux mixture treatment gave a net profit of Rs. 1,004 per acre as against Rs. 209 per acre from spraying of colloidal copper.

(c) *Seed rate in relation to damping off in nurseries*.—Experiments with seed rates ranging from half tola per cent of nursery land to one and a quarter tolas, failed to give any significant results in favour of any particular seed rate.

(d) *Optimum frequency of fungicidal treatment*.—In this experiment, Bouisol was sprayed at intervals of three days, one

week and a fortnight in plots raised on the sandy area. Spraying once in three days and once a week were found to be significantly and equally superior to spraying at fortnightly intervals and unsprayed controls.

15. Tobacco 'Mosaic'—(1) *Classification*.—The mosaic of tobacco occurring in Guntur and in parts of Coimbatore district was identified as *Nicotiana virus 1* of Smith's classification.

(2) *Mosaic resistance in Virginian tobacco H.S. 9*.—Forty-line selections of H.S. 9 made by the Guntur Tobacco Market Committee for mosaic tolerance of the mother plants were tested for mosaic resistance both at Coimbatore and Guntur. Inoculations with *Nicotiana virus 1* produced cent per cent infection at Guntur and percentages over 60 at Coimbatore. The freedom of the mother plants in a field was apparently a case of disease escape as different from disease resistance.

16. *Diseases of oil-seed crops*—(i) *Groundnut (Tikka) (Cercospora personata and C. arachidicola)*.—Field experiments conducted at Tindivanam in collaboration with the Oil Seeds Specialist showed that 'tikka' disease is controllable with Bordeaux mixture of one per cent and half per cent strength as well as by sulphur dusting. In all the treatments, the additional yield obtained from the adoption of control measures well exceeded the investment on the treatments themselves.

(ii) *Gingelly 'sterility'*.—Previous work indicated that the sterility disease is of virus origin. Transmission experiments with the suspected vector *Eutettix phycitis* produced three more cases of successful infection. Grafting experiments, however, failed for failure of union between healthy and diseased plants.

17. *Sugarcane 'mosaic'*—*Varietal resistance trials*.—Twelve cane varieties were under trial for assessing their relative resistance to 'mosaic'. Infection varied from nil to 49 per cent. Co. 453 was completely free while Co. 395, POJ. 2961 and Co. K. 26 were highly resistant with only 2 per cent infection against 49 per cent of the control variety Co. 213.

18. *Ginger 'soft rot' and 'storage rot'*.—Eighteen treatments involving the use of six fungicides before storage, before planting, and both before storage and before planting were tried to assess their relative merits in the control of 'storage rot' of seed rhizomes and the 'soft rot' of the crop in the field. The results showed that two treatments (done before storage and before planting) with grosan G. mercuric chloride or ceresan (dry) have given better yields in the field. When a single treatment is done, treatment with agrosan G. or mercuric chloride before storage is better than treatment before planting.

19. *Cardamoms 'clumprot'* *Pythium spp.*—Clumprot was found to be existent in several discontinuously distributed cardamom tracts. It was equally severe in the erect and creeping

panicled types. Two species of pythium were associated with the disease, *P. aphanidermatum* and *P. complectens*.

WAR EFFORTS AND AGRO-INDUSTRIES.

20. Ergot 'the war and peace time drug'—Research.—(a) *Optimum period for sowing rye and infection of flowers.*—Monthly sowing experiments were conducted during the first week of every month irrespective of weather conditions, and uniform sprays given when the flowers were ready for infection. The results showed that April, May and June are the best months for sowing rye on the western slopes of the Nilgiris for ergot production though rye can be grown successfully throughout the year. Another series of experiments was conducted to determine the best period within the months of April, May, September and October by conducting weekly sowings beginning with the second week of April and the first week of September. Here again, April-May proved to be the optimum for ergot production.

(b) *Optimum period and time of the day for inoculation sprays.*—This experiment was carried out in two series. In one series the inoculation spray was given one week, two weeks and three weeks respectively after the emergence of earheads. In another series sprays were given at 10 a.m., 3 p.m. and 8 p.m., respectively. It was found that the best period of spray was the third week after emergence of ears which synchronised with the maximum anthesis. Sprays at different times of the day did not give any significant difference.

(c) *Optimum number of sprays to produce maximum infection.*—Two series of experiments were conducted using two, four, six and eight sprays per treatment to determine the optimum number of sprays required for maximum infection. In both series two sprays gave the lowest yield, but in the first series, four, six and eight sprays gave almost uniform yields while in the second series six and eight sprays gave better yields than four sprays.

(d) *Varietal trials.*—Eleven varieties of rye including the local rye and Australian black winter rye were tried under identical conditions. All varieties proved susceptible to *Claviceps* infection, but only the local and Australian black winter rye proved suitable for commercial ergot production. Black winter rye came to maturity in $5\frac{1}{2}$ to 6 months against $6\frac{1}{2}$ months' duration of the local rye, but the product of the local rye was superior in alkaloid contents.

(e) *Natural ergots in South India.*—A survey of ergot fungi on grasses was made in Nilgiris, Pulneys, Wynad and Anamalais. Nineteen grasses were discovered as affected by species of *Claviceps*, but only some produced the sclerotial stage. From an analysis of ergots collected from three grasses they were reported to be of no economic value as either not possessing or having only traces of the alkaloids.

(f) *Rainfall in relation to infection.*—A study of the rainfall records showed a positive correlation between the number of rainy days during the flowering months and the yield of ergot.

21. Yeast—Researches on conditions for optimum production.—(a) *Rate of consumption of sugar in the wort.*—The estimation of sugar contents of the wort determined at hourly intervals after the start of fermentation showed that sugars were consumed very rapidly during the second and third hours more than at any other period, and the need for additional charges of sugar at this period.

(b) *Change of pH in the wort.*—Estimation of pH values of the wort at intervals showed a progressive fall from about 6.1 to about 3.9 within eight hours.

(c) *Rate of consumption of nitrogen.*—The nitrogen content of the medium was estimated at intervals. An accumulation of nitrogen was noticed towards the later stages of the fermentation particularly at the close. The complete stoppage of liquor ammonia, to neutralize the acids produced during fermentation, did not materially affect the yield of yeast.

(d) *Effect of increased aeration of wort on production.*—The average quantity of dry yeast produced by the use of a diaphragm blower of 1.6 c.ft. capacity per minute is 1 lb. 1 oz. representing 9 per cent of the sugar supplied. By the use of an additional smaller blower of about 0.6 c.ft capacity an average yield of 1 lb. and 3 oz. were obtained representing 10 per cent of the sugar supplied, thus showing the possibilities of increased aeration.

(e) *Effect of the height of the column of wort on production.*—An attempt was made to compare the results of aeration of the same quantity of wort through a column 8 feet in height as against a column $3\frac{1}{2}$ feet in height. This work is in progress.

(f) *Cane juice as a source of sugar for yeast production.*—Autoclaved cane juice containing 15 per cent of total sugars was diluted and used as wort. Other conditions being equal, the output was only 4 per cent on sugar. The addition of molasses to cane juice increased the yield to 9 per cent of sugars supplied, thus proving the value of a certain proportion of glucose in the wort and the superiority of molasses as a cheaper source of sugar for yeast production.

(g) *Filteration of air for preventing contamination of the product.*—Filteration of air to collect particles of dust and spores of air-borne organisms was found a prime necessity to prevent contamination of the yeast and to reduce the insoluble ash in the final product.

(h) *Control of bacterial contamination.*—The use of sodium metabisulphite at the rate of one ounce per 50 gallons of water (1 in 8,000) was found to be effective in preventing bacterial growth without affecting the growth of yeast.

J. 2117 N43

N41

(i) *Silvered sand for sterilizing the wort.*—A preliminary study of the use of silvered sand which is reputed for its oligo-dynamic property, showed the possibility of utilizing this material for sterilizing water and sugar solutions without recourse to heat.

(j) *Isolation of a large celled strain of *Torulopsis utilis*.*—A large celled strain was isolated, multiplied and used for production. While the output per day with this strain was not perceptibly higher than the normal strain, the product was richer in thiamin value but lower in nicotinic acid. There was no perceptible change in flavour.

(k) *Quality of the product.*—Samples of the product were analyzed by the Government Agricultural Chemist and the vitamin contents assayed by the Director, Nutrition Research Laboratories, Coonoor, and the Controller-General of Food Supplies, New Delhi. The reports were highly complimentary.

Quantity produced.—A total quantity of 150 lb. of dry yeast was prepared during the year and 106 lb. sold to the public directly or through the Government Products Sales Depot, Madras.

Baker's yeast.—A strain of *Saccharomyces cerevisiae* was multiplied and its usefulness as baker's yeast tested satisfactorily. Small samples were supplied on indent.

22. *Malt extract—Control of mouldiness in storage.*—(a) *Source of contamination.*—This was found to be through air-borne spores between the drawing of the extract from the still and final packing and storage. The organisms involved are *Aspergillus* sp., *Rhizopus* sp., yeasts and bacteria. The fungi being aerobic organisms grow only on the surface.

(b) *Control measures*—(1) *Sterilization by heat.*—The thermal death point of *Aspergillus* sp. was found to be 75° C for thick-walled spores and 55° C for thin-walled spores, and of yeast and bacteria 85° C for ten minutes exposure. Steaming the product for two hours daily for two consecutive days was found to be effective in rendering it completely free from viable organisms, but the process adversely affected the taste and flavour of the extract besides inducing frothing.

(2) *The use of preservatives.*—Experiments were carried out to find out if the addition of the following would be effective in controlling moulds in the extract:—(1) Thymol 1 in 1,000 aqueous solution, (2) boric acid 1 per cent aqueous solution, (3) salicylic acid 1 per cent aqueous solution, (4) chloroform pure, (5) formalin 40 per cent, (6) alcohol 95 per cent and (7) glycerine added as a thin layer on the top. Of these, boric acid, thymol and salicylic acid were found to be ineffective, chloroform while effective was not to be recommended owing to its poisonous nature. Formalin, alcohol and glycerine were effective and further experiments are in progress to find out the extent to which the use of these can be incorporated in practice.

(3) *Increase of the concentration of extract.*—Experiments carried out in collaboration with the Government Agricultural Chemist gave results which indicated that with the increase of the density of the extract, the development of fungus is inhibited.

23. *Grow more food*—(a) *Sorghum—'Anti-smut' campaign.*—With a view to obviate the losses from the smut disease of sorghum and thus increase the production of foodgrains in the Province, a scheme was drawn up to popularize the use of sulphur as a seed dressing for sorghum seeds. Sanction was obtained for the purchase and distribution of 42 tons of ground sulphur which is about 15 times the quantity of sulphur used for the purpose in normal years. When put into operation, the production of sorghum in the Province is expected to increase by at least 10 per cent.

(b) *Control of pests and diseases of food crops.*—A scheme to provide relief against the preventable and controllable pests and diseases of vegetables and other food crops was formulated. In the absence of standard spraying equipment, the question of purchasing all the A.R.P. stirrup pumps, converting them into spraying equipment with the least expenditure and distributing them throughout the Province was studied and preliminary proposals submitted to the Director of Agriculture.

(c) *Edible mushroom.*—The feasibility of growing edible mushroom from waste paddy straw was studied, the method of cultivation perfected and demonstrations conducted in Coimbatore, Tirurkuppam and Madras. Bottles of mushroom spawn were supplied on indent.

24. *Agri tree killer.*—Due to the cessation of imports of proprietary tree killer solutions, a substitute mixture called agri tree killer was prepared from ingredients available in India and 34 gallons were distributed to *Devasthanams* and other clients.

25. *Penicillium.*—Cultures of *Penicillium notatum* were obtained and preliminary studies made on the production of the valuable antibiotic under South Indian conditions.

26. *Potato—Production, conservation and distribution.*—I was privileged to study the system of production, conservation and distribution of potatoes grown in the Bombay Province at Poona and neighbouring centres and to submit a report on the system in vogue in that Province. As a sequel to this report, I prepared and submitted a scheme for the conservation and distribution of potatoes grown in the Madras Province.

PLANT QUARANTINE—LEGISLATIVE MEASURES.

27. *The examination and certification of exports of plants and plant products continued during the year.*

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

(1) *Bud rot of palms.*—East Godavari, West Godavari, Kistna, Guntur and three taluks of Malabar.

(2) *Wheat rusts*.—Nilgiris, Kodaikanal taluk of Madura district, and Devikulam taluk of Travancore.

(3) *Broom rape of tobacco, etc.*—Guntur, Kistna, East Godavari, West Godavari and Nellore.

(4) *Cardamom mosaic*.—Palghat taluk of Malabar.

(5) *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 was employed under the Agricultural department for the control of broom rape of tobacco. One sub-assistant in Mycology and three maistris continued to be on special duty in South Malabar to co-ordinate the work of the Agricultural and Revenue departments in the control of bud rot of palms.

PROPAGANDA.

28. Leaflets and charts were prepared on the following subjects :—

- (1) *Mahali* disease of areca palms. A new recipe for spraying.
- (2) Sugarcane smut. Its control.
- (3) The uses of ergot.
- (4) Kill unwanted trees.
- (5) The rusts of wheat.

The section participated in several exhibitions and shows. The more important among them were the War Services Exhibition at Madras and the Flower Show at Ootacamund. I gave a talk at the T. H. Services Club, Coimbatore, on the war efforts of the Madras Agricultural department.

29. *Teaching*.—Thirty-two theory classes and 31 practical classes were held for the students of B.Sc. III. Besides these, sixteen classes were held for the students of the short course in Agricultural Sciences.

30. *Advisory*.—Sixty-nine specimens were examined and reported on, besides answering several enquiries by correspondence.

MICROTOME SUB-SECTION.

31. *Microtomy*.—One hundred and one materials were received, 87 imbedded and 617 permanent slides prepared and supplied to various research workers in the department.

MISCELLANEOUS.

32. *Supply of cultures*.—Stock cultures of fungi were supplied to the Imperial Mycologist, the Mycologist to the Government of Central Provinces and Berar, the Economic Botanist, Assam, the Mycologist, Ceylon, the Professor of Botany, Dacca University, the Professor of Botany, Presidency College, Madras, and the Professor of Botany, Agricultural Institute, Allahabad.

COIMBATORE,
8th August 1944.

K. M. THOMAS,
Government Mycologist.

ADMINISTRATION REPORT OF THE LECTURER IN BOTANY, COIMBATORE, FOR THE YEAR 1943-44 (FASLI 1353).

I beg to submit my Administration Report for 1943-44.

2. As per G.O. No. 1949, dated 2nd May 1944, and Director of Agriculture's endorsement No. Roc. A. 1-701/42, dated 9th May 1944, thereon I took over charge of the Botanical Garden, Orchard and Banana Area, from the Fruit Specialist on the afternoon of 3rd June 1944. I was on leave for a month from 8th June 1944 when Sri K. Cherian Jacob acted in my vacancy. The headquarters of Sri T. Venkataramana Reddi, Gazetted Botanical Assistant, Rubber Scheme, was shifted to Bannur, Kurnool district, and he moved to that place on the 20th March 1944.

3. *Establishment*.—There was no change in the staff until I took over charge of the Botanic Garden, Orchard and Banana Area, when the entire staff attached to this unit was transferred to me. This consists of one teaching assistant trained in horticulture who is also the farm manager, a sub-assistant and the menial staff.

4. *Teaching*.—The University syllabus was adhered to. For the B.Sc. (Ag.) III Mycology was handled by the Mycologist, Genetics by the Geneticist and Horticulture by the Fruit Specialist. The lectures and practical classes handled by me and my assistants, Sri S. V. Parthasarathy and Sri D. Daniel Sundararaj are given below :—

					Lectures (one hour).	Practical classes (one hour).	Total (hours).
Class I	..	..	..	..	66	56 (81)	147
Class II	..	..	..	..	56	30 (61)	117
Class III	..	..	..	..	18	10 (30)	38

Short course.—For the farm management there were lectures and practical class combined 16 hours devoted to lessons on plant life.

Madras University Examinations.—I functioned as an Internal Examiner in Botany for First Examination along with Dr. N. Parthasarathy, Second Sugarcane Expert and for the Final Examination Paper II along with Sri K. M. Thomas, the Government Mycologist. Sri S. V. Parthasarathy was the Internal Examiner for Paper I. Final Examination, along with Dr. N. Parthasarathy.

5. *Seed testing*.—One hundred and thirty-two samples were tested for germination capacity for different officers of the department.

6. (a) *Herbarium—Systematic and Economic Botany*.—One thousand and fifty-five botanical specimens were identified. Of these 561 were for the Herbarium and the rest for correspondents chiefly of the Agricultural, Forest, Health, Veterinary, Public Works and Tea Scientific departments; importers and exporters of drugs and private individuals. Five hundred and two botanical specimens were collected for the Herbarium from Tinnevely, Chingleput, Ramnad districts and the High Ranges of Travancore. Of these, 138 were new distributions for Tinnevely, Ramnad and Travancore. Two hundred and ninety-five specimens were prepared and mounted. One thousand three hundred and thirty-five Herbarium specimens of North Arcot district were ledgered. Two hundred and eighty sheets of specimens being part of the collection made during the year were incorporated after being duly numbered and ledgered. Forty-two specimens were distributed on exchange relations and 40 were received. Usual repair of Herbarium sheets and other routine work connected with the Herbarium were carried out.

Economic botany, intelligence and seed supply.—One hundred and seventy-six subjects covering a wide range from 74 correspondents and pertaining to the various aspects of general and economic botany were dealt with. Helped the officers of the Public Works Department of this Province stationed near coastal regions in the collection and identification of *Clerodendron inerme* Gaertn to be grown to prevent soil erosion by sea. Half-a-dozen South Indian plants collected from various places were got ready for forwardal to the Director of the New York Botanical Gardens for his investigation on the insecticidal and other properties.

6. (b) *Fodder grasses and forage plants*.—The study of fodder grass is continued. They yielded only one cutting during the year. *Chloris Bournei* Rang and Tad has given the highest closely followed by *Cenchrus ciliaris* L. (Kolukkattai). A fodder grass survey of parts of Chingleput district and High Ranges of Travancore were made. The most important feature of the grass flora of the High Ranges of Travancore is the colonization of foreign grasses, viz., Kikuya grass (*Pennisetum clandestinum* Hochst) and golden Crown grass (*Paspalum dilatatum*) in about 80 square miles in the course of 40 years. Both are good pasture grasses and also very effective soil binders. The cattle mostly of Scinde origin of this place depend mostly on these grasses as their sole feed. *Themeda triandra* Forsk (Mal : Potha pul) has been found to be an excellent fodder grass for milch cows. A pasture grass map of this Province was prepared showing the most important perennial and annual grasses for each district indicating their occurrence with also their local names. This map shows the richness or otherwise of the pasture grasses in the various districts. The first series of feeding trials with 'Star grass' (*Cynodon plectostachyum* Pilger) for its cyanogenetic contents are being conducted in collaboration with

the Government Agricultural Chemist with two pretty old bullocks. If this grass proves not injurious to stock it will be indeed an excellent pasture grass with soil binding characteristics.

Fodder trees.—The various fodder trees introduced to the different places are being acclimatized.

6. (c) *Seed supply*.—The District Agricultural Officer, Madura, was supplied with 1,500 slips of *Brachiaria mutica*, a grass that thrives in marshy places. They are reported to be doing very well.

7. *Rubber-yielding plants*.—The report prepared by the Gazetted Botanical Assistant, Rubber Scheme, is appended after scrutiny.

8. *Melinis minutiflora*.—The grass that fights snakes—For more than a year, this plant has been under observation and a detail report on this was submitted last on 17th June 1944. So far no insect repelling properties have been noticed.

9. *Botanic Gardens and Orchard*.—As this was under the Fruit Specialist till 3rd June, the report on this will be submitted by the Fruit Specialist.

10. *Tours*.—I was on tour to the Nilgiris in July for collection of cryptogams, to the Chingleput district in December with my Assistant Sri S. V. Parthasarathy for survey of grasses and collection of material for classes, to Nilgiris again in March for collection of *Lobelia* plants. I toured the coastal tracts of Ramnad and Tirunelveli districts for a preliminary survey of the sea weed *Gracilaria lichenoides* in connexion with agar-agar scheme. Sri S. V. Parthasarathy and Sri D. Daniel Sundararaj were taken in parts for this survey to enable them to identify the weed.

11. *Visitors*.—Sri Venkataswami Naidu, B.A., B.L., Rao Bahadru S. Sundararaman, M.A., I.C.S. (Retired) and Sri Vinayaka Mudaliyar, Livestock Development Officer, visited the Herbarium. The visitors have remarked in the visitors' book that "the Herbarium is the model of its kind". As regards the economic work they wish that some of the important fodder grasses were widely advertised and introduced in suitable areas and that the work on bananas deserves publication.

COIMBATORE,
10th August 1944.

S. N. CHANDRA SEKHARA AYYAR,
Lecturer in Botany.

APPENDIX A.

Report on the Rubber Scheme for 1943-44.

I continued to be in charge of the botanical aspect of the rubber scheme, sanctioned in G.O. No. 651, Development, dated 23rd December 1942, for the investigation of the rubber-yielding plants in Madras Province.

Botanical survey.—Botanical survey with special reference to the occurrence of the rubber vine, *Cryptostegia grandiflora* was done in the districts of East Godavari, West Godavari, Krishna, Guntur, Kurnool, Cuddapah, Anantapur, Bellary, North Arcot, South Arcot, Chingleput, Tanjore, Tiruchirappalli, Mathurai, Tirunelveli, Ramnad and Malabar. The survey has revealed extensive gregarious areas of this rubber vine in Kurnool and Tirunelveli districts and number of isolated patches (population being over 500 in many localities) in other districts.

A number of laticiferous plants were collected from various parts of the Province during the survey. These were tested for their rubber content in collaboration with the Government Agricultural Chemist. None of them were found superior to *Cryptostegia grandiflora*. In most cases latex could not be coagulated; in others where coagulation was possible, the resulting substance was very sticky and resinous that it could not be used as a rubber substitute.

Research work on *Cryptostegia grandiflora*.

Seed maturation and viability experiments.—The collection of seed of *Cryptostegia* presents some practical difficulties. The seed pods, after they are fully mature, dehisce on the plant itself and the seeds which are provided with tufts of hairs are blown off by the wind. These experiments therefore, were started to find out the best time for collection of seed pods from the plant before they dehisce without impairing the seed viability. Seeds were collected from pods at various stages of ripeness and their viability tested. The stage at which the pods turn brown and begin to dry up, is about the best time for collecting the seed pods. At this stage, the seeds possess 60 to 80 per cent viability. The pods begin to dehisce from 10 to 30 days after they have turned brown, during which period they can be collected.

Germination trials on stored seed have shown that the seed improves in viability with keeping in early stages. Seeds from freshly collected pods which showed 85 per cent viability, have shown 96 per cent viability after 16 weeks and 84 per cent after 40 weeks of storing. These results indicate that *Cryptostegia* seed is highly viable and possesses high keeping quality.

2. Experiments on pre-treatment of seed.—Under normal conditions, the seed takes about a week to ten days and more to germinate. These experiments were mainly aimed at shortening this duration and produce uniform germination in order to grow this plant successfully under rain-fed condition. Two trials were made in each experiment and 100 seeds tested each time. Treatment No. IV seems to be the best and most convenient method for adopting on a field scale. It is also the simplest. In this treatment, the seeds are given all the factors, moisture, warmth and air necessary for germination and germination starts within a few hours after soaking the seed. The seeds absorb water and in about 12 hours become greatly enlarged and attain their maximum size.

After 24 hours, the radicle becomes visible at one end of the seed as a white speck. In about 48 hours, the radicle attains a length of 2 to 3 mm. At this stage, the seed is very difficult to handle and there is the likelihood of the radicles breaking off. Therefore, the optimum time of sowing the seed is after the seed is treated for about 12 to 24 hours as in treatment No. IV.

3. Depth of sowing experiments.—The object of these experiments is to find out the suitable depth at which the seeds should be sown, and with the knowledge gained, to evolve a suitable method of sowing the seed in the field under dry conditions, to get the maximum benefit of the soil moisture and ensure successful germination. These experiments have shown that, if the seeds are to be sown in well prepared nursery beds, the best method of sowing the seed is to sow them on the surface and lightly cover them by gently stirring the soil. For sowing direct in the field, the seeds can be sown at a depth of about half an inch. Sowing at greater depths delays germination and also adversely affects germinating capacity. The results are tabulated below :—

Depth of sowing.				Period of germination.	Per cent of germination.
				DAYS.	
Surface sowing	..	..	..	6	85
1/4 inch below the soil	..	..	..	7	85
1/2 "	..	..	..	7	82
3/4 "	..	..	..	8	75
1 "	..	..	..	10	60
2 "	..	..	..	13	35
3 "	..	..	..	18	12

In the above data, average of two trials made is presented, the number of seeds tested each time being 100.

4. Dry sowing experiments.—The object of these experiments is to find out suitable method by which the plant can be raised on a field scale under rainfed conditions. With the knowledge and experience gained in the depth of sowing and seed treatment experiments, dry sowing experiments were taken up soon after the receipt of north-east monsoon rains in October. Seed treatment as indicated in experiment IV was adopted and the seed was sown at a depth of $\frac{1}{2}$ inch. Simultaneously, two months old seedlings were also transplanted in the field for a comparative study of direct sowing versus transplanting seedlings under rainfed conditions. Both these methods of planting were attended with great success and have demonstrated this rubber vine can be successfully raised entirely as a dry crop under rainfed conditions. From a comparative study of the direct sowing of seed and transplanting seedlings, the latter method is found to have many advantages over the former, the chief of them being :—

(1) The seed rate per acre is very greatly reduced in transplantation. To plant one acre of land (8,000 plants) four ounces of seed will be sufficient if the nurseries are raised and seedlings transplanted. If the seeds are sown direct in the field, the seed rate is increased fourfold.

(2) Transplantation has the advantage of putting older seedlings in the field, which could withstand the following summer better than their younger contemporaries, i.e., seedlings from seed sown direct in the field.

(3) In the transplanted field weeding operations are done cheaply and easily by using bullock power. In the sown field animal labour cannot be used as the seedlings are very small and slow growing in the early stages and are difficult to make them out from the weed seedlings even if plantings are done in lines.

(4) In alkaline lands the soil at the top cakes and forms a hard crust on drying. This seriously interferes with the germination of the seed and if rains are not favourable, many seedlings fail to come out of the soil penetrating the hard crust, resulting in number of gaps in the sown field. There is no such danger in the case of transplantation. In alkaline soils, therefore, only transplantation should be adopted.

5. *Habit and growth studies.*—Fortnightly measurements of shoot and root length of *Cryptostegia grandiflora* were recorded and the habit of the plants as they grew was studied. It was observed that in early stages the seedlings grow erect like those of a tree species for about 2½ to 3 months. Thereafter, the main stem becomes straggling. At this stage the plant produces a number of lateral shoots which give the seedlings a bushy appearance. When the plant is about four months old, the main shoot rapidly elongates and appears as if in search of some support to climb on. Some of the axillary shoots especially those that arise from near the base of the plant also grow very rapidly and attain a length of over 6 feet in about 2 months. At this stage the plant is very characteristic with its two types of branches, the ordinary leafy ones bearing an abundance of foliage and growing on all directions and the long whip-like shoots which are comparatively leafless growing erect. The leafy shoots are thinner with shorter internodes and give the plant the characteristic bushy appearance. The (comparatively) leafless branches are vigorous growing and have longer internodes. They often twine round each other and help the plant in climbing. The following data gives average measurements of ten representative seedlings selected in the field:—

Days after sowing.	Number of nodes in the seedlings.	Length of shoot. INCHES.	Length of root. INCHES.	Remarks.
20	1	1.5	3.5	..
35	3	4	6	..
50	7	8	9	..
65	12	14	18	..
80	16	17	23	..
95	20	21	25	Lateral shoots begin to arise.
110	23	*32	26	Whip-shoots begin to appear.
125	26	*40	29	* Length of whip
155	30	*65	30	"
185	36	*72	30	"

From the above data it will be seen that the growth of the seedlings is slow in the early stages. From the fifth month onwards the main stem rapidly elongates and attains a length of about 6 feet in about two months. Some of the axillary shoots, especially those that are produced near the base of the plant, also grow vigorously like whips and are capable of attaining a length of over 6 feet in about two months. More often these shoots are more vigorous growing than the main shoot itself. While the main stem grows straggling, these whips grow more or less erect. The root system of the plant is very remarkable. In young seedlings of about three to four weeks old, its length is nearly double that of the shoot. It grows rapidly and the tap root attains a length of nearly 2½ feet when the seedlings are about three months old. This accounts for the extreme drought resisting character of this plant.

6. *Experiments on pruning.*—These experiments were conducted to find out the effect of different systems of pruning on the regrowths and habit of the plant with special reference to the production of whip shoots which are the best parts of the plant suitable for tapping. The experiments were started on one year old plants in October during the north-east monsoon period when the conditions for regrowths were optimum. Before pruning, the plants had on an average, four whip and 23 leafy shoots per plant. Observation and measurements were done for two months from the date of pruning (shoots measuring less than 6 inches being omitted). Six plants were selected in each system of pruning and their average measurements are tabulated below:—

System of pruning.	Average new growth per plant.			
	Whip shoots.		Leafy shoots.	
	Number produced.	Average length. INCHES.	Number produced.	Average length. INCHES.
1 Coppicing, i.e., pruning down to about 4" from the ground level ..	1	103	8	25
2 Coppicing, i.e., leaving a leafy vegetative shoot alone ..	1	105	8	27
3 Coppicing, i.e., leaving a whip shoot alone ..	2	105	10	26
4 Coppicing, i.e., leaving a leafy shoot and a whip shoot ..	2	103	6	24
5 Coppicing, i.e., leaving the main shoot and an axillary leafy shoot.	2.5	110	7	25
6 Coppicing, i.e., leaving the main shoot and a whip shoot ..	2.5	95	8	22
7 Pruning all whip shoots leaving leafy shoots ..	3	108	6	24
8 Pruning all leafy shoots leaving whip shoots ..	2	92	10	23
9 Control ..	2.5	95	6	25

It is seen from the above data that *Cryptostegia grandiflora* responds remarkably to pruning, putting forth plenty of fresh growth within a short time after pruning. It was observed that the

regrowths were put forth mainly from the nodes on the whip shoots. In cases where the whips are completely pruned back, the regrowths appear mainly from the base of the plant. It is seen from the results obtained that drastic pruning of the plant induces more leafy growth and less number of whip shoots. It would appear that leafy vegetative growth is essential for the production of whip shoots in the plant. When all leafy shoots are pruned down leaving whip shoots alone, more number of leafy shoots are produced. When whip shoots alone are pruned leaving all the leafy shoots, more number of whips are produced. Therefore, it appears as if there is a sort of balance between the number of whips and leafy shoots produced in a plant. The whip shoots, after a certain period of growth, bend down from their erect position. When this happens, number of shoots begin to arise on these horizontally disposed older whips. When the whips are pruned down before they bend, new whip shoots were found to arise mainly from below the pruned portions.

From these results it appears that in order to induce the maximum number of whip shoots in a plant, it is essential that the leafy shoots are not removed drastically. Pruning back old whip shoots induces the production of more whips. Therefore, as soon as a whip shoot is fully tapped it is advantageous to prune it back leaving a short stump for fresh shoots to arise. Sometimes as the tapping is in progress, the whip shoots bend down and a number of shoots are produced on them. Since many of these shoots have tendency to grow like whips, the older whip shoots in these cases may be suitably pruned or trailed instead of being cut back, in order to encourage the growth of these new shoots.

7. *Planting of Cryptostegia grandiflora*.—Experiments on the propagation methods, habit and growth of *Cryptostegia grandiflora* have shown that this plant can be grown as a short term rubber crop. Ecological observations have shown that this plant is very hardy and is adaptable to varying soil and climatic conditions. Therefore with the sanction of the scheme in G.O. No. 574, Development, dated 15th April 1943 extensive planting of this rubber vine was taken up along the canal banks and poramboke lands near canals. In most of the places, the plants are coming up well and will be ready for tapping in a few months.

8. *Collection of rubber in Kurnool district*.—Work connected with the scheme sanctioned in G.O. No. 741, Development, dated 21st February 1944, for the collection of rubber from *Cryptostegia grandiflora*, was taken up in May 1944, in Bannur area in Kurnool district. Tapping was done by collecting latex and plugs adopting the direct bleeding method. Data collected for 15 days showed that when latex was collected, the cost of one pound of rubber worked out to Rs. 17-6-0. When plugs alone were collected, the cost was Rs. 10-15-0 per pound. It was observed that the labourers wasted much time in going round the rubber bushes which are growing in

between thorny wild growth and date palms and on an average a worker could tap only about 600 shoots in a day. As an experimental measure, an area of about 5 acres was cleared of the thorny undergrowth and tapping done by collecting plugs alone. When this was done, the labourers were able to tap about 3,000 shoots each per day, with the result that the cost of collecting rubber has been brought down to Rs. 4 per pound. This figure is the lowest so far recorded and is still capable of improvement as the pruned plants put forth more tappable shoots after the rains and the labourers gain more and more experience. The output of crude rubber also has increased from almost nothing to nearly 3 pounds per day, mainly due to clearing the wild thorny growth and making more and more shoots available for tapping. The clearing and pruning work and collection of rubber in Bannur area, Kurnool district is in progress. When the entire area which extends over 200 acres is suitably cleared and bushes pruned to convenient heights, it is hoped to get from 15 to 20 pounds of rubber per day from this area alone.

A quantity of 55 pounds of crude rubber was collected up to the end of June 1944.

ANNUAL REPORT OF THE BIOCHEMIST, FRUIT CANNING AND PRESERVATION WORK (MADRAS) FOR THE YEAR 1943-44 (1st JULY 1943 TO 30th JUNE 1944) (FASLI 1353).

JUNE 1944), FASLI 1353).

This is the second annual report. I submit, herewith, the detailed report of my section.

Staff.—Sri G. Rama Rao, Canning Assistant, was transferred to Anakapalle on 11th September 1943. Sri K. Sambamurthy joined as Canning Assistant on 15th November 1943. The store-keeper's post which remained vacant was converted into that of a clerk and Sri C. Beesanna was appointed as clerk on 20th June 1944. I remained in charge of the work throughout the year. In addition, I was also in charge of the Imperial Council of Agricultural Research Scheme for the institution of quality grading standards for South Indian citrus fruits.

The fruit products section was made an independent research section in February 1944. During the year, I visited Kilakadayam in Tirunelveli district, Tiruchirappalli and Mangalore to study the possibility of developing the fruit preservation industry in these important fruit growing areas. Arrangements were made to obtain from abroad machinery and equipment required for the Fruit Products Research Laboratory. Although the facilities at Kodur are very limited, a number of important experiments were carried out and the results are briefly described in the following sections under main headings.

I. CANNING.

A series of experiments were carried out during the year to find out the suitability of different kinds of fruit for canning. The effect of changing the standard procedure for canning was also investigated in a preliminary way to standardize the method for canning some important varieties of fruits.

Among the South Indian fruits, mangoes, pineapples and guavas are the most likely to be important for commercial canning. Attention was, therefore, directed towards their utilization for canning and preservation.

Mangoes.—Among the numerous varieties of mangoes, Baneshan, Alampur Baneshan, Mulgoa, Neelum and Bangalora are commercially important. A series of varietal canning trials with these fruits have given interesting results. The Neelum is a small size fruit with a bright yellow peel when ripe. The flesh is non-fibrous, compact and of a rich golden yellow colour, and possesses good taste and flavour. The Bangalora, on the other hand, is a large size fruit, with a crisp and non-fibrous yellow flesh. The taste and flavour are fair only. Although the fruit stands handling,

it does not ripen uniformly like the Neelum. This is a disadvantage especially when a standard pack is required. Baneshan and Alampur Baneshan are high class dessert mangoes and fetch fancy prices in the fresh fruit market. Both have an attractive yellow coloured flesh which is quite compact and non-fibrous, and possess very good taste and flavour. They stand well the usual peeling process.

The pH of mango pulp is about 3.6 in the case of Neelum and 3.4 in the case of Bangalora when they are at the canning-ripe stage. The pH of the fruit is a very important factor in deciding upon the time and temperature of processing. Acid fruits require processing for a shorter while than the less acid fruits. Vegetables which are non-acid in nature require to be processed under pressure at a temperature higher than that of boiling water. Some of the varieties of mangoes have a pH in the neighbourhood of about 4.6 to 4.8, and the processing of such fruit in boiling water may not be sufficient to destroy all the spoilage organisms.

Neelum.—The results of a typical experiment on the canning of Neelum mangoes are as follows:—

		LB. OZ.	PER CENT.
Weight of 12 fruit	.. ..	5 13	..
Peel	.. ..	0 9	9.69
Stones	.. ..	0 12	12.90
Slices	.. ..	3 15	67.74
Trimnings and pulp from stone		0 6	6.45
		Total ..	96.78
Loss during preparation	..		3.22
Number of A-1 size lacquered cans filled			9

The fruit which was firm ripe was peeled with a stainless steel knife and the two sides of the fruit were sliced and cut into two pieces each. The remaining portion of the fruit left on the sides of the stone was removed in two slices. Even after removing these six slices, a small portion of the pulp was still left adhering to the stone (about $\frac{1}{2}$ oz. per fruit). The slices, 7 to 8 in number, were carefully arranged together in the hand and placed in one lot inside an A-1 size lacquered can. By this method, the maximum amount of fruit could be filled into the can without breaking the slices during filling.

After filling the fruit into the can, sugar syrup of 45° Brix at 175—180° F was run in leaving a head space of about quarter inch. The cans were exhausted for 8 to 10 minutes at 185—190° F by placing them in hot water. After exhaust, they were double seamed using a Dixie automatic sealing machine and processed in boiling water for 30 minutes. After processing, they were quickly cooled in cold water to prevent 'over-cooking' and

'stack-burning' during storage. The cooled cans were wiped dry, marked with a code and stored at ordinary room temperature for further observation.

Although the procedure described above was the one generally employed for canning mangoes, a number of changes were also introduced to standardize the method. The effect of varying the syrup strength, the time of exhaust and the time of processing, was also investigated. In the case of distinctly acid fruits like peaches, pears, plums, berries etc., the time of processing is very short, varying from 8 to 20 minutes for many of the standard sizes of cans. In the case of mangoes, however, on account of their comparatively high pH, it is not safe to underprocess the cans. A process time of 30 minutes is sufficient for almost all fruits except tomatoes in solid pack, and was, therefore, adopted as the standard. In some of the experiments it was reduced to 25, 20 and 15 minutes. Since the pH of mangoes is quite high, it is sometimes recommended that they should be processed at higher pressures. In order to study this, in some of the experiments, the cans were processed in a Burpee retort at 5 lb. (228° F) pressure for periods varying from 10 to 20 minutes.

Work at Campden Research Station, England, has shown that the addition of citric acid to the covering syrup leads to a decrease in the losses due to hydrogen swells and perforations in some canned fruits. The effect of adding citric acid in the case of mangoes was, therefore, studied in a preliminary way. In some of the experiments lime juice was added to the syrup to raise its acidity by about 0.5 per cent and the scum which was formed during heating was removed. Cans to which citric acid was added were processed for different times at ordinary as well as higher pressures to see if the process time could be reduced. The samples are kept in storage for observation after an interval of 6 to 12 months and even longer periods.

At this stage it may be stated that the Neelum mango has most of the characteristics of a good canning fruit. It has firm, compact and non-fibrous flesh which stands handling well, and the taste and flavour are also good. The colour of the flesh is a bright orange yellow resembling that of clingstone peaches. It stands processing remarkably well, and the syrup remains clear and bright. It ripens uniformly and keeps well for some days even in ordinary storage. It is, therefore, possible to turn out a good canned product from this variety of mango. Further experiments are, however, necessary before making any finer alterations in the standard procedure for its canning. Lacquered cans, a syrup of 50 to 55° Brix, an exhaust of 10 minutes and a process of 30 minutes in boiling water may be adopted for producing a really good canned product from Neelum mangoes.

The method and technique employed in the case of canning of the Neelum mango was adopted in the case of the other varieties

also. Complete data were collected regarding the percentage of peel, stone, flesh, trimmings, etc., and the yield of cans. The cans will be examined during storage by the "cut-out" technique to find out the best method for canning many of the important varieties of mangoes.

Bangalora.—A series of canning experiments have shown that this variety also can be utilized for producing a fairly good canned product. The fruit being large, it can be canned in the form of pieces about 1 to 1½ inches in size.

Alampur Baneshan and Baneshan.—These two varieties give good canned products. About 62—67 per cent of the fruit can be utilized for canning. A syrup of 50° Brix is satisfactory. It is to be seen how the canned product keeps during long storage. Hydrogen swells or perforations have not been observed so far.

Mulgoa.—This fruit was canned in the same way as Baneshan. While fresh, it possesses a strong and rich flavour. In some of the fruits of this variety, there are numerous dark brown fibres running along the outer portion of the flesh just below the peel. These are likely to spoil the appearance of the canned product. About 66.4 per cent of the fruit is available for canning.

It is proposed to continue these systematic experiments on varietal canning using other sizes of standard cans like A-2 and A-2½, plain as well as lacquered. The time of processing will have to be standardized for these sizes of cans also as they are commercially the most popular sizes.

2. *Pineapple*.—Canning of pineapples is an important industry in West Indies and Malaya. Pineapples of good quality like the Kew and Mauritius varieties are grown on the West Coast, and it is, therefore, desirable to find out if they could be utilized for canning. The Kew pineapple is a large fruit with big eyes. Its peel is green when under-ripe. It can be kept in ordinary storage and allowed to ripen. The average weight of a fruit is about 4 to 5 lb. The Mauritius is a smaller pineapple weighing about 2 to 2½ lb. each. The Kew has numerous deep-set eyes and the removal of the outer peel does not remove them completely. They have to be extracted by means of a pineapple eye-extractor. When they are removed by means of this instrument, the loss due to peeling is minimised considerably, but the slices have a marked broken edge which takes away much of the attractiveness of the canned product. In the case of the Hawaiian canned pineapple, the outer edge is quite smooth. The flesh of the Mauritius pineapple is of a deep yellow colour and has sweet taste and strong and persistent flavour. Being fibrous and not compact, the slices have a tendency to break down during preparation. Since pineapples contain a proteolytic enzyme, it is desirable to work with rubber gloves.

The following data for Kew pineapple from Mangalore are of considerable interest. The fruit, which was firm ripe, was peeled

118 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

with a stainless steel knife and the eyes removed with a pineapple eye extractor. The peeled fruit was cored and cut into rings about half an inch thick. The rings were cut into 8 sections to fill into small A-1 size cans.

	LB. OZ.	PER CENT.
Weight of four fruits with Crown	14 6	..
Weight of crowns	1 11	11.74
Weight of peel	2 12	19.13
Weight of eyes, trimmings, core, etc.	3 9	24.78
Weight of slices for canning ..	6 0	41.75
Total ..		97.40
Loss of juice, etc., during preparation ..		2.60
Number of A-1 size cans prepared ..		10 only.

There was much loss of fruit during preparation, as the eyes are deep set. The slices were filled into A-1 lacquered cans, covered with 40° Brix syrup and processed for 25 minutes in boiling water. The canned product was good. The cans are kept in storage for further observation. It may be pointed out that hydrogen swell formation is quite common with canned pineapple. To cut down the cost of production it is desirable to make use of the considerable amount of trimmings and eyes for jam and for syrup. Experiments have already shown the possibility of doing this.

3. *Guavas*.—Guavas are grown extensively in some parts of the Presidency and their utilization for canning and preservation is an important problem. In some parts of India, they are used mostly for preparing guava jelly. Recent work has shown that they are rich in vitamin C. Preliminary work at the Fruit Products Research Laboratory at Kodur has shown that canned white guavas resemble in several respects the more familiar canned pears.

There are two distinct types of guavas, one with white flesh and the other with pink or red flesh. The white varieties, especially the seedless ones, appear to be better suited for canning. The firm-ripe fruit was washed, peeled with an ordinary or special rotary peeling knife and cut into halves. The seeds were scooped out by means of a spoon-shaped knife and the halves placed in water to prevent browning due to enzyme action. In some of the cases, the halves were cut into two pieces each. The prepared fruit was filled into A-1 size lacquered cans, covered with 40 or 45° Brix syrup, exhausted for 10 minutes and processed for 30 minutes in boiling water. After processing, the cans were quickly cooled in cold water, wiped dry and kept in storage. In a typical experiment, making use of a mixed lot of firm-ripe guavas for canning,

the peel was 14.1 per cent, seeds 32.1 per cent and fruit fit for canning 53.8 per cent. The seeds could be more easily scooped out of quarters than from halves. About 6 to 7 halves of medium size fruits could be filled into an A-2½ size can.

II. JUICES, SQUASHES, ETC.

The work under this subject was carried out using a variety of fruits and a number of interesting and useful products prepared. Citrus squashes were prepared on a fairly large scale, as there appears to be a considerable demand for these. As many as 1,480 bottles of squash, syrup and cordial were prepared during the year and most of them were quickly sold out. In a tropical country like India, there is a considerable demand for soft fruit drinks. Most of this demand is, however, met by means of artificial beverages which are of doubtful nutritional value. The newer knowledge of nutrition has indicated the importance of fruits as a rich source of minerals and vitamins and their place in human nutrition. It is, therefore, desirable to introduce really nutritious fruit juices in the place of the artificial ones. The public having already cultivated a taste for soft drinks, there will not be much difficulty in finding a ready market even for large outputs of fruit juices. What is required is intensive propaganda and the lowering of the cost of production so that the products may come within the reach of one and all.

Lime squash.—The method for the preparation of lime squash was standardized. Exhaustive data was collected regarding the percentage of juice, peel, rag, etc., in limes throughout the year. There is a considerable variation in the Brix and acidity of lime juice from different parts of the Presidency during different periods of the season. The juice from slightly green fruit is of a higher Brix than that from fully ripe yellow fruit, but the yield is about 5 per cent less. Using an ordinary hand squeezer, the yield of juice from ripe limes varies from about 42 to 48 per cent. The Brix value of the juice is generally about 8 to 9°, although higher values were sometimes observed. The percentage of acidity as citric acid is about 7 to 7.5 per cent. The Brix value of the juice was noted in all the experiments so that squash of a known Brix value could be prepared from it. The juice was weighed. An equal weight of water was taken and the calculated amount of sugar required to raise the Brix of the squash to 55 or 60° was dissolved in it. The syrup was heated to boiling, the scum removed and the syrup filtered through cloth to remove dirt. It was cooled to about 130° F before adding the lime juice. The squash thus prepared was preserved by the addition of potassium metabisulphite at the rate of 0.06 per cent. The chemical was added dissolved in a small quantity of water. The squash was filled into previously sterilized bottles which were later closed with crown corks. This method of adding syrup to the juice was found to give a cleaner and better flavoured squash than the alternative

method of adding water and sugar directly to the juice. Sugar always contains some impurities and during the preparation of the syrup these can be easily removed. It is, however, necessary to replace the water lost through evaporation during the preparation of the syrup.

Although the method described was the one usually employed, some changes were introduced in the technique. The effect of pre-heating the juice to destroy the pectic enzymes involved in the clearing and clumping of juice was also studied. The juice was rapidly heated to 189.5° F, kept there for two minutes and cooled suddenly. This is the procedure recommended by Joslyn and Marsh for pre-heating the juice (Fruit Products Journal, 1934, 14). Pre-heated juice does not clarify as rapidly as the fresh unheated juice. The results of these experiments will be given when more critical data becomes available.

The following data obtained in a typical experiment on lime squash preparation are noteworthy. The limes were got from the market at Kodur and were yellow ripe.

	LB. OZ.	PER CENT.
Weight of 415 limes	29 10	..
Weight of juice	14 2	47.68
Weight of peel and rag ..	14 13	49.99
		97.67
Loss of juice during extraction, etc.	..	2.33
	Total ..	100.00

(a) Brix 9.4°.

(b) Acidity 7.44 per cent as citric acid.

Lime squash of 60° Brix —

	LB. OZ.
Juice	14 2
Water	14 2
Sugar	39 1
Squash	67 5

Potassium metabisulphite at 0.06 per cent = 18.4 gm.

Number of 24 oz. bottles of squash prepared = 31.

The fruit juice content is 20.98 per cent.

The cost of production of 24 oz. of squash is 8 annas approximately. This comparatively high cost is worked out allowing for a price of Rs. 5 per 1,000 limes and 4 annas per pound of sugar.

The cost of 55 degrees Brix squash will be slightly less, i.e., about 7 annas. Supervision, depreciation and interest charges, etc., are not included in this cost. When working on a factory scale, even after allowing for these, the cost of production is not likely to be far more as there will be considerable saving in fuel and labour charges. It is, however, desirable to add another anna to this cost to be on the safe side.

2. *Lemon squash.*—Lemons contain much oil in the peel, and it is, therefore, desirable to peel the fruit, crush and press the peeled fruit to get the juice. The yield of juice is about 40 per cent and it is, of about 7 degrees. Brix has an acidity of about 4.5 to 5.0 per cent. The method of preparation of squash is the same as that for lime squash. A 55 degrees Brix squash is preferable to a 60 degrees Brix one. Lemon squash prepared from peeled fruit has poor flavour indicating thereby the necessity of adding a certain amount of the peel emulsion to fortify its flavour. The emulsion of peel from about 4 per cent of the fruit taken will be sufficient for the purpose. Large lemons can be cut into halves without peeling as in the case of oranges. During the extraction, a certain amount of peel oil is introduced into the juice and this gives it the real lemon flavour. The addition of peel emulsion is not necessary in this case.

3. *Orange squash.*—The Chinese or Sathgudi orange is an important commercial citrus fruit in Ceded Districts and Chittoor. It is a high class dessert fruit and fetches a good price in the fresh fruit market. The main season fruit yields about 45 per cent juice, when peeled, cut into halves and pressed in a superjuicer. The juice of oranges is, however, generally extracted by reaming against a revolving spindle. The juice is of 10 to 12 degrees Brix and has an acidity of about 0.5 to 0.6 per cent. The juice from off season fruit has an acidity as high as 0.8 to 0.9 per cent. When squash of about 60 degrees Brix is prepared by using this juice, the taste and flavour of the finished product are not satisfactory, being too sweet and flat. A series of experiments have, however, shown that when the juice is acidified with citric acid in the form of lime juice, good quality orange squash can be prepared. A blend of orange and lime juices in the rate of 2:1 was found satisfactory. The squash prepared has excellent taste and flavour and keeps well in storage. Its acidity is about 1.3 per cent. It is preserved with potassium metabisulphite just like lime squash. The orange juice content of 60 degrees Brix squash is as high as about 30 per cent. About 4 to 5 oranges of 3 to 3½ inches diameter size will be required to prepare one 24 oz. bottle of orange squash.

4. *Loose jacket orange squash.*—Loose jacket oranges from Kodaikanal, Kallar and Burliar, etc., were utilized for preparing orange squash. In this case also, the same method as was used in the case of the Chinese oranges was found suitable. The squash is of orange yellow colour unlike the Chinese orange squash which is of a light yellow colour only. It has good taste and flavour. Samples are kept for observation of changes in colour, taste and flavour during long storage.

5. *Orange squash from Batavian and Vadlapudi oranges.*—Batavian and Vadlapudi oranges also have been successfully utilized for the preparation of orange squash of good quality. On account of its higher acidity the Vadlapudi squash has a better flavour. The acidity of 60 degrees Brix squash is about 1.90 per cent. When the ratio of lime juice added is reduced from 2:1 to 3:1, the acidity of the squash decreases to 1.24 per cent.

6. *Kichili squash.*—The Kichili orange (*Citrus maderasapata*, *Tanaka*) is a medium size fruit weighing about 5 to the pound, and the peel is rich in oil. The juice is of about 10 degrees Brix and has an acidity of about 2.4 to 2.9 per cent. Experiments have shown that this juice when blended with lime juice in the ratio of 3:1 can be used to prepare excellent quality orange squash. The fruit is available at a cheap price and promises to be an interesting source for the preparation of a number of products besides orange squash. The fruit is peeled and the peeled fruit is crushed and pressed in a basket press to get the juice. The yield of juice is low being only about 33 to 35 per cent.

7. *Mango squash.*—Experiments have shown that some varieties of mangoes, especially the juicy and fibrous ones, can be utilized for making mango squash.—Hamlet, a large variety of mango, was used in one of the experiments. The fruit, which was fully ripe, was washed, peeled and the edible portion which was soft, juicy and fibrous was cut into small slices. The slices were heated for 15 minutes with $1\frac{1}{2}$ times their weight of water and the soft pulp rubbed through the fine-mesh revolving copper screen of a fruit pulping machine. The resulting pulp, which was thick and viscous, was of about 6 degrees Brix and 0.25 per cent acidity as citric acid. Sugar was added to raise its Brix to 65 degrees and the mixture heated to boiling. Lime juice to the extent of about $\frac{1}{7}$ th the weight of the squash was also added to raise the acidity of the final squash by about 1.0 per cent. On heating, the pulp rose to the top leaving a fairly clean syrup below. In one set of experiments this pulp was not removed, but was stirred in with the squash itself. In another set of experiments, it was removed to facilitate filtration of the squash through cloth. Filtration is very slow as the pulp soon clogs the pores of the filter and it should be scraped off frequently. A considerable amount of the pulp is removed during filtration thereby reducing the fruit content of the squash. The alternative method of adding clean syrup with the sugar dissolved in water was also tried, but in this case the fruit juice content of the squash was reduced to as low as 7 per cent in some cases. Squash prepared by direct addition of sugar contains about 15 per cent of the mango fruit pulp. Although the fruit pulp may be cleaned by a preliminary filtration, the addition of sugar is likely to introduce small traces of impurities, which can only be removed by dissolving in water and filtering off. The only way of maintaining the high fruit juice content of the squash is to use an efficient filter press for removing the traces of impurities from the final squash. Good quality mango squash was prepared from the Neelum mangoes

also. The squash was preserved with potassium metabisulphite at the rate of 0.06 per cent. This work will be continued on a more intensive scale during the coming season as mango squash is likely to be of considerable commercial importance. The possibility of utilizing a homogenizer, as in the case of milk used for canning, to break up the pulp finely is also worth investigating.

8. *Cashew apple syrup.*—Cashew apple nuts find a ready sale, but the fruit is not utilized to any extent. The freshly expressed juice is of about 10.7 degrees Brix and 0.22 per cent acidity, as citric acid. Due to enzyme action it turns greyish purple. To prevent further discoloration it is necessary to heat it rapidly to boiling and cool quickly. On heating, the proteins coagulate, and when filtered through filter paper, a clear filtrate is obtained. The heated juice can be allowed to settle overnight and the clear supernatant liquid syphoned off and utilized for making cashew apple syrup. On adding lime juice to this juice in the ratio of 2:1, the pale grey colour of the juice clears up and a copious flocculent precipitate is formed. Although the precipitate shows a tendency to settle down rapidly it cannot be removed by filtering through cloth. The cleared as well as the freshly extracted juice can be used for preparing cashew apple syrup of 60 degrees Brix which can be preserved chemically. When freshly prepared, the syrup has a slight catching effect on the throat, probably due to the excess of tannin, but on ageing it tones down considerably.

9. *Pineapple syrup or squash.*—An excellent pineapple squash can be prepared from the whole fruit as well as the trimmings left during canning. The ripe fruit is peeled, cored and sliced. The slices are crushed and pressed in a Simon Frere metal press. The juice which is of about 10 degrees Brix and 0.75 per cent acidity as citric acid can be used to prepare pineapple squash of 60 degrees Brix. It can also be blended with $\frac{1}{3}$ rd its weight of lime juice and the blended juice converted into squash. The acidity of the squash will be about 1.1 per cent and its taste and flavour quite good. It is preserved with potassium metabisulphite.

10. *Lime peel syrup, orange peel syrup and jack syrup.*—The syrup left over in the candying of lime peel, orange peel, jack fruit, etc., can be converted into good syrups by acidifying them with lime juice to the necessary extent. These syrups are quite clear and bright and have the characteristic flavour of the original fruit.

11. *Lime juice cordial.*—A series of critical and exhaustive experiments were carried out on the preparation of cordial from lime juice. Different methods of clarifying the juice such as the addition of fining agents like Kaolin, Kieselghur, etc., were studied. It was noticed that juice submitted to preliminary heating does not settle quickly due, perhaps, to the destruction of the pectic enzymes in the fresh juice. When the freshly pressed juice is stored in coloured glass carboys of about 5 gallon capacity, clarification is rapid, and in about a month's time the clear supernatant juice can be syphoned off. The addition of commercial quality Kaolin

imparts a slight earthy flavour to the juice. It was further observed that when the carboy is partially filled with the juice, it turns brown due to oxidative changes. To get a clear and bright yellow coloured juice, it is necessary to fill the carboy completely, leaving only a small amount of headspace, with fresh juice which has been preserved with potassium metabisulphite.

The preparation of lime juice cordial from the clear juice is similar to that adopted in the case of lime squash. The juice should be diluted with an equal quantity of water as, otherwise, the acidity of the cordial would be as high as about 4 per cent. A 55 degrees Brix cordial will have a fruit juice content of about 23 per cent and every decrease of 5 degrees in its Brix will increase the juice content of the cordial by about 2.60 per cent and vice versa. The bottled cordial develops an attractive bright amber colour during storage and a small amount of compact sediment settles down at the bottom of the bottle. This sediment can be avoided only by filtering the cordial prior to bottling through an efficient filter press.

III. JAMS, JELLIES AND MARMALADES.

Jams and jellies form an important class of by-products in the fruit preservation industry. Cull fruit which cannot be used for canning can often be successfully employed for the preparation of jams, jellies, etc. Jams and jellies were prepared from a number of important South Indian fruits. Most of the work had to be done using paraffin stoves, as steam was not available to work the jacketed jam pan. The experiments have given interesting results and shown the possibility of developing this industry. The jam was packed in screw-top jars or lacquered cans. In the case of some of the samples of mango jam, pineapple jam, etc., packed in ordinary screw-top jam jars, there was a slight growth of mould on the surface of the jam. Unless the jars have air-tight seals, in hot and humid places, the surface of the jam is likely to become mouldy during long storage. It is, therefore, desirable to cover the surface of the jam with a thin layer of melted paraffin wax at the time of filling the jam into the jars. This prevents the condensation of moisture on the surface of the jam which, by diluting the concentration of sugar in the top layer, favours mould growth. When jam is packed in air-tight Sutax jars which have rubber ring seals or in cans, covering with paraffin wax is not necessary.

Mango jam.—The ripe fruit is peeled, cut into slices and the pulp softened by heating with about 1/3rd its weight of water. To the pulp an equal weight of sugar is added and the boiling finished at 220° F. Since mangoes are low in acidity, it is necessary, to add acid to fortify the set, taste and flavour of the jam. Generally tartaric acid is added, but citric acid in the form of lime juice was found suitable in the case of mango jam. The addition of pectin is not essential although it helps to improve the set of the jam. Mango jam is of a bright golden yellow colour and possesses

good taste and flavour. It is likely to be popular with the public. Trimmings and stone pulp left over in the canning of mangoes can be economically converted into mango jam.

2. Pineapple jam.—Excellent quality jam can be prepared from whole pineapple fruit as well as from trimmings left over during canning. The slices are softened by boiling with about 1/3rd their weight of water for about 15 to 20 minutes. Lime juice at the rate of about 1/14th the weight of pulp is added to increase the acidity of the jam. An equal weight of sugar is added to the pulp and the boiling finished at about 220° F° when the jam gives a satisfactory 'flake test'. Instead of lime juice, citric acid or better still tartaric acid can be used. The jam can be packed in jam jars or lacquered cans.

3. Jack jam.—The edible portion of jack fruit is cut into slices and boiled with $\frac{3}{4}$ its weight of water to soften the pulp. Sugar is added to the pulp in the rates of 1 : $\frac{3}{4}$ and the acidity is raised to 1 per cent by adding citric acid or lime juice. Jack jam has a bright golden yellow colour and a very strong and characteristic flavour which may not appeal to all people.

4. Guava jelly.—A series of critical experiments were carried out to standardize the method for the preparation of guava jelly of good set and clarity. Slightly under-ripe fruit which is rich in pectin should be used. In fully ripe or over-ripe fruit the pectin content is low and consequently the jelly prepared from them does not have a good set. To give a good set, the extract should be of about 7 degrees Brix as at this concentration it is rich in pectin as shown by the alcohol test. An equal weight of sugar and addition of about 0.5 per cent citric acid as lime juice lead to a jelly of good set, clarity and brilliance. Guava jelly is an important article of commerce.

5. Orange marmalade.—The Kichili fruit has proved to be an interesting source of raw material for the preparation of orange marmalade. Marmalade prepared from Kichili fruit alone is far superior in set, taste and flavour to that prepared from a mixture of Kichili and Chinese orange. The taste is, however, slightly bitter as in the case of the typical English marmalade. It is desirable to add to the marmalade a fairly large amount of shreds, especially of Chinese orange. Although this tends to make it slightly bitter in taste, the appearance of the finished product is much improved. The marmalade can be packed in jam jars, plain or lacquered cans.

IV. CANDIED PRODUCTS.

Candied, crystallized and glazed products are luxury products and fetch high prices. Their preparation, although quite simple in principle, requires much skill and care to get a really good product. Firm ripe fruit is prepared and taken through a series of syrups of increasing concentration from about 30 to 70 degrees. In the final syrup, the product is kept for 10 to 15 days so that it might absorb the sugar thoroughly. It is then taken out, drained on wire sieves

and dried in the shade to get the familiar candied product of commerce. It forms the basis for further refinements such as crystallizing, glacing, etc. During the candying process, the acids present in the fruit invert a part of the sugar and it is this invert sugar that is responsible for the gloss in the candied product. Much of recent work on the subject is concerning this aspect of the candying process.

Candied kumquat, pineapple, jack, lime, lemon and orange peel have been prepared in the Laboratory. The products have very good taste and flavour and are popular with the public. The effect of salt-curing lime, lemon and citron peels was also studied in a preliminary way. Preliminary salt-curing gives a better-candied peel than the ordinary process. Since much sugar is used for candying fruit, it is desirable to convert the final syrup into suitable beverages.

V. DRYING AND DEHYDRATION.

Sun-drying of fruits like grapes, dates, etc., is an ancient art, and large quantities of dried fruit of commerce are produced by this method in countries where weather conditions are suitable. The process is simple and economical, but there is always much contamination in the finished product due to accumulation of dust, insect eggs, etc. The modern process of dehydration under controlled conditions of temperature and humidity in closed chambers known as dehydrators gives a cleaner and more attractive product. To minimize insect attack during storage, before dehydration the fruit is subjected to sulphur fumigation and the final product is carefully packed in clean and air-tight containers. Infestation during storage is one of the most serious problems in the case of many dried fruits. In recent years the dehydration of vegetables has sprung into prominence in connexion with the feeding of the Defence Forces.

A series of experiments were carried out at the Fruit Products Research Laboratory in order to standardize methods for the dehydration of local fruits and vegetables. Products like banana figs, banana flour, dehydrated guava, etc., are excellent products and their production should be encouraged. Preliminary trials on the dehydration of mango slices have given interesting results. A few of the typically Indian vegetables like brinjals, cowpea, etc., were dehydrated successfully. Most of the work was done using small home-drier or a small dehydration room in both of which one has to make use of the natural draught to circulate the hot air in the drying chamber. The time of dehydration is consequently long being as much as 18 to 20 hours in the case of unripe bananas. This can be considerably reduced by installing a fan in the dehydrator so that circulation of the hot air over the drying trays may be through forced draught. With some of the modern dehydrators excellent dried products can be produced. In all the cases, data was collected regarding the percentage of yield, quality of the final

product, etc. The average yield of flour in the case of many of the important varieties of bananas is about 14 to 15 per cent and that of figs varies from about 13.0 per cent in the case of Mauritius to about 26.7 per cent in the case of Nendran. After about 4 to 5 months storage, the figs, especially those which have not been sulphured, become badly infested with chrysalids, grainbeetle, Indian meal moth, etc. Packing in air-tight containers and fumigation of the dried product appear to be the only means of overcoming this type of damage.

VI. BY-PRODUCTS.

Nearly 50 per cent of the limes is left over as peel and rag in the preparation of lime squash. This can be dried in the sun or dehydrated. During sun-drying, a certain amount of mould growth takes place. The dried peel can be powdered and used as metal polish. It may also be possible to extract pectin from it. Systematic experiments in this direction will be undertaken as soon as suitable equipment becomes available. Extraction of orange oil is another important by-product industry. A simple but efficient method involving absolutely no machinery has been developed in the Fruit Products Research Laboratory for the extraction of excellent quality orange oil from the peel of Kichili fruit and loose jacket oranges. In the case of Kichili fruit the yield of first quality oil is about 10½ lb. per ton of fruit which compares favourably with the yields in California which are reported to be 6 to 8 lb. only. About 7,000 Kichili fruit weigh one ton. Complete details regarding this investigation will, however, be published separately.

The utilization of the peel of mango, pineapple, guava, etc., left over during canning and of the stones and seeds of these will become an important problem as the industry develops. Preliminary data were collected regarding these.

Conclusion.—The results achieved in several directions of the fruit and vegetable preservation industry are interesting and encouraging. The work will be intensified as soon as proper equipment becomes available.

VII. TECHNICAL ADVICE, TRAINING OF STUDENTS, ETC.

As many as 32 enquiries of varied character regarding technique, machinery, equipment, etc., were answered. A special demonstration on the preparation of lime squash was given at Kilakadayan in Tirunelveli district before interested fruit growers. Three persons who are interested in the canning and preservation industry visited the Research Laboratory for short periods to get first-hand knowledge of the technique.

VIII. EXHIBITIONS.

The section took active part in the War Services Exhibition at Madras, the Rayalseema, Tamilnad and the West Coast Fruit Shows. Samples of fruit and vegetable products were sent to

various exhibitions, shows, museums, etc., in as many as 17 different places throughout the Presidency. The products have been awarded certificates of merit and have met with praise from different quarters. The products placed for sale at the Government Products Sales Depot, Madras, have shown that there is a good demand for many of them.

IX. ANALYSIS OF FRUIT PRODUCTS.

Expert opinion was given regarding the quality of two samples of pineapple jam sent by a Mangalore firm and one sample of dried prunes from Coonoor.

X. WILD DATES AND THEIR UTILIZATION.

Preliminary work was undertaken regarding the possibility of utilizing wild dates.

KODUR P.O.,
4th August 1944.

G. S. SIDDAPPA,
Biochemist, Kodur.

APPENDIX I.

*Statement of charges and receipts from 1st July 1943 to
30th June 1944.*

40-C. Agriculture. Experimental farms—A. Agricultural Research stations—

	RS.	A.	P.
I. (a) Pay of officers and staff ...	5,071	7	0
(b) Dearness allowance ...	276	8	0
II. Travelling allowance ...	1,007	10	0
III. Contingences ...	3,653	8	9
Total ...	10,009	1	9

IV. Receipts during the same period—

(XXIX—A—Agriculture—Agricultural receipts—Rupees
1,313-15-9—Miscellaneous—Canning.)

SCHEME FOR THE INSTITUTION OF QUALITY GRADING STANDARDS FOR SOUTH INDIAN CITRUS FRUITS (25TH AUGUST 1943 TO 30TH JUNE 1944)—INTRODUCTION.

This scheme which has been sanctioned by the Imperial Council of Agricultural Research for a period of two years at a total cost of Rs. 2,970 was placed in my control during the first year to investigate the possibility of evolving standards for the grading of citrus fruit on a quality basis. The staff consists of one assistant and one laboratory attender only. The scheme started working on

25th August 1943. The main results of this investigation are given briefly here as complete details will be published in the report to be submitted to the Imperial Council of Agricultural Research.

General.—As a result of an exhaustive series of experiments carried out during the year, it has been possible to lay down certain definite standards for the grading of citrus fruit on the basis of their quality. This is considered to be far superior to the present system of grading by size alone. It adds to the value of grading by size. The standards for the Sathgudi or Chinese oranges are clear cut and definite, while in the case of other citrus fruit they can at best be broad and tentative only. The method and technique of determining and applying the quality standards have been worked out.

Sathgudi or Chinese orange.—There are two commercially important seasons for the sathgudi oranges. The main season lasts from September to January and the off-season from May till August. The sathgudi orange is a tight-skinned fruit with a bright orange yellow skin when fully ripe. The commercial size grades vary from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches in diameter. The weight of the fruit increases with the size of the fruit. The average weight of a $3\frac{1}{2}$ -inch diameter fully mature fruit is 361 ± 4.4 gm., while that of a $2\frac{1}{2}$ -inch diameter fruit is 169 ± 3.8 gm. The 3-inch diameter fruit has an average weight of 251 ± 6.6 gm. The percentage of peel increases regularly with the size of the fruit. It varies from 20.4 per cent in the case of $2\frac{1}{2}$ -inch diameter fruit to 24.3 per cent in the case of $3\frac{1}{2}$ -inch diameter fruit. In the case of all sizes of fruit, there is a tendency for the percentage of rag and seed, to be slightly more towards the very early and late periods of the season. During the main season it varies from about 30 to 32 per cent, but the variation is not regular. The percentage of juice decreases with increasing size of the fruit in any one lot of commercially graded fruit, the variation extending from a mean value of 44 to 49 per cent. For any one size grade of fruit, the percentage of juice decreases gradually with advancing season, the late season samples recording the lowest percentage. The Brix value of the juice throughout the main season does not vary much, although there is a tendency for the smaller size grades of fruit to have a higher Brix value. The minimum and maximum values recorded during the main season were 9.1 and 13.9 degree Brix, the fruits being of $3\frac{1}{2}$ and $2\frac{1}{2}$ -inch size respectively. The percentage of acidity decreases with increasing maturity of the fruit, green and slightly immature fruit having a higher acidity than yellow and ripe fruit. The minimum and maximum values recorded for machine graded fruit were 0.40 and 0.74 per cent respectively. The Brix-acid ratio is the most important and characteristic index of palatability of an orange. In machine graded fruit the mean value varies from 18.30 to 21.97, the smaller ratio being found in the case of the $3\frac{1}{2}$ -inch size fruit and the larger in the case of the $2\frac{1}{2}$ -inch size fruit. This gives an idea of the possible range of variation that can be allowed for in fixing quality

standards and was actually made use of in drawing them. Fruit which has a ratio outside these limits $\pm$ some purpurs aept (about 2) has generally been actually found to be of poor palatability, being either too acid or too flat in taste. Even within these limits there is a range which occurs in fruit of special quality only. The standards proposed are, therefore, based on sound experimental data.

2. *Off-season sathgudi oranges*.—Off season sathgudi oranges have a higher percentage of peel and a lower percentage of juice than corresponding main season fruit. The acidity of the juice is high varying from 0.52 to 1.28 per cent. The Brix-acid ratio is low, many of the values being less than even 15.0. Only a small percentage of these fruits satisfy the standards fixed for the main season fruit. They are mostly of a green colour and do not attain the full yellow colour. They are slightly sour in taste and of mild flavour only.

3. *Quality standards for main season sathgudi oranges*—

- (a) Total juice should not be below 42.0 per cent.
- (b) Acidity should be between 0.40 and 0.70 per cent.
- (c) Brix-acid ratio:
 - 16.0 and below. Poor quality fruit.
 - 16.1—20.0. Good quality fruit.
 - 20.1—24.0. Special quality fruit.
 - 24.1 and above. Good quality fruit.

These standards should be tried in actual commercial practice.

4. *Batavian oranges*.—Batavian oranges are of good size, about 2.75 to 3.50 inches in diameter and of a rich lemon yellow colour when ripe. The percentage of rag is high and that of juice low when compared with sathgudi oranges. The Brix value varies from 7.9 to 12.1. The Brix-acid ratio varies from 11.4 to 41.5. Fruits with very high ratio are flat and insipid in taste. To be of good quality, the juice should have a ratio of about 14 to 22.

5. *Vadlapudi oranges*.—These are large size loose jacket type oranges very popular in the Circars. The percentage of peel is higher than that of rag and seed. The Brix value varies from 9.7 to 12.2 and the percentage acidity from 1.34 to 2.13. The Brix-acid ratio varies from 4.84 to 7.61 which compares well with that for some of the South African or Californian oranges. Almost all the samples analysed were very sour in taste. When fully ripe, the peel is of a deep orange yellow colour and is quite rich in oil.

6. *Loose jacket oranges*.—Twenty-four samples from five important centres in South India were analysed. The percentage of peel is invariably greater than that of rag and seed. The percentage of juice varies from 44.5 to 50.0 per cent. The Brix value ranges from 8.8 to 11.6, the percentage of acidity from 0.31 to 0.89 and the

Brix-acid ratio from 12.7 to 28.7. The lowest Brix and acid values were recorded by samples from Mannantody in Malabar, while the highest Brix value was for a sample from Kallar Government Garden. For good palatability, these oranges should have an acidity of 0.45 to 0.80 per cent and a Brix-acid ratio of 14 to 22. Fruits with a ratio less than 14 are distinctly sour in taste, while those with a ratio greater than 22 tend to be flat in taste.

7. *Limes*.—Samples of limes from seven different localities in the Province were analysed. The average weight of a lime varies from 26 to 61 gm. depending upon size. Limes from the Gudiyattam tract were the largest and the heaviest. The percentage of juice varies from 45 to 58 per cent. The Brix value varies from 8.1 to 10.4, the minimum and maximum values being obtained from samples from Kodur and Rajahmundry. Slightly greenish fruit has juice of a higher Brix than that of fully-ripe yellow fruit. The percentage of acidity varies from a minimum of 6.27 to a maximum of 7.69. Although the percentage of juice and its acidity are important factors in judging the quality of limes, the size and the appearance are the dominating factors which decide their market value. The size or weight of the lime does not bear any definite relationship to the percentage of juice or its acidity. More exhaustive data is, however, being collected under the Fruit Canning and Preservation Work (Madrass).

8. *Other citrus fruits*.—Samples of kichili, gajanimma, jamberi, lemon and a few other species of citrus were also analysed. These fruits are not at present commercially important.

APPENDIX I.

Statement of charges and receipts (25th August 1943 to 30th June 1944).

40-F. Agriculture—

	RS.	A.	P.
I. (a) Pay of staff	818	12	0
(b) Dearness allowance	148	6	0
II. Travelling allowance	152	13	0
III. Contingencies	243	0	9
Total	1,362	15	9

IV. Receipts.—Nil.

ADMINISTRATION REPORT OF THE RESEARCH ENGINEER, LAWLEY ROAD P.O., COIMBATORE, FOR THE FASLI YEAR 1943-44 (1ST JULY 1943 TO 30TH JUNE 1944) (FASLI 1353).

I submit herewith the sixteenth administration report of the Research Engineering Section for Fasli year 1943-44. This deals with the sectional work for the sixth year after the amalgamation of teaching and research effected in 1938. I held charge of the section throughout the year under report both in regard to research and the lecture and practical class work of the B.Sc. Ag. Degree course in Agricultural Engineering for the first and second years.

2. War conditions and the greater scarcity of iron and steel coupled with higher prices for civilian requirements, consumers' goods and agricultural production had its adverse reactions on the more popular use and ryots' demands of iron ploughs and other improved machinery. This together with the departmental instructions not to demonstrate improved ploughs and implements acted as a handicap to intending purchasers and enthusiastic cultivators. Towards the end of the year, however, the outlook was more hopeful and favourable for the resuscitation of demonstrations and recommendations on account of the declared intention of the Iron and Steel Controller to set apart a small proportion of the programmed production for the raw material requirements of agricultural implement and machinery manufacturers and other small tool and implement producers. This combined with the declaration of the Food Production Department of the Government of India to allot more iron and steel under the quarterly quota systems to assist ryots to produce more foodcrops has altered the prospects of agricultural implement users and producers alike and the future favours well for their sales and purchases.

3. *Ploughs.*—The average price of the iron ploughs remained roughly at double their pre-war levels but manufacturers did not have either large stocks or a heavy production programme on account of lack of raw materials especially standard iron and steel needed for the various parts. During the year research work on ploughs was mainly confined to the design of spare parts for old types of ploughs both Indian and foreign made and arranging for their production on a cheap basis under local conditions using such scrap steel as can be procured from the cast off material. Steel shares and other wearing parts were made on a small scale to keep the old ploughs on the field. These included old type American Chantanooga ploughs, Konkan ploughs, Kirloskar's Gurjars and Ransome's Victory ploughs. Buffer spring scrapped by the railways

has been tested for these spare parts and functioned satisfactorily during trials. In order to supply the whole requirements of the various tracts the District Agricultural Officers were addressed and also the Agricultural Research Stations and their consolidated requirements were arranged to be produced at a central workshops and distributed to the different indenting officers. This arrangement was very helpful inasmuch as neither the manufactures nor their local representatives had any stocks of spare parts for the foreign made ploughs sold by them to ryots. Attempts were also made by the makers' representatives in India to get them manufactured at one of the local works in Madras but these failed under field conditions and were not suitable for the replacement of the worn out originals and the prices charged were also very high.

To make systematic arrangements on a broadbased method for the distribution of plough production in the Province a number of known fabricators were requested to express their views on the proposals for manufacture of iron ploughs under price control by Government. Except a few, others have expressed their inability to take up iron ploughs manufacture under price control schemes and to those who have agreed to do so sample skeleton costings sheets prepared in consultation with the Deputy Iron and Steel Controller have been sent for furnishing the required particulars. A circular has also been sent round to the District Agricultural Officers to give detailed estimates for each quarter of their requirements of iron ploughs and other improved implements and their indents have been tabulated and arrangements made with fabricators to supply the approved types and sizes of improved ploughs at controlled prices.

The value of standard iron and steel at the controlled prices ranges from Rs. 300 to Rs. 350 per ton against the pre-war prices of Rs. 120 to Rs. 140 per ton. Based on this value of raw material the ceiling prices will be fixed and it is expected that although raw materials have more than doubled in price, the value of the final finished article will be much less than this limit.

Figures relating to the sales of ploughs to ryots during the year from the Agricultural Demonstrators' depots and direct to the cultivators by the manufacturers amounted to nearly 2,900 against the corresponding total of 4,500 for last year. The position as regards the drop in the number of ploughs sold is due to the inactivity of the Agricultural Demonstrators in demonstrating the improved ploughs and in arranging for supplies from manufacturers. There are two causes for this drop in demonstrations and sales. First is the departmental circular not to encourage sales and use of iron ploughs on account of more urgent steel requirements for war works and the second is the feeling that manufacturers will not be able to supply them at reasonable prices in the absence of any arrangements for the release of raw materials by the Iron and Steel Control.

An interesting feature of this year's sales of plough parts is the large number of shares sold as spares by the makers. For the number of ploughs sold the number of shares alone sold as spares amounted to approximately two and a half times. This is an indication of the fact that the iron ploughs are being used on a large scale and that old implements are also kept serviceable by renewal of the worn out shares. Whereas in former years Depots' sales were more prominent and far in excess of the totals of the manufacturers' direct sales, this year's figure shows that departmental sales are less than a third of the total and the manufacturers' figures are more than two-thirds of the grand total. Nearly half the ploughs sold are those manufactured by Messrs. P. S. G. & Sons, and the rest are of Coopers and Kiroloskar's makes in equal numbers.

4. *Mhote wheels with ball bearings.*—A difficult situation has been created in the matter of manufacture of ball bearing mhote wheels on account of the stoppage of imports of ball bearings. The demand, however, for ball bearing mhote wheels was on the other hand increasing due to non-availability of the iron rod, plates and teak-wood blocks needed for the manufacture of even the ordinary wooden mhote wheels. Ball bearings were made locally with the steel balls available for ordinary purposes and housing and ball race designed to suit these steel balls. The design was tested with satisfactory result and mhote wheels fitted with these swadeshi ball bearings were supplied to ryots in limited numbers. Over eight hundred such wheels have been sold to ryots during the year. A few of these have been reported to have failed or broken down after usage and these have been replaced free of cost by the manufacturers. At the same time the design of the original ball bearing has recently been improved using slightly larger diameter steel balls and thicker and stronger housings and distance pieces. The new design is stronger and more durable than the previous types.

5. *Potato grader.*—On the same principle as that adopted for the orange and lime fruit graders, the old type machine under trials and demonstrations with the Potato Growers' Co-operative Society at Mettupalayam was improved. The grading was regulated in accordance with the Agmark sizes and specifications and with a little experience the rhythmic foot operation becomes not only easy but very pleasing. Messrs. Parry & Co. who are buying large quantities of potatoes for dehydration have requested that a machine be supplied to their Ooty purchasing agency for grading operations. The thing which is against its popular use is the quantity that is handled by the existing size. This capacity can easily be increased fourfold or even more without any inconvenience to the operator and another improvement effected is the placing of the foot operated pedal at the hopper end so that the pushing and pedalling can both be performed by one and the same individual.

6. *Wooden bund formers.*—The wooden bund formers designed last year to meet the urgent demands of cheap bund former employing the minimum of iron and steel have proved another successful new product of this section's research activities. Thirty-six wooden bund formers of various sizes were supplied to the District Agricultural Officers, Bellary and Anantapur and the Dry Farming Development Officer, Hagari and these have been reported to be working satisfactorily. In addition demonstrations wooden implements were also supplied to the Agricultural Demonstrators at Hindupur and Gobichettipalayam and the District Agricultural Officer, Cuddapah. For an ordinary pair of working animal usually owned by ryots, the 5 feet 6 inches bund former is found very heavy and difficult to haul and ryots prefer the 3 feet 6 inches wooden bund former for all their operations. A scheme for the supply of the bund formers required by the District Agricultural Officer, Cuddapah, for the large scale bunding operations in the district has been prepared at his request.

7. *Chaff cutting machine.*—Fodder scarcity prevailing in most areas has created a sharp demand for cheap and efficient chaff cutters. The regular circular chaff cutting machine has become costly and the imported type of knives are not available. The design of an efficient and cheap machine within the means of an ordinary landholder was taken up as an urgent problem. Work was concentrated at improving the simple designs already in existence in the direction of capacity and operational ease. In its present form the design evolved is a foot operated contrivance which lends itself for quick and effortless working by a man. The feeding and cutting are done by the same person and the machine has a capacity of 200 lb. per hour with a three inch cut. Experiments conducted by the Government Agricultural Chemist in respect of feeding cattle with chopped fodder have shown that considerable savings are possible and that chopped fodder avoids waste. At the present ruling prices of raw materials, the new machine is expected to cost nearly Rs. 30 and demonstrations have created a very favourable impression. Already a number of orders have been received for the new machine and a scheme for the manufacture of a first lot of fifty machines has been prepared. These are proposed for despatch to the districts for demonstrations.

8. *Bullock-cart tyres.*—Rationalization of sizes.—The demand for cart tyre steel flats from the various districts showed that as many as fourteen different sections were being used. While these varying sections would ordinarily have been possible for production by the rolling mills supplies of all these different sections are not possible at present. At the request of the Deputy Iron Steel Controller, Madras, to simplify production programmes and distribution to the users at a cheap rate, a rationalised section programme was drawn up and the number was reduced from fourteen to four sections. These sizes only are now proposed to be produced by the

rolling mills and distributed to agriculturists under the quota systems.

A similar programme of rationalization was drawn up in respect of square steel required for cart axes and in this case the number was reduced from six to four for simplification and cheap production.

9. *Agricultural tools*.—Considerable difficulties are now experienced by agriculturists on account of lack of tools such as hand hoes, sickles, hatchets and others. So far no standard spring steel has been allotted under the agricultural quarterly releases and there are no early prospects of getting them from the producers. At my special request the Deputy Iron Steel Controller has promised to reserve all the scrap springs of the railway shops for the manufacture of such tools for which this material is eminently suitable. Samples sickles, hand hoes and hand hatchets were made out of this buffer spring and the tools have been found to be very good. These tools are proposed to be manufactured here on a piece work basis on a large scale for distribution to the District Agricultural Officers. It is expected that about forty tons of scrap spring steel can be got in a normal year and about 1,500 sickles can be made per ton of raw material.

10. *Tractors and tractor ploughing operations*.—Under orders from Government, the old 10/20 McCormick Deering Tractor and Tractor plough were sent to Pattukkottai in November 1943 for commencing reclamation of new areas in the Cauvery Mettur Project area. Work was commenced at Suryanarayanaipura village on the lands of Sri L. Venkatakrishna Iyer and a total area of 170 acres has been tackled during the two months of working in that area. On account of a breakdown in the tractor and the non-availability of new roller bearings for the rear axle further ploughing operations had to be suspended. Just recently spare bearings have been obtained from the local bazaar in Bombay and these will be despatched to Pattukkottai for fitting to the tractor and revive ploughing operations in the area.

A new L.H. Case Tractor was purchased from Messrs. Parry & Co., Ltd., Madras, early in February 1944 for tractor ploughing assistance to ryots and the furtherance of the Grow More Food Campaign in pursuance of Government orders to popularize tractor ploughing. This tractor commenced work in this district at the end of February 1944 and has since been at work regularly for reclamation of new lands and ploughing bariali infested fields for weed eradication.

The total acreage tackled during the year from the time of commencement of ploughing operations by these two tractors amounted to over 600 acres. There is heavy demand from all over the presidency for the supply of tractor ploughing outfits and fresh units are expected to arrive shortly from the imported consignments

under the lease lend arrangements. Six new units with suitable ploughing tackle have been ordered for tractor operations in this Province, three of them being of the wheeled type and three of the caterpillar design. A full complement of the spare parts required for these two tractors now in our possession has been prepared and the manufacturers' stockists addressed to meet these requirements. Actual experience gained during the last eight months with the two tractors reveals that a plentiful reserve of spares both for the tractor and the plough are essential for the continuous working of the units and periodic renewals and repairs are also necessary for ensuring efficient and uninterrupted field operations. When properly planned ploughing operations can be carried out for a maximum of nine months in the year:

11. *Malt factory—Extensions to extract and food production machinery*.—The stepping up of Malt Extract production with a maximum limit of a lakh of pounds per annum was followed by similar sanction for the Malt Food side and orders were issued by Government to increase the plant, machinery and accommodation suited to this increased capacity.

All the extensions and additions ordered in respect of the Malt Extract expansions were completed during the year and the large scale plant commenced working in the month of October 1943. On the side of structural accommodation fresh buildings were constructed for the storage of empty bottles and fulls and also a long chamber for packing, crating, labelling and despatch. A special structure had to be built for the installation of the steaming vats, filters, centrifuges and stills and the cellar below the top floor accommodates the vacuum pumps and electric drives for the shaft sections which operate the centrifuges above. A second boiler was erected adjacent to the old unit and these are now worked alternately.

Machinery and buildings required for the extensions to the Malt Food side were also taken up during the year. On account of the numerous military constructions commenced in the vicinity of the College both labour and building material prices rose up to an unprecedented level and this made the rates unworkable at frequent intervals requiring revisions and reviewing. The couching chambers were extended to take the extra steeped grain and the additional air conditioning equipment was received but could not be erected in time on account of lack of gas and electric supply difficulties. Steeping vats and a second line of roasters were completed, and good progress was made with the polishers. A grain tower silo was constructed to hold a lakh of pounds of cholam grain and the attached drying platform and fumigatorium were also erected.

An evaporative condenser was added in series with the air cooled condenser for the old air conditioning apparatus and this has considerably added to the efficiency of the unit which now

operates very much better. For the boiler a new feed water pump of extra capacity was installed and with this increased supply of feed water additional steam can be drawn for all the new stills and allied combinations. Additional vacuum pumps were installed to cope with the fresh production programme.

12. *Groundnut Godowns Scheme.*—Of the first series of the godowns taken up for construction the structures at Tindivanam and Villupuram are ready for handing over to the South Arcot Groundnut Market Committee and the draft agreement for leasing the building is now awaiting signatures. The godowns at Ulundurpet and Vriddhachalam are also nearly completed and will be ready for occupation in a few days. At Ariyalur and Arni all works are over and the fitting up of the sliding doors are in progress which is expected to be finished shortly. Work at Nandigama is almost over except for a few minor items and finishing touches to the various units. Due to lack of timber the progress has been held up at Tadpatri, Adoni and Kurnool and permits have just been granted for transport by rail from Balharshah where large quantities of timber are available.

Orders have also been received for commencing construction at eight of the remaining ten centres and Kadiri and Hindupur are proposed to be dropped on account of lack of funds. In this second series compound walls have been dropped and only live hedges are proposed to be put up on account of increased cost of building materials and labour. Collection of materials has been ordered at Bellary, Proddatur, Guntur, Nandyal, Vizianagram, Vayalpad and Tirupattur. The agreement and estimates for Amudalavalasa have been prepared and the sanction for this extra centre is awaited.

During the construction stage of the first series of godowns several difficulties were experienced in getting the necessary permits and transport priorities from the respective controlling authorities. This naturally led to extensions in the period of construction. Labour scarcity was also a factor met with in some centres and wages had to be enhanced to attract them to these works. It is however expected that the second series of godowns will be completed in a much shorter time than the first series as most arrangements have been made already for materials controlled and for releases and permits.

13. *Students' Classes—B.Sc. Ag. Course and Short Course.*—Mechanical Engineering and agricultural implements and machinery were continued to be taught by me as a systematic part of the duties of this section head which order came into existence from 1938. The second year class for the B.Sc. Ag. Degree course was handled by me throughout both for lectures and practicals. B.Sc. Ag. first year and the Short Course classes were taught by me and my assistant. The University examination results in Agricultural Engineering were satisfactory as during the previous years.

The new workshop sanctioned during the previous year and partly constructed was completed and this enabled the practical classes to be conducted conveniently and with adequate space for workshop practice.

B.Sc. Ag. Second Year had forty-four lectures for theory classes and 111 hours for practical classes during all the three sessions of the Academic Year.

B.Sc. Ag. First Year had ten lecture hours for the theory classes and fifty-one practical hours for workshop practice during the short term alone.

Thirteen practical and theory combined classes each of two hours duration were conducted for the Short Course Students on Farm Machinery and Agricultural Implements during the month of March.

14. *Irrigation pumping plants.*—An addition was made during the year to the five already existing irrigation pumping installations serving the needs of the Central Farm. The power bore well to the south of the Research Engineering Workshops was fitted up with an electric motor and centrifugal pump and this unit now operates daily both during days and nights as a regular feature for meeting the farm demands. The bore yields a copious supply of water and permits of continuous pumping for days and nights together. A syphon has been constructed to convey the water across the road and this connects the discharge to the existing channel of the old 4 Mhote Well arrangement.

Electric motor sets.—				DAYS.	HC. URS.
4 Mhote well ..	..	..	..	366 (364)	2747 (2584)
57 Well ..	..	..	..	150 (176)	480 (480)
60 Well ..	..	..	..	286 (266)	2217 (1968)
Power Bore Well ..	..	..	..	102	9.1

Figures within brackets are the figures corresponding to the previous year.

Oil Engine Pumping sets.—				DAYS.	HC. URS.
5 A Well ..	..	..	..	247 (230)	931 (1003)
M. Block ..	..	..	..	81 (21)	461 (104)

15. *Workshops.*—With the bringing of the Research Engineering Workshops on the Factories Act register, the several statutory requirements were complied with and no works were executed unlike during the previous years on Sundays. A good deal of time was taken up by the Malt Factory extensions and the maintenance of the plant, machinery and other equipment. More implements and sprayers were received from the Agricultural Demonstrators for repairs and renewals and this arrangement worked successfully for the benefit of the demonstration implements and equipment and helped to keep them in working order. The tractor ploughing works threw additional works on this section in respect of repairs and

replacement of parts. As usual the workshops also catered to the needs of the breeding Stations on the College and the other Research Sections.

16. *Visitors.*—Among the visitors mention needs to be made of Sri S. V. Ramamurthy, I.C.S., C.I.E., Adviser to His Excellency the Governor, Sri P. H. Rama Reddy, I.A.S., Director of Agriculture and the members of the Board of Honorary Visitors to the College.

17. *War effort and savings.*—Forty-eight ten-rupee Defence Savings Certificates were purchased during the year and sixteen one-rupee defence savings stamps were also purchased. The saving scheme continues to operate regularly.

COIMBATORE,
14th August 1944.

B. M. LAKSHMIPATHY,
Research Engineer.

ADMINISTRATION REPORT OF THE SENIOR LECTURER IN AGRICULTURE AND SUPERINTENDENT, CEN- TRAL FARM, FOR THE YEAR 1943-44 (FASLI 1353).

1. *Staff.*—Sri Y. G. Krishna Row Nayudu continued to be in charge of the office of the Senior Lecturer in Agriculture and Superintendent, Central Farm, till 2nd February 1944 afternoon, when I took over charge from him and continued till the end of the fasli year. I went on leave for one month from the afternoon of 6th May 1944 when Sri V. T. Subbiah Mudaliyar, Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm, was in additional charge. There was no change in the personnel of the Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm. Sri K. C. Ramakrishnan, who was appointed as Lecturer in Agricultural Economics, joined duty on 12th July 1943 and continued as such till the end of the fasli year.

Sri D. V. Reddi, Senior Farm Manager, Central Farm, was promoted as Assistant Marketing Officer, Madras, and was relieved on the afternoon of 29th July 1943. Farm Manager Sri V. Mahimai Doss, who was transferred as Marketing Assistant, Tanjore, was relieved on 26th July 1943 afternoon and Sri A. H. Subrahmanya Sarma, who was posted in his place, joined duty as Teaching Assistant in Agriculture on the forenoon of 24th July 1943. Sri K. Kannian, who was posted as Farm Manager, Central Farm, joined duty on 10th August 1943. Sri D. A. Victor, Assistant Lecturer in Animal Hygiene, joined the military and was relieved on 5th December 1943. Janab Muhammad Abbas, Farm Manager, Central Farm, was transferred as Farm Manager under Special Vegetable Officer, Coimbatore and was relieved on 10th April 1944 forenoon. Sri K. Kannian, Farm Manager, Central Farm, was transferred to the Land Reclamation Scheme, Pattukottai, to work under Special District Agricultural Officer, Pattukkottai, and was relieved on 27th May 1944. Sri K. Mukunda Rao, Lecturer in Animal Hygiene, was transferred to Erode and his place was taken up by Sri Francis Joseph, who joined duty on 5th June 1944. Sri K. Hanumantha Rao, who was appointed as Upper Subordinate, was posted to the Central Farm for training and he joined duty on 19th April 1944.

Sri R. Gopalakrishna Ayya, Upper Division Clerk of this office, was transferred to the office of the Director of Agriculture, Madras, on promotion and he was relieved on 25th October 1943. His place was taken up by Sri T. Sadagopan, who joined this office on 6th December 1943.

Four posts of Assistants were sanctioned to the Lecturer in Agricultural Economics in G.O. Ms. No. 1300, Development, dated 23rd March, 1944, for a period of one year from the

date of employment to assist the Lecturer in his studies on economic matters. So far none were appointed for want of qualified candidates.

2. *A.R.P.*—An incident was staged at the Agricultural College with the help of the officers of the main scheme in July 1943 and this was considered successful. A revised scheme was prepared and sent to the Deputy Controller, A.R.P. Main Scheme, Coimbatore, in August 1943. In October 1943, an A.R.P. test lasting for 48 hours was held and the Deputy Controller, A.R.P., who visited the post had expressed that the post was manned well. The activities of the Agricultural College A.R.P. Subsidiary Scheme ceased in December 1943.

3. *War work.*—At the request of the military authorities at Madukarai, batch after batch of Sepoys visited the Central Farm once every week and they were taken round the Central Farm, the College Dairy and all items of work were explained. This programme was arranged with a view to establishing the Sepoys when they are demobilized in the villages and induce in them a rural outlook.

Necessary help and guidance were given for the military to start a small poultry pen at the Agricultural College.

General.—The Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm, visited Vaippar village in Koilpatti taluk in June 1944 as per instructions of the Director of Agriculture, Madras, to report on the method of reclamation of land proposed to form Soldiers' colonies and a report was submitted on 1st July 1944.

At the request of military authorities, lands cultivated by them at Madukarai were visited on 1st June 1944 and technical advice was given.

A course of lectures for the troops stationed at Madukarai on the subject of rural and post-war reconstruction was arranged and so far as this section was concerned, the following lectures were delivered during June 1944:—

(i) Improving the breed of India's cattle (delivered in Malayalam) on 17th June 1944.

(ii) Co-operation—a watch-word in village reconstruction (delivered in Tamil) on 24th June 1944.

4. *Teaching.*—The following classes were held for B.Sc. (Ag.) students and the short-course students.

Class.	Agriculture.		Animal hygiene.	
	Theory. HOURS.	Practical. HOURS.	Theory. HOURS.	Practical. HOURS.
I	66	383	114	65
II	115	431	85	125
III	85	348	..	..
Short course.	127	255	14	49
	393	1,417	213	239

5. *Tours.*—The students of B.Sc. (Ag.), Class II, were taken on tour to Mettupalayam, Kallar, Coonoor and Ootacamund from 14th to 22nd October and again from 4th to 10th January 1944 they visited Trichur and Pattambi. The final year students were taken to some important places in Malabar and South Kanara districts from 1st to 13th November 1943. They were taken to Tiruppur from 5th to 7th February 1944 and to Pugalur Sugar Factory and the neighbouring villages from 10th to 17th February 1944.

6. *Veterinary Hospital.*—During the year 266 in-patients and 2,449 out-patients were admitted as against 254 in-patients and 1,916 out-patients of the previous year. Three hundred and fifty castrations were done as against 182 of the previous year. There was no epidemic among Government animals. The daily average attendance was 37.8 as against 35.62 of the previous year. During the year there was a mild attack of fowl-pox disease among the fowls kept in the Poultry Farm and all of them were protected against the disease. In all, 49 major and 166 minor operations were undertaken as against 14 major and 273 minor operations of the previous year. The following items of work were attended to during the year:—

Bull services.—119 cows.

Specimens examined microscopically.—244 specimens.

Cattle protected against Rinderpest.—21 Government animals.

Inspection of calves born to Government bulls.—37 calves.

The Livestock Development Officer, Hosur, inspected the breeding bulls kept in the hospital. The District Veterinary Officer, Coimbatore, inspected the hospital on 31st March 1944 and the Director of Agriculture, Madras, visited the hospital once during the year.

7. *Farm Labourers' School.*—The average number of boys on rolls was 27 with an average attendance of 23. The school worked for 293 days with 22 admissions and 31 withdrawals. The single teacher handled all the five standards and the school was raised to the status of a complete Elementary school.

8. *College Dairy.*—The dairy herd started with 12 cows, 7 calves and 1 bull at the beginning of the year and closed with 4 additional calves. Inclusive of transfers to and from the Livestock Research Station, Hosur, there were on the average 11.8 cows in the herd, of which 8.4 (or 71.3 per cent) were in milk. The total

milk yield during the year was 49,053½ lb. with an average of 16 lb. per cow in milk per day. The dairy produce was disposed of as follows :—

	LB.	OZ.
Milks ld	32,364	8
Milk fed to calves, poultry, etc.	8,462	8
Milk separated	7,688	12
Milk colostrum, demonstration, etc.	648	0
Cream sold	61	15½
Cream made into butter	705	8½
Butter sold	346	5
Butter made into ghee	8	0
Butter miscellaneous issues	11	0
Ghee sold	6	0
Skim milk sold	3,976	8
Skim milk fed to calves, etc.	2,797	4

Poultry.—The stock at the beginning of the year was 59 birds. During the year 68 chicks hatched out, 15 birds were obtained by transfer, 7 were purchased, 69 were sold and 9 died leaving a balance of 71 birds at the end. The number of eggs laid during the year on the average by each bird of the different breeds were—White Leghorns 172.4, Rhode Island Reds 174.6, Country birds 153.5 Light Sussex 146.0, and Black Minorcas 92.5. The country birds were select purchases and have done well under care and good feeding.

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

	1943-44.	1942-43.
Amount of rainfall	23.18"	24.10"
Number of rainy days	78	93

The south-west monsoon practically failed and crops sown with the commencement of the monsoon had to be resown in September. The north-east monsoon started well, but weakened later; drought set in and the dry crops were affected. The hot weather rains were satisfactory and facilitated the preparatory cultivation of land for the coming season.

(b) *Experiments.*—The major experiments were conducted with the object of determining (i) the amount of water required by crops together with the optimum depth of water at each irrigation and the interval between irrigations, (ii) the relative value of composts and farm yard manure, (iii) the effect of the various preparatory cultivation methods on crops yields, and (iv) the effect of nitrogenous manures on cotton yields.

(i) The quantities of water consumed, inclusive of rainfall, by Chitrai cholam, ragi and Cambodia cotton during the year were

204, 23;29 and 24;51 acre-inches respectively. Two weeks' interval between irrigations gave the best gram yield and one weeks' interval the best straw yield in the case of Chitrai cholam. For ragi, irrigation once in two weeks with 3 acre-inches of water each irrigation was the best. For Cambodia cotton, three and four acre-inches of irrigation at two and three weeks' intervals were the best.

(ii) Composts prepared by the Coimbatore, Bangalore and Madras methods were compared with farm yard manure. Their effect on crops were not significantly different either on the crop in which they were applied or to the succeeding crop.

(iii) various types of cultivation in preparing dry and garden lands were under comparison. No particular treatment was significantly better than the other.

(iv) Groundnut cake and ammonium sulphate were applied to garden land Cambodia cotton crops and their effects were observed. Early sowing was better than late sowing. Application (i) 25 or 50 lb. of nitrogen per acre as ammonium sulphate, or (ii) 50 lb. of nitrogen as groundnut cake were better than other treatments. Similar trials with dry cottons did not give any significant results.

(v) *Paddy* in wet land and bulk crops in dry lands gave reduced yields during the year as a result of the unfavourable distribution and inadequacy of the rains. The garden land crops were normal.

(d) Facilities were provided at the Central Farm for the conduct of field experiments by the various Specialists in the Research section. Facilities were also provided for practical training of the University and short-course students of the Agricultural College. Three coolies deputed by the District Agricultural Officers were given practical training in the handling of improved agricultural implements and in the cultivation of crops.

C. RAMASWAMI,

1st July 1944.

Senior Lecturer in Agriculture and
Superintendent, Central Farm.

146 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

ADMINISTRATION REPORT OF THE PROVINCIAL
MARKETING OFFICER, MADRAS, FOR THE YEAR
1943-44 (FASLI 1353).

I submit herewith the administration report for the year 1943-44 (fasli 1353).

Charge.—Sri K. W. Chakrapani Marar was in charge of the section till 24th April 1944 forenoon when I took over from him and continued to be in charge till the end of the year.

(a) *Assistant Marketing Officer (Cereals and Oilseeds).*—Sri A. Ramaswami Iyer was in charge of this post till 31st July 1943 afternoon from which date Sri D. V. Reddy took charge of the same from him.

(b) *Assistant Marketing Officer (Special Crops).*—Sri A. Ramaswami Iyer took charge of the post on 31st July 1943 afternoon from Sri S. N. Venkataramana Ayyar who was holding this post in addition to the post of Assistant Marketing Officer deputed to Central Provinces for the purchase of pulses for this province. He went on leave from 15th August 1943 and Sri K. W. Chakrapani Marar was in additional charge of this post from 15th August 1943. Sri A. Chidambaram Pillai relieved Sri K. W. Chakrapani Marar of the additional charge from 29th November 1943 forenoon.

(c) *Assistant Marketing Officer (Livestock).*—Sri M. P. Kunhi Kutty continued to be in charge of the post of Assistant Marketing Officer for Livestock throughout the year.

(d) On 19th November 1943 forenoon, Sri V. Satagopa Iyengar assumed charge of the post of Assistant Marketing Officer sanctioned for quality grading of rice in G.O. No. 2808, Development, dated 29th October 1943 and the scheme was further extended up to 30th June 1944.

Messrs. K. Varadachari and M. Narasimham assumed charge (10th January 1944 and 11th January 1944 forenoon respectively) of the posts of two Assistant Marketing Officers sanctioned for the purchase and distribution of manures and seeds in G.O. No. Ms. 4228, Development, dated 24th December 1943. They began to work under the control of Director of Agriculture from 4th May 1944.

On 14th February 1944 forenoon Sri T. K. Thangavelu assumed charge of the post of Assistant Marketing Officer sanctioned in the Gur Purchase Scheme in G.O. No. Ms. 540, Development, dated 8th April 1944.

Sri M. K. Gopalan took charge of the post of Assistant Marketing Officer on deputation to Central Provinces from Sri S. N. Venkataramana Ayyar on 21st April 1944 forenoon.

The posts of two Assistant Marketing Officers were made permanent with effect from 1st April 1944 in G.O. Ms. No. 146, Development, dated 12th January 1944.

Staff.—The posts of six Marketing Assistants were further extended for another year till 31st March 1945. Except one Marketing Assistant and Recorder at Madras, the other five Marketing Assistants and Recorders continued to work under the Grain Purchase Officers.

For the quality grading of rice ten Marketing Assistants were sanctioned. Out of these, one Marketing Assistant at Gudivada was transferred to the general line and the vacancy was left unfilled. Two other Marketing Assistants one from Vijayawada and one from Bhimavaram were transferred to work under the Grain Purchase Officers in order to supply rice to Defence Services.

One post of the Marketing Assistant was sanctioned in G.O. Ms. No. 2738, Development, dated 13th October 1943, for work connected with the Rice Mills Licensing Order and it was further extended up to 31st March 1945.

Seven Marketing Assistants for the purchase and distribution of manures and seeds, and five for jaggery purchase were sanctioned to work under the Assistant Marketing Officers concerned.

2. *Market Surveys.*—Market surveys of chillies, millets, gingelly and niger seed, pulses and meat are in progress. Surveys on table poultry, honey and bees-wax which were taken up during the year were discontinued in preference to the survey on meat as desired by the Agricultural Marketing Adviser. The report on the marketing survey of castor was completed and sent to Agricultural Marketing Adviser and Director of Agriculture. The market survey report on baskets and rattan-making was submitted to Director of Agriculture. With the publication of the All India Reports, in Citrus Fruits, Co-operative Marketing, Hides and Lac, the Provincial Survey Reports were revised and sent to Director of Agriculture for publication. Besides, supplementary information on all the commodities surveyed, was furnished to Agricultural Marketing Adviser. Revision of the reports on sugar, skins and markets and fairs is in progress.

3. *Grading.*—(1) *Rice.*—Rice grading in this Province, which commenced in 1938-39, received a set back during 1942-43 as a result of the various control measures adopted due to the war. During December 1943, a scheme of rice grading was sanctioned by Government to improve the quality of rice produced in mills under the conditions of the Rice Mills Licensing Order in the supplies

arranged by Government through the Commissioner of Civil Supplies. The quantity of rice graded since the commencement of grading work is given below.

Statement showing the progress in rice grading from year to year.

Year.	Quantity of rice graded.	Value of the rice graded.
	MDS.	RS.
1938-39	26,322	1,05,000
1939-40	126,987	5,50,940
1940-41	245,701	12,69,338
1941-42	257,060	15,04,403
1942-43	88,229	5,61,822
1943-44	182,370	15,95,804
Total ..	926,649	55,86,307

When revising the scheme in December 1943, the number of grading centres was brought down to 10 from 15. The grade specifications were modified slightly to suit war conditions, and the number of grades restricted to two and finally into one grade only. Government were pleased to sanction a premium at a fixed rate for the graded rice. (Two annas and 1 anna per maund for the special and A grades respectively, in Nellore, South Arcot, Tanjore and Tiruchirappalli districts and double the rate in the Circars. This was revised later to 3 annas per maund for raw rice and 2 annas per maund for par-boiled rice of A grade in all centres.) The marketing staff carried out the testing, packing and marking of the bags, the cost of the staff being met by a surcharge on the sale of the graded rice.

During the seven months of this year, when grading was in progress, the marketing staff paid 3,940 visits to premises where rice was handled. In these, 1,835 lots comprising 412 lakhs of maunds of rice were examined. From these, 5,039 samples were drawn and analysed for grading. Details of the grading by each centre are furnished separately in the grading statement, and the total quantity graded amounted to 1,82,370 maunds, valued at Rs. 15.95 lakhs of rupees. The total quantity of quality rice put on the market since the commencement of grading in 1938-39 was 34,800 tons, valued at Rs. 55.9 lakhs.

During the year Madras City imported 64,124 maunds of the graded rice; the rest of the quantity being distributed to many deficit districts.

Although a large number of consignments were offered for grading only a limited quantity (44 per cent only) was found to come up to agmark standard, for various reasons. Rejection from grading was due mainly to very high proportion of broken grains and fragments in almost all the centres. Over preponderance of

foreign matter and red rice was occasionally the reason for non-grading in the Circars. In Tanjore district and Chidambaram many lots were not accepted for grading because of the disagreeable odour of rice while in parts of the Circars and Nellore under-polishing was the detracting factor. Dampness in the rice caused by underdrying, precluded some lots being graded in Trichinopoly.

(2) *Tobacco*.—Grading of tobacco at Guntur was in progress from July to October 1943 and 2,76,073 pounds worth Rs. 2,97,725 were graded under agmark standards. The existing grade specifications for fluecured Virginia tobacco were subsequently revised at the Tobacco Conference convened by the Agricultural Marketing Adviser at Guntur in January last. Grading of tobacco under the revised specifications has not yet been taken up. The appointment of special technical staff for supervision of tobacco grading is under the consideration of the Agricultural Marketing Adviser.

(3) *Eggs*.—Grading of eggs was in progress only in the three centres, viz., Madras City, Katpadi and Ootacamund. Nearly 19 lakhs of eggs worth Rs. 1.4 lakhs were graded during the year. There were in all six authorized packers in the Province.

(4) *Sathgudi oranges*.—Grading of sathgudi oranges was in progress at Koduru and Madras City and 10,733 and 7,371 baskets respectively were graded at the above centres, valued at Rs. 1.1 lakhs.

(5) *Other commodities*.—The experimental grading of potatoes based on the existing specifications was considered unsuitable by the Agricultural Marketing Adviser, who ordered the discontinuance of grading for the duration of the war. There was no grading of potatoes during the period. In order to carry the benefits of grading to the producers, it was decided by the Agricultural Marketing Adviser to issue or renew the certificates of authorization only to Producers Co-operative Societies or Unions in respect of fruits, and jaggery. Certificates of authorization issued to individual parties were accordingly withdrawn.

The Fruit Growers Co-operative Societies at Palacole and Kadayam graded 65 and 954 baskets respectively of lime fruits. Till January 1944 grading of mangoes was in progress at Anakapalle, Chittoor and Coimbatore and 14,109 baskets worth Rs. 72,817 were graded during the year. Six hundred and seventy-two gallons of fruit products were graded and marked by the Maruthis's Fruits Products, Tuticorin.

Rice grading accounted for over 65 per cent of the value of the all commodities graded; which increased from 13.7 lakhs of rupees during 1942-43 to 21.6 lakhs of rupees during 1943-44. The total value of quality products placed on the market under the "agmark" scheme from the time grading commenced in the Presidency now stands at 86.2 lakhs of rupees.

4. *Work done through Co-operative Societies.*—In co-operation with the Officers of the Co-operative Department help was rendered to several co-operative societies for taking to improved methods of marketing. Assistance was rendered to the Koduru Fruit Growers Co-operative Society and the Provincial Marketing Society, Madras, in marketing their produce. There was a general expansion in the work of the Provincial Marketing Society due to increased sale of commodities for civil supplies in the city. The following items of work received attention through the Registrar of Co-operative Societies and Joint Registrar of Co-operative Societies, Madras.

(a) The present position and measures taken for starting grading of ghee.

(b) The system of distribution of iron and steel through the Co-operative Societies.

(c) Distribution of pure cotton seed through the Co-operative Societies in Coimbatore district.

(d) Investigation by the Special Officer into the position of milk supply in the city.

(e) Possibilities of organizing Producers Co-operative Societies, pooling their produce and arranging grading.

5. *Regulated markets—South Arcot Groundnut Market Committee.*—The Committee worked the six market yards successfully. The percentage of transaction at these yards rose from 13,561 tons (or 24 per cent of arrivals) during 1942-43 to 29,511 or 34 per cent of the arrivals in the market centre. Once again the yard at Vridhachalam reached the highest proportion (57.3 per cent) of total arrivals in the market. In addition, sub-markets were also maintained. The progress of arrivals and sales at these yards indicate the growing popularity evinced by all interests in the trade. The Government have ordered that the godowns under construction shall be handed over to the market committee. The committee have resolved to acquire additional sites for putting up offices, drying yards, etc., with a view to afford greater facilities to the users of the market yards. The Act was applied satisfactorily.

Guntur Tobacco Market Committee.—The two market yards were maintained at Guntur and Tadiconda. Improvements were effected to the yard at Guntur. Twenty thousand one hundred and fifty-nine pounds of tobacco were handled at the yard at Guntur. Distribution of good seeds, and propaganda against Tokra and damping off of seed-beds and supply of market information were attended to.

Bezwada Tobacco Market Committee.—The committee was under supercession and under the charge of a Special Officer. The yard at Gollapudi had no transactions. The propaganda was continued, on the cultural and marketing aspects of the crop.

Nandyal Cotton Market Committee.—The committee did only propaganda on the cultural and marketing activities of the crop and supplied market information.

Adoni Cotton Market Committee.—The committee acquired the site for a permanent market yard and started to construct the buildings which are hoped to come into use during the year 1944.

Tirupattur Cotton Market Committee.—The market yard transacted 2,560 pothies (250 lbs.) of kapas and 3,950 candies of lint (784 lbs.). The usual propaganda was continued. The construction of a godown is in progress.

6. *Market intelligence.*—The weekly reports of arrivals, stocks and prices of cattle at Tiruvottiyur market, weekly prices of major agricultural commodities prevailing in Madras market and the prices of potatoes at Mettupalaiyam market were regularly furnished to the Commissioner of Civil Supplies, Madras. Wholesale price of potatoes at Mettupalaiyam market, as on Monday every week was continued to be furnished to Agricultural Marketing Adviser to the Government of India, Delhi. Weekly statements showing the total quantities of sugar received at and despatched from Madras Salt Cotaurs were regularly furnished to the Collector of Madras and the Commissioner of Police, Madras. Monthly wholesale prices of castor seed and cake prevailing in Vizagapatam, Vizianagaram, Guntur and Mathurai markets were furnished to the Chief Controlled of Purchase (Supply), Directorate General of Supply, New Delhi. Frotnightly prices of English vegetables were furnished to the Director of Agriculture, Madras. Besides a number of enquiries from co-operative societies, producers, trade and private bodies, other departments of Government received attention.

7. *Samples sent.*—(a) In connection with a scheme for fixing grade standards for ghee in Madras Presidency, 30 samples of ghee prepared from genuine milk under strict supervision were collected from six different centres and sent to the Government Analyst for analysis. The results showed that in most of the samples the R.M. value was below 28 as detailed below :—

<i>Results of analysis of ghee samples.</i>					Number of
R. M. value.					samples.
					2
20 to 21.9	...	...	...	...	5
22 to 23.9	...	...	...	...	13
24 to 25.9	...	...	...	...	9
26 to 27.9	...	...	...	...	1
28 and above	...	...	...	...	
			Total	...	30

152 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

(b) Samples of jaggery were sent to the Sugar Controller, Simla, at the instance of the Commissioner of Civil Supplies, Madras.

(c) Samples of rice of different grades under the new specifications for war quality were sent to the Agricultural Marketing Adviser for analysis.

(d) Samples of split pulses were sent to the Cereal, Cereal Milling and Baking Laboratory, Punjab Agricultural College, Lyalpur, from various centres of production in the Presidency.

8. *Transport facilities.*—The marketing staff maintained frequent touch with the Madras and Southern Maharatta and South Indian Railways in connection with the transport facilities for the movement of the agricultural commodities. Owing to the abnormal conditions arising out of the war, most of the concessional rates granted previously were cancelled by the railways.

9. *Work done in co-operation with other departments.*—Close co-operation was maintained with the Officers of the Co-operative, Industries, Civil Supplies and Veterinary departments. The schemes connected with rice grading and jaggery purchase were working under the control of the Commissioner of Civil Supplies. The following were the most important among the subjects that received attention :—

- (a) Distribution of groundnut cake and zoning scheme.
- (b) Distribution of iron and steel to agriculturists.
- (c) proposed survey of meat, fish and vegetables for military.
- (d) Ceiling Prices for groundnut oil cake.
- (e) Measures for the purchase and distribution of jaggery.
- (f) Estimated production and consumption of ghee in the Province.
- (g) Control of prices of copra.

10. *Meetings and conferences attended.*—The Provincial Marketing Officer attended the Third Tobacco Conference convened by the Agricultural Marketing Adviser to the Government at Guntur in January 1944. A meeting of the War Services Exhibition in August 1943, the meeting of the Madras Board of Transport convened by the Commissioner of Civil Supplies, Madras, in July 1943, the General Body Meeting of the Madras Industries Association, were also attended. Two meetings of the South Indian Railway Advisory Committee in October and April and one meeting of the Madras and Southern Mahratta Railway Advisory Committee in March 1944 were attended. Three meetings of the Board of Directors of the Provincial Marketing Society, Madras, were attended. A meeting of the Provincial Cotton Committee was attended by the Provincial Marketing Officer as Secretary. The Provincial Marketing Officer also attended meetings of the Price Fixation Committee for Vegetables and Dehydrated Mutton at Ootacamund and Madras held in different months.

11. *The Rice Mills Licensing Order—Increasing the output of rice through milling restrictions.*—The Madras Rice Mills Licensing Order No. (1) 1943, aiming at regulation of milling of paddy and increasing the outturn and nutritive value of rice, brought in during the previous year of report, continued to be in force. The rice mills are licensed and a milling return is obtained every month from each mill through the Collectors of districts. So far 4,907 mills have been licensed in the Province. Of these, returns due were received from only 36 per cent during the year and the average outturn of rice and broken rice together from paddy works out to 70.7 per cent. This is 3.7 per cent higher than the outturn assumed to obtain prior to the enforcement of the Rice Mills Licensing Order. On the basis of this increased outturn the output of rice is estimated to have been increased by about 41,640 tons for the whole Province.

Side by side with checking the outturn of rice through a scrutiny of the milling returns, iodine tests indicating degree of polish were also made by the marketing staff in the grading centres. In this way 7.48 lakhs of maunds were examined of which 3.80 lakhs of maunds alone were adjudged normally polished as provided for in the Rice Mills Licensing Order. Overpolished rice amounted to 2.92 lakhs of maunds and 76,000 maunds were found to be under-polished.

The marketing staff have inspected mills showing abnormal milling outturns and have discussed the defects observed and violations of the Rice Mills Licensing Order with the revenue officials and millers concerned. A coloured chart indicating the correct reaction in the iodine test for polish was supplied to the Board of Revenue (Civil Supplies) for circulation among the Grain Purchase Officers and standard samples were prepared in the buying areas, indicating the proper degree of polish to be given to rice.

12. *Work connected with the war.*—Detailed information in respect of production, market intelligence, imports, exports, etc., of several commodities were furnished to Director of Agriculture, Madras, Civil Supplies Department and Government of India. The following are some of the most important items.—

(a) Figures of area under potatoes and production in the different growing centres of this Province and the quantity required by the dehydrated factories during 1943 were furnished to the Assistant Secretary to Government, Development Department, (through the Director of Agriculture).

(b) The controller of Supplies, Madras, was furnished with the average wholesale prices of potatoes at Mettupalayam during 1938 and 1939.

(c) The Controller of Supplies, Madras, was furnished with statistics of groundnut and other vegetable oils and fats used in the manufacture of soap in the United Kingdom during the period 1932-36.

154 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

(d) Three representative samples of indigo dye were collected from Cuddapah, Anantapur and South Arcot districts and forwarded to the Inspector of Chemical Warfare Weapons, Kirkee for test.

(e) Detailed figures of export of sheep and goats to Ceylon, Cochin State, Bangalore, Travancore, etc., and the current prices of goats at Vellore, Bellary, Nellore and Madanapalle were furnished to the Controller of Supplies, Madras.

(f) A detailed report on the imports of rice into Madras City with necessary statistics for ten years from 1934-35 by rail, sea, canal, etc., was submitted to the Additional Secretary to Government, Development Department.

Besides, the Director of Agriculture and the Commissioner of Civil Supplies, were furnished with statistics regarding production, area, etc., of groundnut and cotton seed.

(g) A zonal scheme for the movement of groundnut oilcake, bones and bonemeal, in order to avoid cross movements by rail, was prepared and submitted to Director of Agriculture.

(h) In connexion with the measures to promote the grow more food campaign, statistics were furnished to the Director of Agriculture on a number of points and proposals made. The marketing staff also helped in the propaganda towards Grow More Food in their tours.

13. *Jaggery purchase*.—A scheme of procurement of cane jaggery from the surplus districts in the Province for export to other deficit Provinces and States began functioning from March 1944 under the control of Commissioner of Civil Supplies. One Assistant Marketing Officer with headquarters at Madras and five Marketing Assistants with headquarters at Anakapalle, Poddapur, Hospet, Vellore and Kodumudi are engaged in purchase and movement of cane jaggery.

The area of purchases and contracts obtained were as follows :—

Visakhapatnam district and East Godavari district.—North Zone.

Bellary district.—Central Zone.

North Arcot, Salem, Chittoor, Coimbatore and Tiruchirappalli districts.—South Zone.

	Contracts obtained.	Allotted.	Moved up to date.
	TONS.	TONS.	TONS.
North zone	7,743	7,004	5,574
Central zone	665	550	304
South zone	11,283	2,571	1,416
	19,691	10,125	7,294

The purchases have all been made within limits of prices approved by the Government.

So far, a total of 10,125 tons of jaggery have been allotted to the Provinces of Bombay, Central Provinces and Berar, Orissa, Coorg, Cochin and Hyderabad and Civil and Military Station, Bangalore and 7,294 tons have been exported, according to quotas fixed by the Gur Controller, Government of India, Simla.

In addition, arrangements are in progress for the distribution of palmyrah jaggery to the State of Travancore.

14. *Programme of work for 1944-45*.—The programme of work sent with my letter No. A.-1001/44, dated 15th June 1944 has been approved by Government in G.O. No. 2814, Development, dated 29th June 1944.

15. *Financial Statements*.—The appended statement shows the budget allotment and the amount expended in the year 1943-44 (fashi 1353).

MADRAS,
7th August 1944.

S. N. VENKATARAMAN,
Provincial Marketing Officer.

FINANCIAL STATEMENT, 1943-44.

The following shows the budget allotment and the amount expended in the year 1943-44 from 1st July 1943 to 30th June 1944 :—

I. Funds provided by the Imperial Council of Agricultural Research (B. Marketing Scheme).

1. Receipts—Nil.

2. Expenditure—

Head of account.	Budget provision in 1943-44.	Expenditure from 1st July 1943 to 31st March 1944.	Expenditure for 8 months from 1st April to 30th June.	Total.
(1)	(2)	(3)	(4)	(5)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Pay of Officers and Establishment.	6,400 0 0	4,258 7 0	2,186 6 0	6,444 13 0
Travelling Allowance and other compensatory allowances.	2,700 0 0	2,004 1 0	921 2 0	2,925 3 0
Dearness allowance.	600 0 0	500 1 0	296 15 0	797 6 0
Contingencies ..	600 0 0	566 7 5	45 11 6	612 2 11
	10,300 0 0	7,329 0 5	3,450 2 6	10,779 2 11

II. Provincial Funds (A. Direction).

1. Receipts—Re. 0 4-0.

2. Expenditure—

Head of account.	Budget provision in 1943-44.			Expenditure from 1st July 1943 to 31st March 1944.			Expenditure for 3 months from 1st April to 30th June.			Total.		
	(2)			(3)			(4)			(5)		
(1)	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Pay of Officers ..	10,500	0	0	8,756	2	0	2,874	15	0	11,631	1	0
Pay of Establish- ment.	8,900	0	0	6,407	12	0	981	13	0	7,389	9	0
Travelling allo- wance and other compensatory al- lowances.	7,500	0	0	4,632	13	0	1,158	9	0	5,791	6	0
Dearness allo- wance.	2,100	0	0	1,280	10	0	335	0	0	1,615	10	0
Contingencies ..	1,900	0	0	1,646	14	3	338	11	9	1,985	10	0
	30,900	0	0	22,724	3	3	5,689	0	9	28,413	4	0

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, GUNTUR, FOR THE YEAR 1943-44
(FASLI 1353).

CHARGE AND STAFF.

The Northern division with headquarters at Guntur, continued to be in charge under Sri T. Budhavidheya Rao till his retirement on 7th February 1944, except during September-October 1943, when in his leave period Sri S. Sitarama Patrudu was in additional charge. Sri Y. G. Krishna Rao held charge of the division from 8th February 1944 till the end of the year under report. The district of Visakhapatnam was bifurcated on 21st June 1944 into the administrative units, North Vizagapatam and South Vizagapatam with headquarters at Chicacole and Visakhapatnam, respectively.

The following are the nine administrative units—

District.	Officers that held charge.
Visakhapatnam	Sri M. V. Raghava Rao and Sri S. Sitarama Patrudu.
North Visakhapatnam ..	Janab Muhammad Kasim Adeni.
South Visakhapatnam ..	Sri S. Sitarama Patrudu.
East Godavari	Sri U. Vittal Rao and Sri. V. Atchyutaramayya.
West Godavari	Sri V. Atchyutaramayya, Sri K. Venkatraman and Sri P. A. Venkateswara Ayyar. .
Kistna	Sri L. Narasimha Chari.
Guntur	Sri P. A. Venkateswara Ayyar, Sri A. Chidambaram Pillai and Sri S. Venkatraman.
Nellore	Sri S. Venkataraman, Sri A. Gopalakrishnayya Naidu and Sri M. V. Raghava Rao Naidu.
Kurnool	Sri V. K. Subramania Mudaliyar and Sri K. Jagannatha Rao.
Bellary	Sri R. N. K. Sundaram and Sri G. Sakharama Rao.

WAR EFFORTS AND INCREASED PRODUCTION OF FOOD
CROPS AND VEGETABLES.

2. Besides giving correct picture of the war situation, the departmental staff contributed their quota in Defence Savings Bonds, certificates, Provident Fund and Red Cross collections. An Agricultural Exhibition was arranged at Peddapur in connection with Red Cross Week and a drama was staged in Amalapur, in which the Agricultural Demonstrator took part. A novel feature of Visakhapatnam district was the departmental advertisement with the help of bullock carts taken in procession in the streets which attracted crowds. Utilization of waste lands, new wells for irrigation, cultivation of vegetables, financial assistance under Takkavi loans for the purchase of seed, manure and implements were some of the features under "Grow More Food" campaign. The special staff

at Visakhapatnam supplied vegetables, fruits and onions regularly to the Military department, the largest consignment being five can-dies of carrots from Kovvur. The Anantagiri scheme was started during the year for the production of vegetables and preliminary spade work was done for the extension of the same in Lambasingin in Chintapalli taluk. The Araku valley scheme (since sanctioned) was investigated. Under "Grow More Food" campaign 34 maistris were sanctioned in Visakhapatnam district. In West Godavari district new projects, viz., the Polavaram project, Kanoor and Pendyala Project, Losari Project and Kaldhari Project were investigated. Contributions and subscriptions by way of Defence Savings Bonds, certificates, stamps, etc., amounted to Rs. 14,318 in the division.

GROW MORE FOOD.

3. This campaign was intensified through lectures, at special Food Council meetings, at the District Periodical Conferences, and by the celebration of the Grow More Food weeks in several districts.

Advantage was taken of the enhanced provision for the grant of loans for seeds, manures and implements and the work was increased six-fold over that of last year. Collector's discretionary grants were utilized for the supply of seeds and manures free to poor and deserving ryots in the division.

Several new irrigation projects were investigated and in West Godavari district alone ten new schemes covering an area of 13,000 acres are under examination to render 5,000 acres ready for cultivation in the coming fasli. In the same district 3,183 acres were assigned to the landless poor under the Land Colonization Co-operative Societies for the landless poor. There was a 15 per cent increase in the district in the area under food crops.

The above efforts resulted in the following increases :—

- (1) Assignment of wastelands, 18,045 acres.
- (2) Wastelands cultivated with food crops, 649 acres.
- (3) Fallow lands brought under cultivation, 5,363 acres.
- (4) New wells dug, 659 acres.
- (5) Increase in the area under food crops 2,50,230 acres.

The ban on the cultivation of mungari cotton as a pure crop in the Ceded districts and special scheme sanctioned for Bellary for growing dry food crops in the off season in wetlands have augmented the area under food crops.

AGRICULTURAL EDUCATION.

4. Practical training in agriculture to the sons of the soil who were interested in improved agriculture was given in Agricultural Research Stations at Anakapalle, Samalkot and Guntur. Thirty-four students were trained in Samalkot, out of whom six were selected as Demonstration Maistris. There were 32 boys in the Juvenile

Labour School, Anakapalle, and 31 in Samalkot. During the year, Government sanctioned the opening of IV standard in Samalkot School and there were nine admissions in this standard. The departmental staff rendered all possible help to school gardens and to schools having agriculture in the curriculum.

SEASON AND ITS INFLUENCE ON CROPPING.

5. Rainfall during fasli 1353—

District.	Average fall in inches for the 51 years ending 1920.	Rainfall during 1943-44.
(1)	(2)	(3)
Visakhapatnam	40.7	42.06
East Godavari, Agency	49.0	44.01
Do. Plains	40.3	42.61
West Godavari	39.2	43.56
Krishna	37.0	37.98
Guntur	31.8	37.69
Nellore	35.0	53.92
Kurnool	25.7	29.45
Bellary	23.2	25.50

The *South-west monsoon* started in time in July with vigour in all the districts except Nellore. Sowings of the dry crops and transplanting of paddy were done in normal season. The severe drought from August onwards in Guntur, Kistna, Godavari and Kurnool districts adversely affected the dry crops like budama paddy, jonna, groundnut and also paddy and sugarcane. "Kodu" (gall fly pest) appeared in an epidemic form and caused damage to 20,000 acres of paddy in Kaikalur taluk of Kistna district.

The *North-east monsoon* commenced early in September with very heavy rains in the division which resulted in the delayed sowings and transplantation of dry crops like chillies, tobacco, jonna, variga in Kistna and Guntur districts. But these rains revived the early crops, enabling them to give yields at least 20 per cent below normal, especially in Godavari districts. In October there was severe drought in the division, except in North Visakhapatnam, where there was cyclone. Crops like tobacco, chillies and jonna suffered in consequence. The absence of the usual November cyclone facilitated the harvest of first crop paddy in the division. The northern taluks of Visakhapatnam district were subject to a severe cyclone on 31st October, which badly damaged the standing crops. Cyclone relief work was, however, undertaken under a special Government grant and distress relieved as far as possible in the badly affected areas.

In Kurnool district, the heavy rains of September-October delayed the sowings of cotton and also adversely affected the young cotton and jonna crops.

The hot weather of 1944 was very intense and severe and the usual summer showers were absent. In Godavari districts there were slight rains in March which facilitated the cane planting and

helped plantains and pyru gingelly. These rains in Guntur district, however, spoiled the Natu tobacco kept in open fields for sun curing. With good water-supply in the canals, the second crop paddy had sufficient water throughout its duration, but due to the adverse easterly winds blowing for a long period, the yield was reduced from 12 to 8 bags per acre in the Godavari districts.

To conclude, the season was fair for the early sown dry crops of first crop paddy, bad for the late sown crops and not to the mark for the second crop paddy.

Cyclone relief.—As noted above, the northern taluks of Visakhapatnam district were subject to a severe visitation of a cyclone on 31st October 1943, which damaged the standing crops considerably. Prompt relief measures were undertaken under a special grant of Government and free distribution of manures and seed were made to the poor and deserving ryots. 12,250 bags of paddy were supplied as seed, as also 50 bags of pyru ragi and Rs. 25 worth of vegetables.

One of the measures, contemplated, to tide over the effects of cyclone in this area is to build up large reserve stocks of ragi, the staple food of the tract, by encouraging its cultivation under wells. Mere digging of wells would be of no use. What is wanted is augmentation of springs in them to make more water available for garden crops. Vizagapatam district is an undulating country and subject to soil erosion to an alarming degree. Until anti-soil erosion measures are taken up by bunding and strip cultivation and also by the improvement of tanks, more water cannot be impounded to augment water supplies in irrigation sources—wells and tanks. A scheme has been submitted, with this end in view and when this materializes, it is hoped to avert famine—shortage of food—due to cyclone, by growing ragi under wells during non-cyclone period of the year.

DEMONSTRATION AND PROPAGANDA.

6. Usual propaganda and demonstrations were carried out during the year under report. One thousand eight hundred and sixty-four demonstration plots, 23 trial plots and 294 observation plots were laid in the division. The special scheme in 9 taluks of Vizagapatam district was merged into "Grow More Food" campaign from 1st April 1944. With the sanction of additional staff, a maistry for every firka and sub-depots in important centres of the taluks, ryots could have easy access to the purchase of departmental seed, and purchase of manures. This was augmented by the state control of the price of groundnut-cake and the imports of commercial fertilizers like Ammonium sulphate and Ammonium Phosphate under 'Lease and Lend'. Running of seed farms for all important crops and adequate seed supply was made available, as each district had a 'target figure' in view to make departmental seed self-sufficient. But due to shortage of wagons and other transport facilities, the desired success could not be achieved. Unprecedented sales were recorded in most of the depots resulting in good popularity of the department.

The long-felt desire to have ready cash to the ryots was solved by the sanction of interest-free loans for the purchase of seed, manure and implements. 'Trading schemes' were also introduced to facilitate the supply and sales of seeds, manures and iron.

Crops—(1) *Paddy*.—The main items of improvement carried out during the year were varietal, cultural and manurial. The area under improved strains in the division was 1,722,641 acres as against 1,342,897 of the previous year. The following are the strains suitable for the districts noted against each in the deltas. —

Vizagapatam.—GEB 24, Bobbiliganti 1, Sunk'sannam 5, Mypali 7, Gunupur Sannam 47, Bayabunda 1, Mah. rajabhogam.

West Godavari MTU 1, 5, 10 and GEB 24, MTU 9 and 15.

East Godavari.—SLO 1,2 and MTU 3

Kistna.—MTU 8, 13, 12 and 14.

Guntur.—MTU 7, 12, 13, 16 and 19.

Kurnool and Bellary.—GEB 24.

For alkaline lands SR 26 B was suitable except in Kistna and West Godavari districts.

Cultural work.—Thin sowings of seed beds and economic planting were the two main items of improvement under this head. There were 61,237 acres under thin sown seed beds and 653,244 acres were planted economically as against 41,381 and 476,191 acres of the previous years.

Manuring.—Green manuring and green leaf manuring was done in 286,823 acres as against 348,793 of the previous year. Where this was not available, use of groundnut cake or castor cake supplemented with phosphatic manure was advocated. Due to acute difficulty in procuring railway wagons and the high market rates prevailing in certain localities and restricted cake movements, these could be applied in a limited area of 360,599 acres.

(2) *Cotton H 1 Cotton*.—This occupied an area of 5,000 acres during the year in Kurnool district. The strain was better than the local and was popular in the western taluks of the district. One hundred acres of seed farms were raised and arrangements were made for the seed supply. In the Bellary district 560,509 lb. of seed were sold by the department and distributed by the Co-operative Societies and sown over an area of 52,583 as against 282,473 lb. of seed and 22,367 acres of last year. A total estimated spread of H 1 was 335,000 acres including seed farms as against 144,437 acres of last year. Three thousand acres of H 1 cotton seed farms were raised in 6 villages at Guntakal and 324,080 lb. of seed were got. One thousand bales of lint obtained were sold at a premium of Rs. 50 to Rs. 80 per candy of 784 lb. over locals. The total area under Westerns in the division was 340,000 acres.

Northerns.—N 14 cotton in Kurnool occupied 25,000 acres as against 37,000 of the previous year. The area under this strain

is going down due to the low yield when compared with the local and the low premium offered in the market. Past 4 years trial of other strains No. 23,556, and H 1 showed that they were superior to N 14 in the point of yield.

Cocanadas.—X 20 Cotton occupied an area of 812 acres in the division. The yield was better than the local. An area of 5 acres has been set apart under seed farm conditions for next year in Nellore. After the advent of the more paying crops of groundnut and virginia tobacco, cotton has lost its importance in the division.

Cambodia cotton tried in small scale as a rainfed crop did not fare well and there was no demand for the lint in the market.

Mungari cotton.—There was no strain suitable to compete with the local.

Millets—Jonna.—In the Guntur district J 869 (yellow) and J 916 (red) were spreading for the punasa season but there were no suitable strains for the pyru season. In the East and West Godavaris T 6 for grain and J 103 for fodder were popular. The strains did not spread rapidly as they were late to ripen or did not compare favourably with the local in point of quality of grain. In Kurnool N 29/68, N 28/3, T 6 and gundu panna jonna strains were popular. In Bellary T 1, M 47-3 and 29/68 were under spread in a total area of 16,265 acres. T 1 occupied an area of 15,227 acres. The total area under all the improved strains in the division was 117,494 acres.

There was difficulty in getting enough sulphur for treatment against smut disease and some had to revert to copper sulphate treatment. The area under seed treatment was 93,677 acres against 59,009 acres of last year. The area under improved jonna strains was as under :—

	ACS.
East Godavari	681
West Godavari	1,080
Krishna	650
Guntur	2,260
Nellore	258
Kurnool	96,300
Bellary	16,265
	117,494

Ragi.—EC 593, VZM 33 and AKP 525 and R 42 were the strains suitable for the division. AKP 525 was suitable for both the punasa and pyru seasons in Vizagapatam district and more so in pyru season on account of early maturity by 15 days in comparison

with the local, and the consequent loss demand for water under the precarious source of wells. The area under this crop was as under :—

	ACS.
Visakhapatnam	9,379
East Godavari	129
West Godavari	301
Krishna	71
Guntur	145
Nellore	250
Kurnool	1,200
Bellary	145
	11,620

EC 593 was found suitable for both dry and irrigated conditions in Kurnool. R 42 was popular in Bellary district.

Korra.—K 132 in Nellore, K 6 in Guntur and K 132, N 140, K 68, K 23 in Kurnool and Bellary were the departmental strains under distribution with the following areas and occupied 33,385 as against 33,736 acres of last year :—

	ACS.
Guntur	1,185
Nellore	185
Kurnool	18,750
Bellary	13,265
	33,385

Sajja.—PT 700 Poona Ganti was the only strain found suitable to some extent but being a cross-fertilized crop there were still no good strains. The following was the area in different districts :—

	ACS
Visakhapatnam	1,850
East Godavari	21
West Godavari	3,020
Krishna	5
Guntur	102
	4,998

(4) *Sugarcane*.—The varieties found suitable to the factories and for jaggery manufacture were Co. 419, 421 and 213. There were, however, small areas under purple mauritius and J 247 under natural spread. The area under different districts was as under :—

	ACS.
Visakhapatnam	23,955
East Godavari	9,468
West Godavari	1,210
Krishna	2,081
Guntur	12
Bellary	7,700
	44,426

Line planting and wider planting were carried on in 32,374 and 18,064 acres respectively. Two thousand six hundred and thirty demonstrations for the manufacture of better jaggery were conducted. One thousand and ninety-one improved furnaces were constructed. The percentage of recovery at Vuyyur sugar factory was 9.4, the highest so far obtained. This is attributed to the change in the time of the application of manure resulting in the cessation of growth earlier than normal and consequent early maturity with better purity in the juices. However, the yields are reported to be low.

(5) *Groundnut*.—AH 15, AH 25 and 32 were the three departmental strains under distribution. For want of superior types the area under the strains was limited to 5,521 acres as against 2,900 acres in the previous year.

(6) *Tobacco*.—HS 9 Virginia tobacco in the division gained immense popularity and had spread from Guntur district to Kistna East and West Godavaris and Nellore in an area of 36,433 acres, out of a total area of 82,301 acres of Virginia tobacco in all the districts. Under the special seed multiplication scheme 12,157 lb. HS 9 Gold dollar and Bonanza were distributed during the year. This was the second year under the ten years seed multiplication scheme.

(7) *Chillies*.—Guntur strain 398 was the chief strain grown in a large scale in the division. It occupied an area of 1,765 acres as against 1,193 acres of the previous year. Due to increased demand 5 acres under seed farm conditions were arranged in Guntur district and 4,215 lb. of dry fruits were obtained and sold from this area.

(8) *Vegetables*.—Under "Grow More Food" campaign, this was one of the chief item of activity. Better yielding indigenous and English vegetables were introduced on a large scale in an area of 14,555 acres as against 4,287 of the previous year. Two thousand two hundred and eight-five pounds of seeds and 23,751 packets of all varieties were sold from the depots during the year as against

263 lb. of seed and 15,018 packets of last year. A special Demonstrator in charge of growing the vegetables was posted for the Military supply in Vizagapatam district for giving advice to ryots of Parvatipur and Salur taluks. Two Gazetted Officers at Vizagapatam, one for English vegetables and another for the supply of fresh fruits, onions and indigenous vegetables co-opted as agents for supply to the Military department. The Anantagiri scheme functioned during the year and the survey of Lambasingi in Narasapatnam and Arakku valley were completed and they will be started soon. Cabbage, cauliflower, Knolkol, carrots, turnips were successfully grown in Visakhapatnam districts and from Kovvur taluk carrots were supplied to the Military. Potatoes were introduced in small areas successfully in West Godavari and Nellore districts.

TREE PLANTING.

7. Special "tree planting" weeks were celebrated in the division during the year. Casurina seedlings, glyricidia, maculata and avenue trees, cashewnuts Korukapalli by the department. A special feature was the large-scale planting of tamarind trees in all vacant sites.

FRUITS.

8. The staff arranged for the supply of grafts and seedlings from reliable nurserymen and department. Mangoes, citrus, cashewnuts, jacks, pineapples, grape vines were introduced on a large scale and nearly 3,000 acres were brought under orchards newly during the year. The increasing demand could not be met for the supply of the seedlings from the departmental nurseries.

SOIL EROSION.

9. This was tackled chiefly in the dry lands by the bundings, contour sowings and strip cropping and constructions of surplus water weirs. The use of bund former in 160 cases was demonstrated and a total area of 3,351 acres was tackled for the soil erosion.

FODDERS.

10. Fodder crops were encouraged on a larger scale. Pillipesara was universally grown for fodder in Nellore, East Godavari and Kistna districts for the purpose. The departmental sweet stalked jonna strains T. 6, J. 103 were popular. Arrangements were made to supply guinea, Napier and Kolukattai grasses and lucerne. Silos in 12 places were demonstrated.

The following were the areas in principal districts :—

	ACS.
East Godavari	46,142
Kistna	28,000
Nellore	10,569

AGRICULTURAL IMPLEMENTS AND MACHINERY.

11. In statement II the sales conducted and the uses of the various demonstrations with the improved implements is appended (Statement No. II). There was a set back in the supply of the implements due to abnormal rise in prices due to war conditions.

During the year, the wooden grinder for paddy shelling became very popular and 151 of these were sold. Due to war conditions there was dearth for kerosene and this was to some extent made good by the supply of vegetable oil lamps. Ramadeepas and G.S.T. Tumbler float lamps were sold through the depots for which there was a good demand.

SUBSIDIARY INDUSTRIES—APICULTURE.

12. Bee-keeping is a very popular industry in the Northern circars due to favourable conditions existing there and it has got a bright future for development as the public are getting interested in it and the demand for pure and genuine honey is increasing. There are 2,839 hives in this division of which over 1,400 are in West Godavari district, mainly in Tanuku taluk. Special bee-keeping schemes were in progress in the districts of Visakhapatnam, East Godavari and West Godavari. The work in this direction required to be still intensified and extended to new areas as the present demand for honey is far above the production. There was a drive in the Vizagapatnam district for popularizing this industry as the District Collector sanctioned Rs. 250 from his discretionary grant presenting bee-hive boxes free to the schools.

SEED DISTRIBUTION.

13. Due to increased popularity of the departmental seeds the demand for pure seed for the food crops, and industrial crops was very high. In addition to the supply from the Research Stations seed farms were run for all the important crops.

The following quantity of seeds were supplied departmentally to the ryots during the year:—

Paddy	.. .. .	13,615,925 lb.
Cotton	.. .. .	396,777 "
Millets	.. .. .	236,986 "
Oil seeds	.. .. .	33,105 "
Green manure seeds	.. .. .	1,799,345 "
Sugarcane setts	.. .. .	5,561,000 Nos.

LOANS.

14. To give an impetus to the 'Grow More Food' campaign, loans were disbursed liberally for the purchase of implements up to a maximum of Rs. 100 and for seeds and manure up to Rs. 75 to be repaid in two annual instalments, free of interest. As far as possible, supplies were made in kind, serving the purpose for which the loans were intended. The magnitude of the work multiplied to six times that of last year and the District Agricultural Officers, East Godavari and Krishna were each sanctioned a Special

Gazetted Assistant to cope up with increased work. The supply of loan forms was adequate by the middle of the year, though short in the beginning. Special mairies and demonstrators were posted for this work in heavy centres. The total amount of loans disbursed during the year was Rs. 13,22,112 to 20,099 ryots as against Rs. 2,29,340 of last year.

MANURES.

15. (a) *Farm-yard manure*.—As a result of the departmental propaganda, proper preservation of farm-yard manure was done in 44,599 acres in heaps and pits. The conservation of cattle urine by the 'dry earth' and 'trench' systems was carried out in 28,046 cases. In case of 25 enlightened ryots cover was given to the manure pits for protection against sun and rain. Special 'Manure weeks' were demonstrated in the division and the Agricultural depots had model manure pits and heaps to be copied by ryots.

(b) *Composting of water material*.—This was carried out in 7,687 cases. A special Demonstrator was in charge of the compost manufacture for the Telugu districts and Municipalities and Panchayat Boards manufactured Poudrette in 170 cases.

(c) *Green Manuring*.—This was advocated wherever facilities existed. For paddy crop, green manuring and green-leaf manuring was done in an area of 286,823 acres. Pillipesara, sunnhemp, indigo, wild indigo, Sesbania Sp., supplies were made to an extent of 1,799,345 lb. as against 474,300 lb. of last year.

(d) *Concentrated manures*.—With the imposition of ban on the movement of groundnut and castor cake, and control of the prices, ryots had better supply of oil cakes than in the previous year but the required quantity could not be supplied due to shortage of railway waggons. The division was divided into deficit and surplus districts according to the production of the cake and movements from one district to another were on systematic basis. From surplus districts the deficit district was catered. Vizagapatnam to East and West Godavari, Guntur to Krishna, etc. no movement was allowed from deficit district. In case of Krishna district, it was found necessary to requisition the stocks with the help of the District Collector as the merchants held up the stock. The supply of Ammonium sulphate and Super phosphate was inadequate but by the end of the year sufficient stocks available for 1944-45 crops were received by the department. In all cases, the concentrated manures were distributed only for the purposes of food crops and vegetables.

PESTS AND DISEASES.

16. The Madras Agricultural Pests and Diseases Act, 1919, was enforced for the control of some pests and diseases in some districts as indicated below:—

(1) *Red hairy caterpillar*.—Tekkali, Bobbili, Chipurupalli, Parvatipuram, Palakonda and Chicacole including Narasannapeta sub-taluk of Vizagapatnam district and Dhone taluk of Kurnool district.

(2) *Black-headed caterpillar (Nephantis serinopa)*.—Divi and Bezwada taluks.

(3) *Budrot of palmyra and coconut*.—East Godavari, West Godavari, Kistna and Guntur districts.

(4) *Orabanche on tobacco and others crops*.—Vizagapatam, East Godavari, West Godavari, Kistna, Guntur and Nellore districts.

(5) *Water hyacinth*.—East Godavari district.

Of the above, items 1 and 4 are vested in the Agricultural department and the rest working under the Revenue department.

Item No. 4 was tackled by a Gazetted Officer stationed at Guntur. The pests and diseases mentioned above except item No. 2 were not yet controlled and hence the Act is still in operation.

Special schemes were in operation for the following pests and diseases :—

(1) *Silver shoot of paddy or Kodu*.—Chicacole taluk of Vizagapatam district.

(2) “ *Damping off* ” disease and *thrips on chilli*.—Gollaprolu area of East Godavari district.

(3) *Orabanche and mosaic on tobacco*.—Agricultural Research Station, Guntur.

Item No. 1 had to be continued for the next season due to heavy cyclone which spoiled the experiments. Item No. 2 could not be run successfully due to non-availability of tobacco dust and is being repeated in the following season. Item No. 3 is under a Gazetted officer of the Mycology Section with some assistants.

Propaganda and demonstration on the control of the following pests and diseases were continued :—

Thrips on chilli.
Epilachna on brinjal.
Prodenia on English vegetables.
Army worm of paddy.
Field rats.
Rhinoceros beetle on coconut.
Calocoris on jonna.
Rice hispa.
Pests of castor.
Stored Product pests.
Paddy blast.
Citrus gummosis and die back.
Cholam smut.
Tobacco damping off.

EXHIBITION AND SHOWS.

17. There were exhibitions and shows during the year on occasions of fairs, festivals, conferences, jamabandis, Health weeks, Red Cross shows, etc. The departmental stalls were put up which

attracted large crowds, wherein samples of improved seed, agricultural implements, insecticides, charts, were displayed and some demonstrations were conducted on the spot for elucidation. The All-India Regional Cattle Show was conducted at Ongole during the year.

The following were the major agricultural exhibitions conducted during the year :—

(1) All-India Kisan Sabha—Bezwada.

(2) Godavari Pushkaram—Rajahmundry.

(3) Agricultural Exhibition—Satyanarayana temple—Annaram.

(4) Agricultural Exhibition—Pattesim (Polavaram taluk) for Sivarathri festival.

(5) Kotappakonda Exhibition—Guntur district.

(6) All-India Cattle Show—Ongole.

(7) Nellore District Agricultural Exhibition and Cattle Show.

Ninety-seven magic lantern lectures and 5,620 ordinary lectures were delivered by the staff during the year.

JOINT WORK WITH OTHER DEPARTMENTS.

18. The department moved closely with other departments like the Revenue, Co-operative, Public Works Department, Education, Health and National War Front Organization during the year. The officers co-opted with the Revenue department for investigation of new schemes for post-war reconstruction, assignment of waste lands in the ‘ Grow More Food ’ campaign and Pest Act operations. The collaboration with the Co-operative and Revenue departments was continued in the following cases.

(1) Sugarcane Growers’ Co-operative Society at Kirianpudi.

(2) Honey and Wax Supply Co-operative Society at Pithapuram.

(3) Kistna Agricultural Improvements Society, Gudivada.

(4) Punadipadu Paddy Seed Multiplication Society, Punadipadu, Krishna district.

(5) Agricultural Improvements Society, Nagayalanka, Krishna district.

(6) Four co-operative land colonization societies in West Godavari district.

AGRICULTURAL ASSOCIATIONS.

19. There were 549 associations functioning during the year under review and 1,350 meetings were held. These associations supply a long felt want in bridging the gulf between the cultivator at the one end and the department at the other end. What is aimed at is the proper understanding of the cultivators’ needs in

improving crop production as an aid to 'Grow More Food' campaign and one can think of no better organization than these in accomplishing the object. More impetus will be given to these by giving first preference to the members of these associations in the matter of supplying agricultural requisites, the object being to convert the whole village into an association. Target figures have been prepared for each association regarding each item of improvement to be carried out and no efforts will be spared to reach the aim. In East Godavari, the Associations go under the name of "Good Farmers' Associations" the duty incumbent on each member being to have a manure pit, to sow an improved seed, to grow vegetables, to feed animals properly and to help the demonstrator in his work. It is hoped with this new orientation the associations will become a potent factor in carrying out the programme of improvement, chalked out in each village by the department.

SPECIAL SCHEMES.

20. The following special schemes were in operation during the year in the division:—

(1) *Scheme of work on sugarcane (ancillary) to Imperial Council of Agricultural Research.*—Scheme at Anakapalle in Bobbili, Vizagapatnam district, Kirlampudi, East Godavari district and Vuyyur in Krishna district, with the object of verifying in ryots' lands, the results of the experiments of the Agricultural Research Station, Anakapalle, and continued for the third year. In Bobbili, the cyclone caused complete damage to the sugarcane crop and no conclusive results were obtained. In Kirlampudi, Co. 419 proved to be highest yielder both as a plant and ratoon crop and application of ammonium sulphate alone gave the maximum yield followed by its combination with groundnut cake. The scheme was closed on 31st March 1944.

(2) *Sugar Excise Fund Subsidy Scheme.*—This continued to work in Bobbili, Kirlampudi, Vuyyur and Hospet. A special Demonstrator was in charge of Vuyyur area and in all places the other staff were engaged in getting the sugarcane manured with oil cakes, regulating the harvest of cane during the crushing season, and getting more area planted under cane. It is of interest to record that a recovery of 9.4 per cent is obtained for Vuyyur area.

(3) *Koya Uplift Scheme.*—This scheme was in existence in three villages at Arlagudem, Ramaraopet, Gollagatta of Bhadrachalam taluk with the object of improving the economic condition of the koyas and inducing them to take to settled cultivation. During the year six pairs of cattle, six mould board ploughs, 2 H.M. Guntakas and improved seed were supplied and one "Good Farmers' Association" was started under this scheme.

(4) *Soya bean trial in East and West Godavari districts.*—This was the third and final year of the scheme. The results in

West Godavari were encouraging and the crop occupied 43 acres during the year while in East Godavari due to seasonal conditions the crop did not come up in all the 12 acres.

(5) *Bee-keeping Scheme.*—The scheme was continued in West Godavari district with a special staff of one Fieldman, five bee-keepers. The apiary in Tanuku taluk continued with 26 hives.

(6) *Broom rape on tobacco.*—This was continued with a special staff of one District Agricultural Officer, one Assistant, 22 fieldmen and 66 maistries. The act was extended to three taluks of Visakhapatnam district (Salur, Chodavaram and Cheepurupalli). During the year 72,269 pits were dug and an amount of Rs. 550-13-0 permanent advance was spent. Three cases of prosecutions were launched for the violation of the Act which ended in convictions, 121,595 acres for tobacco, 4,320 acres for brinjals and tomatoes were tackled for the parasite.

(7) *Rice Development Schemes.*—In Vizagapatnam district there was an area of 2,063 acres under seed farm conditions which produced 4,435 bags of seed in 11 taluks and 50 special maistries were appointed for this work. In East Godavari district from an area of 3,635 acres, 17,728 bags of pure seed was made available. In West Godavari district, 3,750 acres were run on seed farm conditions and 2,111,297 lb. of pure seed was purchased by the department. In Krishna 3,750 acres of seed farms were arranged, but due to adverse seasonal conditions only 27,515 bags of paddy seed could be purchased. The target figure for the district for 1944-45 season is 300,000 acres. In Guntur district 1,150 acres were arranged under seed farm conditions and 10,819 bags of seed were purchased. Thus in all the delta districts by the introduction of trading schemes, spread of departmental paddy strains was on the increase and would ultimately cover the entire area replacing local varieties.

(8) *Rubber Scheme.*—This was sanctioned for the East Godavari and West Godavari districts. In Amalapur taluk seedlings of the vine 'Cryptostegia Grandiflora' were planted along the bonda channel. This was in charge of a fieldman, 16,650 plants were planted out of which 15,000 are alive. The Public Works Department is looking after 4,036 plants raised in their compounds. In the West Godavari district seedlings were planted on canal banks, locks area, rest-house compounds, and school gardens. The scheme which was started in August 1943, was closed on 30th April 1944.

(9) *H. 1 Cotton Seed Distribution Scheme.*—The distribution of cotton seed on the seed farm conditions under the joint auspices of the agricultural and Co-operative departments was continued in Adoni, Guntakal and Bellary, this being the second year of the total five years' scheme, 560,509 lb. of seed were sold by the department and were sown over an area of 52,583 acres.

(10) *Soil Erosion Scheme.*—A special scheme to conserve soil moisture and prevent soil erosion by bunding with wooden bund

formers was sanctioned on 9th June 1944. By the close of the year 206 demonstrations were conducted and an area of 2,347 acres were banded.

(11) *Sugar Factory Scheme, Hospet*.—Under the guidance of Sub-Collector, Hospet, a special Demonstrator worked from 16th October 1943 to 15th April 1944 under the cane commandeering scheme, 60,129 tons of cane were crushed and 64,026 bags of 2 cwt. each of sugar were produced.

LEGISLATION.

21. The inspecting officers of the department enforced the sections of the following Acts during the year :—

- (1) Cotton Ginning and Pressing Act.
- (2) Sugarcane Act.
- (3) The Pests Acts—enumerated in paragraph 16 above.
- (4) The Madras Manure Dealers' Licensing Order, 1943.
- (5) The Madras Rice Mills Licensing Order, 1943.

AGRICULTURAL RESEARCH STATION, ANAKAPALLE.

22. *Season*.—A total rainfall of 37.17 inches distributed over 89 days was received during the year. The South-west Monsoon was uniform and was beneficial to punasa crops. The North-east monsoon rain spent itself in October. Thereafter there was drought. Owing to uneven distribution the yields of crops were not uniformly good.

Crops.—Paddy was planted over 35.75 acres with an yield of 2,564 lb. grain and 3,237 lb. straw in the non-experimental area. Sunkisannam 5, BAM 1 and Mypali 7 were cultivated for seed multiplication. Pure line selection was in progress in Ramasagaram, Ramagada, Baleramabhogam, Vazzanam and palagarbhayyanda. Work in three seasons on chodi, ganti, jonna was continued. In chodi, AR 125 and AR 129 recorded better yield than the standard 525 in the Punasa season with yields of 3,010 lb. and 2,688 lb. respectively.

Sugarcane.—Co. 467, Co. 469, Co. 473 were promising from the point of juice quality and growth vigour though inferior to Co. 419 the control. In the yield trial, with mid-season maturing varieties, Co. 449 recorded the highest tonnage of 43.31 per acre, closely followed by Co. 542. With 42.87 tons against 37.23 tons yielded by Co. 421, the control. In the late maturing varieties Co. 444 gave the highest acre yield of 56.13 tons followed by Co. 419 (control) with 47.92 tons of cane per acre. An experiment to determine the optimum Nitrogen requirements of cane by application of 50 lb., 100 lb., 200 lb., 250 lb. per acre was laid with Co. 419 for the first year. An average yield of 64.39 tons was recorded from these fields.

SUGARCANE RESEARCH STATION, GUDIYATTAM.

23. *1. Varietal trials*.—(1) *Study plots*.—Thirty-seven varieties were tried in the March-planted plots under two sets of conditions, normal and restricted, Co. 363, Co. 460, Co. 465, Co. 471, Co. 475, Co. 527, Co. 553, Co. 557, POJ. 2961 and Co. 419 (control) recorded over 19 per cent sucrose and 90 per cent purity. Co. 467 was the highest yielder in these plots. Co. 466 and Co. 475 were next best. Co. 463, Co. 466, Co. 467, Co. 469, Co. 472, Co. 475, Co. 551, Co. 554, Co. 562, Co. 563 and Co. 565 out-yielded the control, Co. 419.

In the June-planted study plots, Co. 545 gave the highest yield of 31.39 tons of cane per acre and was superior to Co. 419, the standard.

(2) *Yield trials*.—In a preliminary yield trial with ten mid-season maturing varieties, Co. 554, recorded the maximum yield of 30.48 tons of cane closely followed by Co. 461 with 30.23 tons against 24.20 tons given by Co. 419, the control.

Among the varieties compared in the early and late yield trials Co. 449 stood first, and was superior to Co. 421 and Co. 419, the controls in the two series respectively. It gave 29.44 tons of cane when cut in December as an early cane and 36.64 tons as a late cane against 22.48 tons yielded by Co. 421 and 31.80 tons recorded by Co. 419. However, Co. 421 and Co. 419 were slightly superior to Co. 449 in point of jaggery recovery with 12.66 per cent and 12.98 per cent recovery in cane weight against 12.33 per cent and 12.88 per cent recorded by Co. 449 in the early and late trials respectively.

II. Cultural trials—Time of planting late varieties.—Plantings in May closely followed by the April planted crop recorded the highest yields when compared to March and June-planted crops. Co. 419 gave better yields than Co. 411 in this experiment.

AGRICULTURAL RESEARCH STATION, SAMALKOTA.

24. *Paddy*.—Paddy was grown in a total area of 34.61 acres. An average yield of 3,248 lb. per acre was obtained. An area of 30.51 acres was devoted for growing pure seed of S.L.O. strains 1 to 18 and GEB. 24 for distribution in the district.

(1) *Study of selections and types*.—Out of 198 selections in Akkullu, Atragadda, and Rasangi, handled last year, 76 were carried forward and they were transferred to Agricultural Research Station, Maruteru, for further study. The different types, three in all, were also sent to Maruteru.

(2) *Yield trials*.—(a) *Dry paddies*.—Five Budama cultures were studied on observation plots for their yield performances.

(b) B.A.M. 6 and S.L.O. 10 yield trials :—B.A.M. 6 has proved a better yielder than S.L.O. 10. As B.A.M. 6 recorded

significantly higher yields in two out of three years of trial, it is proposed to stop the experiment and multiply B.A.M. 6 for distribution.

(3) *Manurial trial*.—(a) The trial with water-hyacinth indicated that it can be useful as a green leaf manure to paddy.

(b) The trial with S.L.O. 3 with different doses of nitrogen from groundnut cake, had shown that

(i) the yields gradually increase with the increased doses of nitrogen;

(ii) the differences in yield due to different doses of nitrogen are statistically significant.

(4) *Cultural trials—Inter-seasonal cropping trials*.—The trial with GEB. 24 as an intermediate crop coming between an early short duration Sarava crop and a daiva crop was not successful. The intermediate crop and the second crop recorded very poor yields, the former due to a heavy attack of stem-borers and the latter due to late planting, necessitated by the late maturity of GEB. 24.

Second crop.—The two popular varieties S.L.O. 12 and S.L.O. 16 were raised on a bulk scale in a total area of 8.61 acres.

Sugarcane.—The cane area 5.71 acres was mainly occupied by varietal trials, observations of new arrivals and cultural trials, like wrapping and propping and minimum expenditure trials.

Varietal trials.—Different types of cane were under observation for yield, growth, tillering, etc., in two series with Co. 419 and Co. 421 as respective controls.

Yield trials.—(a) *Preliminary yield trials*.—Fifteen varieties were under preliminary yield trials with Co. 421 as control. Of these, eight promising varieties were carried forward for regular yield trial in the next season.

(b) *419-series*.—Five varieties were under yield trials for the second year with Co. 419 as control. Co. 419 gave the highest yield as in last year, and was followed by Co. 545 and Co. 517.

Cultural trials.—(1) *Wrapping and propping experiments*.—The trial was run on the same lines as last year. The results show that the treatmental differences and inter-actions between treatments and varieties are not statistically significant.

(2) *Minimum Expenditure trials*.—This is the second year trial and the experiment was conducted on the same lines as last year. Even though the treatment 'local' has given, as in the previous season, the highest yield, interpretation of the results on an economic basis shows that economic practice II has given better monetary return.

Plantain.—A total area of 3.08 acres was under plantain under the two systems of planting Tholakari and Seethakattu (planted and ratoon).

Miscellaneous crops and vegetables—Green gram—Yield trials.—As in the previous years, culture G. 3 11/105 was found to be the best yielder, and it is proposed to multiply this for distribution. Further trials on green gram were stopped and the cultures were transferred to Pulse Station, Vizianagaram.

Vegetables.—Different kinds of gourds, greens, beans, and other popular vegetables were grown on the station on a total area of 1.84 acres. The seed was mostly utilized for preparation of vegetable packets.

RICE SUB-STATION, BUCHIREDDIPALEM.

25. *Improvement of local varieties of paddy in Nellore district*.—(a) *Pishanam*.—Culture 1,293 of the first batch was multiplied on the station and in the taluks of Kandukur and Kavali for distribution. The results of strip trials with three cultures of the first batch and two of the second batch of selections with Pishanam local are significant.

(b) *Molakolukulu*.—Thirty-six cultures belonging to a second, third and fourth batch of selections in Molakolukulu were grouped into series on the basis of glume colour grain and duration. The individual cultures forming the series and bulk obtained by mixing high yielding cultures of the series were together compared against Molakolukulu local, both in the early and late planted conditions. During the year when seasonal conditions were favourable, the results of the trials have shown that—

(1) eleven cultures have yielded 10 to 16 per cent increase over the standard in early planted condition;

(2) under late planted condition, 19 cultures have recorded increased yield above the standard by 10 to 37 per cent;

(3) nine cultures have recorded increased yield within the early and late planted conditions;

(4) the bulks made of the cultures of each series have yielded more or less the average of the increase recorded by the cultures themselves.

Out of 30 cultures in the preliminary yield trial one gave significantly better yield than 2.552, a promising culture under distribution and 24 were on a par with it.

AGRICULTURAL RESEARCH STATION, NANDYAL.

26. *Charge*.—Sri T. Krishna Reddy, B.Sc. (AG.) was in charge of the station till the 13th May 1944 and Sri R. Narasimha Reddy, Farm Manager, continued to be in charge from the 14th May 1944 till the end of June 1944.

Season.—The rainfall though normal was not evenly distributed with the result that the early sown crops suffered from drought, and the late sown one from excess of moisture.

Cotton.—Out of an area of 17.43 acres put to cotton, No. 14 bulk occupied an area five acres. It gave an acre yield of 310 lb.

Jonna.—Jonna selections and bulks occupied an area of 26.5 acres and N.J. 29/68 grown over an area of 13.5 acres, gave an acre yield of 290 lb. due to adverse seasonal conditions.

Korra.—The area under Korra mixture was 11.26 acres and N. K. 132 grown over an area of 8.90 acres gave an acre yield of 130 lb.

Vegetables.—Different kinds of vegetables were grown for the production of seed and 2,950 packets of seeds were made from the seed produced.

Agricultural Education.—Six students are undergoing training in short course in Agriculture from April 1944.

Livestock.—There were 1,925 cows on an average in milk in the year. The average yield of milk in pounds per head recorded 3.12 lb. from one calving to another and 6.07 lb. for the lactation period. Thirty-three services were performed by the three bulls on the station.

AGRICULTURAL RESEARCH STATION, GUNTUR.

27. *Season.*—The total rainfall received during the year was 26.59 inches as against 32.98 inches, the average for the past 21 years. The season was unfavourable for variga and chillies and fair to the other crops.

Crop improvement—(a) *Millets.*—Selection work in punasa and painu jonnas, korra, sajja, variga and maize was continued. J. 895 is added to the list of strains under issue from this station viz., J. 869 (yellow), J. 916 (Red), J. 103 and J. 75. In korra K. 6 was largely in demand. In variga, small quantities of seed have been collected for trial in the next season. In maize it is proposed to take up hybridisation work.

(b) *Tobacco.*—Selection work was continued in Virginia, country and cheroot types.

(c) *Chillies.*—Strain No. 398 continued to be popular on account of its high yield, tolerance to thrips, and getting a premium of Rs. 24 over that of local per candy. Experimental work was continued as in the past. In the comparative trials strains 1402, 1406 and 1410, having given consistently better yields will be tried in the district against 398 and local.

(d) *Pulses.*—Cotton Specialist's Redgram strains Nos. 1723, 2028, 2515 and 2840 were tried in comparison with Bellary local, as a mixture with sajja one line for every five lines of sajja. None of the strains was found superior to Bellary local.

Agronomy—(1) *Cultural trials.*—Bar pointed plough versus country plough versus Cooper plough No. 11 (inversion plough). No special advantage was found in bar-pointed plough. The trial will be discontinued.

(2) *Continuous cropping versus rotation experiment.*—Growing of tobacco and chillies on the same plot as against rotation was started afresh again. It will be possible to assess the value of the experiments only after a few years.

(3) *Chilli Cotton mixture trials.*—The economics of growing a mixture of chillies and cotton, a practice in vogue in Gollaprolu of East Godavari district was repeated again. The difference in money value of produce from the two treatments was not significant.

(4) *Mixed cropping trials.*—These were continued.

(5) *Cotton manurial experiment.*—This was initiated at the instance of Indian Central Cotton Committee. Plots were laid out to test on cotton the direct effect of groundnut cake and ammonium sulphate applied at 0, 20, 40 and 60 lb. Nitrogen per acre to apply in two methods broadcasting and drilling. Except in groundnut cake 40 lb. and 60 lb. broadcasted, where the stand was low the yields in the rest were nearly equal.

(6) *Rainfall and crop yield correlation experiment.*—This is a long range experiment started in 1941-42 and is being continued. From this year's results groundnut and pyru jonna, it is gathered to yield more in years of higher rainfall.

Miscellaneous.—The fruit trees in the orchard are five years old. The growth of trees, especially the citrus and the mango, is remarkably good.

Vegetables.—To help "grow more vegetable" campaign, vegetables were raised in the interspaces of the fruit plants in the orchard area. Sales effected consisted of 285 lb. of vegetable seeds, 4,600 tomato seedlings and 1,125 brinjal seedlings.

DRY FARMING STATION, HAGARI.

28. The scheme of Dry Farming Development scheme was sanctioned in G.O. No. 1307, dated 29th June 1943 with the help of a grant from Imperial Council of Agricultural Research for a period of 2 years 9 months from 1st July 1943 to 31st March 1946. This is the first year's report. The object of the scheme is to try out the improved dry farming practices on a large scale on cultivators' fields, to give them an opportunity to see for themselves under their own conditions of soil and cultivation, the value of the improved practices. Therefore with a view to elicit their opinion on the results of this year's trial, a conference of cultivators was held, and the various improvements on large scale were discussed. The vote was unanimous in favour of contour embankments. The question is one of inability to meet the capital cost. This can be

solved to some extent by assistance from Government in the form of loans. The next largest measure of agreement was on wide spacing of crops 18 inches for sorghum and 36 inches for cotton. With regard to bunding 7 inches high by the bund former, as an annual operation, in preparatory cultivation, it was agreed that it could be done with advantage for sorghum only. With regard to the short duration of jonna strain M. 47-3, as compared to the existing strain T. 1, this strain was found deficient in producing straw.

GUNTUR,
8th September 1944.

S. SITARAMAPATRUDU,
Deputy Director of Agriculture,
Northern Division.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, CHITTOOR, FOR THE YEAR 1943-
44 (FROM 1ST JULY 1943 to 30th JUNE 1944) (FASLI
1353).

I. CHARGE.

Mr. Sadaat-Ullah Khan was in charge of the Central division, Chittoor, till 18th March 1944 when he proceeded on leave for six months handing over charge to Rao Bahadur Sri V. Ramanatha Ayyar, Headquarters Deputy Director, Madras. The latter was in charge of this division till 1st April 1944 on which date I returned from leave and assumed the charge of the post of the Deputy Director of Agriculture, Central division, Chittoor, and continued to be in charge for the rest of the year under report. The outstanding feature of the year was the restoration of the Agricultural Demonstrators to the Headquarters taluks of the District Agricultural Officers and the appointment of firka maistris.

The names of the District Agricultural Officers who held the charge of the districts at the end of the year under report are given below :—

Head-quarters.	Name of the officer.	Taluk with Demonstrators.	Taluk without Demonstrators.	Remarks.
<i>A. Anantapur district.</i>				
Anantapur ..	Sr V. N. Subanna Acharya.	8	1	The Agricultural Demonstrator, Hindupur, is in additional charge of Madakasira taluk throughout the year.
<i>Cuddapah district.</i>				
Cuddapah ..	Sri K. Jagannada Rao.	6	1	There is no demonstrator at Sidhout since 6th August 1943.
<i>Chittoor district.</i>				
Chittoor ..	Sri M. Kanti Raj	8	2	Kuppam and Kalahast are without demonstrators.
<i>Chingleput district.</i>				
Saldapet ..	Sri M. Subramaniam Pillai.	7	..	....
<i>South Arcot district.</i>				
Cuddalore ..	Janab A. Gulam Ahmed Saib.	8	..	....
<i>North Arcot district.</i>				
Vellore ..	Sri M. A. Bala Krishna Iyer.	8	8	Cheyay, Polur and Gudiyatam are without demonstrators.
<i>Salem district.</i>				
Salem ..	Sri S. Dharmalinga Mudaliar.	10	..	No Agricultural Demonstrator was in additional charge for over six months.

II. AGRICULTURAL EDUCATION.

2. The Juvenile school at the Agricultural Research Station, Palur, continued to work satisfactorily. There were 30 pupils on the roll and the daily average attendance was 16. The night school was not functioning.

III WAR EFFORT AND GROW MORE FOOD CAMPAIGN.

3. *War effort.*—Intensive propaganda was done in all meetings held by the district staff to contribute liberally to the War Fund. Young and able-bodied men were induced to enlist in the army. The Agricultural Demonstrators regularly visited the reading circles allotted to them, and read the Yuddasanchika to the gatherings. They also did propaganda for the Defence Savings drive and helped the Revenue Department to reach the target figures. A sum of Rs. 3,987 was contributed towards War Fund by the officers and the staff during the year. Besides they also collected an amount of Rs. 78,963 towards the War Bonds and National Savings Certificates, etc. The major portion of this collection was done by the district staff in Cuddapah district. The Collector of Cuddapah district awarded three prizes to three Agricultural Demonstrators who made the maximum collection.

4. *Grow More Food Campaign.*—Intensive propaganda was done by the district staff throughout the division during the year under report for the increased production of food crops by addressing 6,270 meetings of ryots and by organizing food committees. The various concessions granted by the Government to increase the area under food crops and the advantages of growing departmental strains on a large scale with judicious and extensive application of oil cakes were explained to the ryots. They were also advised to take full advantage of the interest-free Takkavi loans for the purchase of improved seeds and manures. A "Grow more food week" was celebrated throughout the division to make the people more conscious of the need for increasing the area under food crops. Prizes in the shape of improved implements, manures and certificates were awarded to deserving ryots who took active part in growing more food crops. As a result of the departmental propaganda, and also due to favourable season, the increased area brought under food crops was 5,28,000 acres over that of last year. In the case of paddy alone the increased area comes to 39,000 acres over the normal area in this division. The sowing of cereals and pulses as a mixture with non-food crops was also advocated and the area brought under this item of work was 67,500 acres. No imported strains were obtained from outside the province. But the quantity of improved seeds of paddy, ragi, cholam, cumbu and korra distributed during year from the department together with the seed made available from reliable ryots was 527.5 tons. The area covered by this seed was about 50,581 acres. Taking the area under natural spread into account, the total area occupied by all the improved strains of food crops during the year is estimated to be about 675,200 acres. The quantity of green manure seeds made available

to the ryots by the department as well as by private agencies was 177,629 lb. The total area under green manure crops including the natural spread comes to 99,889 acres. Oil cakes and bonemeal were also advocated. Cakes in large quantities were applied to paddy. The quantity distributed was 24,600 tons and the area manured was about 194,700 acres.

The percentage of increase in the production of food crops as compared with the previous fasli is about 12.

5. *Vegetables.*—Special attention was paid during the year under report for the increased production of vegetables. Propaganda was done for the increased production of vegetables by growing them in the backyards and compounds of houses and also on a field scale, and a demand for increased vegetables seeds was created. During the year a central seed store was opened at Madras to meet the increased demand for seeds for vegetable growers in the city. During the year 2,766 lb. and 16,239 packets of vegetable seeds were distributed and an area of 5,862 acres was brought under vegetable cultivation. Three special vegetable farms were opened in Chingleput and Chittoor districts for the Military supply.

IV. DEMONSTRATION.

6. *Season and rainfall.*—The south-west monsoon set in time in all the districts except in Salem and South-Arcot. The rainfall was normal and well distributed in the districts of North Arcot and Chingleput while it was far below the average in Chittoor. Tanks had however adequate supply of water due to unprecedented rainfall received in May 1943. Sowings of dry crops and planting of paddy were taken up in time. In Salem and South Arcot districts the rains received in July and August were neither heavy nor evenly distributed and in consequence it was not possible to complete the dry land sowings and prepare the paddy nurseries in time. In Cuddapah and Anantapur the season began well and early crops of green manure, korra, varagu and cumbu were sown. These crops suffered considerably due to poor rainfall in July followed by prolonged drought in August; but, they however revived to some extent with the help of good rains received in September. The September rains were taken advantage of to sow Hingari crops in Cuddapah and Anantapur districts and the transplanting of paddy was pushed through.

The North-east monsoon started in time throughout the division except in Anantapur district. There were heavy rains in the months of October and November in all the districts. This rainfall brought good supplies to the irrigation sources and there was copious supply of water throughout the year. It was therefore possible to bring the maximum area under paddy in most of the districts. The continuous wet weather prevailed in October and November, adversely affected the dry crops in Chingleput, Anantapur and Cuddapah districts. More pests and diseases were in evidence. The late sown korra got badly affected with rust while castor, pulses and white-cholam suffered from insect attacks and in consequence their yields

were reduced. The weak south-west monsoon and the drought that prevailed in August were also responsible for low yields of all rain-fed crops.

There was bright weather during the months of January and February and it was helpful for harvesting and threshing of paddy, jonna and pulses. In March there was an unusual heavy rainfall in Cuddapah district which not only interfered with sugarcane curshing but also caused heavy floods in Pennar with the result the whole Melon crop cultivated in the river bed was washed away. Though the rains were inadequate during the hot weather season, the crops did not suffer in the districts of Chingleput, Chittoor and North Arcot on account of the availability of water in the tanks, wells and good springs in the river channels.

The South-west monsoon made its appearance early in the June 1944 with some good showers and with the help of these rains sowings in dry lands were taken up in some districts.

The season for the year under report was favourable to paddy, sugarcane and cotton, but not for dry crops which suffered from continuous wet weather during north-east monsoon period.

Rainfall.

	1942-1943.	1943-1944.
	INCHES.	INCHES.
Anantapur	13.49	17.98
Cuddapah	28.14	33.87
Chittoor	38.89	49.36
Chingleput	45.15	63.37
North Arcot	46.62	40.45
South Arcot	74.48	40.32
Salem	36.32	39.06

A. CROPS.

(a) Cereals.

7. *Paddy*.—Paddy is an important crop cultivated in all the districts under various conditions depending upon the source of water-supply. The main improvements advocated for this crop are the extension of area under superior strains, reduction of seed rate in the nurseries, economic planting and proper manuring.

(a) *Distribution of superior strains*.—During the year under report as many as 41 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 place does not fare well even in an adjoining taluk. But the more important and wide spread among them are G.E.B. 24, Co. 2, Co. 3, Co. 7 and Co. 14 for samba season and Co. 18, Add. 3 and Add. 18 for the Kuruvai season. With the recent introduction of short duration strains such as Co. 13 and Co. 18 the long-felt need for improved paddy strains for Navarai season (December to March) has been met in North Arcot district. The strains of Co. 2, Co. 3, Co. 13, Co. 14 and Co. 16 are spreading in Salem district and Co. 20 in Anantapur district. Vigorous propaganda was made this year to increase the area under paddy and to

intensify its cultivation by heavy manuring in order to get increased yields. With a view to augment the seed supply seed farms on a large scale were organized in ryots' lands and also through the medium of the three seed multiplication schemes sanctioned for Chittoor, Cuddalore and Chingleput districts. The quantity of improved seeds supplied to the ryots by the department during the year was 1,061,976 lb. as against 462,451 lb. in the previous year. The area occupied by these strains was 552,183 acres. It exceeded last year's area by about 103,025 acres. This is about 23 per cent of the normal area under paddy in this division.

(b) *Cultural*.—Raising of thin paddy nurseries in well manured seed beds followed by economic planting was largely advocated in places where there were facilities for the same such as assured water-supply and fixed periods of planting. The area under economic planting was 344,174 acres as against 281,527 acres during the previous year.

(c) *Manuring*.—The ryots are fully aware that the application of green manure is the cheapest and the best method of manuring for paddy. The suitable crops advocated for growing as green manure are kolingi, daincha, sunnhemp, indigo and pillipesara. This practice has become widely popular in places where the seasonal conditions are favourable. The chief handicap to the rapid extension of the area under green manure crops is the lack of irrigation facilities in the summer months of April and May when they suffer most for want of moisture. The area occupied by them during the year was about 101,857 acres as compared with 89,885 acres in the previous year. The quantity of green manure seeds supplied was 177,629 lb. The application of bonemeal and superphosphate in conjunction with green manure was also advocated. The quantities of these fertilizers used were 562 tons and the area manured with these was 12,375 acres. Oil cakes in large quantities of 24,038 tons were applied to paddy and the area manured was 182,338 acres.

8. *Millets*.—Cholam, cumbu, ragi and korra are the important millets grown in this division. There are now under trial and distribution 12 strains in cholam, 5 in cumbu, 5 in ragi and 3 in korra. The area occupied by these strains during the year is estimated at 123,018 acres. The statement showing the quantity of seed distributed and the area covered including the natural spread is given below :—

	Cholam.		Ragi.		Cumbu.		Tenal.	
	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	4,018	6,870	3,911	953	..	..	682	411
South Arcot	135	42	4,037	3,967	..	68	..	..
Anantapur	23,233	47,276	20,440	6,539	..	15	10,122	11,863
Salem	1,932	453	2,891	28,788	836	1,565	..	..
North Arcot	724	175	3,446	6,000	1,650	258	..	..
Chingleput	740	27	1,558	1,248	60	97	..	..
Chittoor	2,753	275	36,567	6,694	208	26	..	..
Total	34,435	55,126	72,850	53,589	2,744	2,029	10,804	12,274

(b) *Sugarcane.*

9. Popularization of improved varieties was the most important activity in regard to this crop. Co. 419 is the most popular variety throughout the division. Co. 281 is popular in South Arcot and North Arcot districts while P.O.J. 2878 was popular in Cuddapah and South Arcot. The other popular variety in South Arcot district is Co. 349. The total area under improved varieties was 44,380 acres as against 42,203 acres of last year. The other improvements advocated are planting in trenches with proper spacing, judicious manuring and the use of improved mills and furnaces. Trenching and line planting of cane with wider spacing was done in 24,138 acres. During the year under report as many as 1,047 Sindhiwaha furnaces were constructed and 178 demonstrations of jaggery making were given.

(c) *Fibres.*

10. *Cotton.*—Cotton is grown as a dry crop in Anantapur and parts of Cuddapah districts. H-1 strain is popular in these two districts for its better lint quality and higher ginning percentage than the local. During the year under report it occupied an area of 114,439 as against 126,351 acres in the previous year. Co. 3 Cambodia is the most favoured strain in Salem. This was recently introduced to replace Co. 2 as the former is capable of spinning up to 50s which is a great advance over that of Co. 2. The Co. 3 Cotton Multiplication Scheme is in its third stage. During the year under report the scheme was extended to Rasipuram and Salem taluks. Altogether a quantity of 96,246 lb. of seed for an area of 4,500 acres was distributed. Three ginning factories were arranged and five dealers were appointed in time to purchase the seed farm kapas. About 4,000 bags of seed are expected to be obtained from the seed farms of this year. Co. 3 and Co. 4 are also grown in the districts of North Arcot, South Arcot and Chittoor. The total amount of seeds of all Cambodia strains distributed during the year was 273,698 lb. and the area sown with these strain was 47,503 acres.

(d) *Oil-seeds.*

11. *Groundnut.*—Propaganda for the improvement of this crop was continued on the same lines as in the previous year by distribution of improved seeds. The varieties introduced are A.H. 25, A.H. 45, A.H. 32 and A.H. 698. A.H. 25 is popular in Chittoor, Cuddapah and Anantapur districts. A.H. 45 is also grown in a small area. A.H. 698 is popular in Salem, North Arcot and Cuddalore districts. The distribution of seeds of all the strains amounts to 37,205 lb. and these strains occupied an area of 16,945 acres during the year.

Gingelly.—S.I. 89 is popular in South Arcot and North Arcot districts. It is not found suitable in Cuddapah. The total quantity of seeds of this strain distributed was 1,034 lb. and the area brought under this strain including the natural spread was 1,025 acres.

Coconut.—The chief items of propaganda were selection of seed nuts and seedlings and proper method of planting 25 feet apart. General advice on inter-cultivation and raising and application of green manure crops was also given. Eighteen hundred and twenty-eight seednuts and 1,299 seedlings were supplied from the coconut stations.

(e) *Fodder.*

12. Growing of crops exclusively for fodder purposes was one of the important items of propaganda done by the department and it may also be stated that a considerable portion of ryots population are now setting apart a small portion of their holding for growing fodder crops. The demand for seed and grass slips was met as far as possible. The following seeds and grass slips were supplied to the ryots during the year.

Fodder cholam 60,040 lb., pillipesara 28,076 lb., Kalukattai grass 35 lb., Lucerne 62 lb., maize 12 lb. and guinea and Napier grasses 29,050 slips.

(f) *Pulses.*

13. The need for increasing the area under pulses was explained to the ryots and growing these grams as a mixture with groundnut cotton, cumbu and cholam was advocated. The ryots were also advised to grow black and greengrams after paddy. During the year 8,089 lb. of seeds of pulses were distributed.

(g) *Fruits.*

14. The area under fruit trees has been steadily increasing as a result of the intensive propaganda made by the department. The cultivators now realize the advantages of raising fruit trees with reliable grafts, and there is a great demand for the grafts produced by the department. The following fruit plants were supplied by the department during the year.

Mango	1,287	Grape vine cuttings ..	115
Citrus	1,552	Other fruits plants like	
Plantain suckers ..	750	figs, jacks, pome-	
Sapotas	75	granates, etc. ..	93
Pine apple suckers ..	1,312		

(h) *Vegetables.*

15. *The exotic vegetable scheme.*—This scheme was sanctioned by the Government to produce and supply vegetables to the Military department. An area of 58 acres was taken over by this department from the Hosur Cattle Farm for the production of vegetable. As many as 25 kinds of vegetables were cultivated and the total quantity of vegetables supplied till 31st March 1944 was 625,698 lb. and the sale-proceeds amounted to Rs. 47,614. The expenditure of

the scheme including the cost of the staff was Rs. 22,026. Thus the net profit got from the scheme was Rs. 25,588. As this scheme was closed, a separate scheme was started in Hosur taluk with a view to supply 6,000 lb. of exotic vegetables daily to the Military. The vegetables are grown under conditions of agreement. This scheme was started on 6th April 1944. About 40 acres are planted with vegetables every month to maintain a regular supply. Supply of vegetables was commenced from the 1st of July and the average daily supply works out to 5,000 lb. The indigenous vegetable scheme in Salem taluk was also taken up during the year with a view to supply 1,000 tons of vegetables to the Military. About 40 acres have been brought under vegetables so far and the supply of vegetables will be commenced from the 1st of September 1944.

Potatoes.—The potato scheme was commenced on 14th February 1944. The quantity of seed distributed was 151,429 lb. and the planting was done in an area of 150 acres at the end of May 1944. The early planted crop is having a good stand.

Bellary onions.—Propaganda for increasing the area under this vegetable was carried on throughout the division. The quantity of seed distributed was 2,452 lb. in the districts of Anantapur, North Arcot and Salem.

(i) *Soil erosion.*

16. Soil erosion is a serious menace in dry lands. Considerable propaganda was done for the protection of soil from erosion. Seven hundred and ninety-four demonstrations with bund formers were given and 5,616 acres were bunded. Peripheral bunds were put up over an area of 221 acres. Terracing was done over 55 acres. Hedge planting against erosion by wind was done for an area of 197 acres. To consolidate bunds 16,000 suckers of aloes were planted during the year.

Permanent embankments with stone were put up in 15 places in Rayachoti and to a length of 150 yards in Jammalamadugu.

B. AGRICULTURAL IMPLEMENTS.

17. 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. 14, Gurjar plough, Zamindar plough, Karachi Bar pointing plough, P.S.G. No. 6 are the type of ploughs that were in great demand. Ridge ploughs the G.M. Trampler, the wet land puddler are also in great demand. The sale of implements was limited to their availability with the concerned firms. During the year 434 ploughs were sold to the ryots by the department and 188 by the private agencies. One hundred and nine tons of iron defectives and cuttings were supplied to the ryots for the manufacture of agricultural implements. The following statement gives the

number of demonstrations conducted and the implements sold by the department during the year :—

	Sale.	Demonstration.
Ploughs	622	5386
Guntakas	Nil.	224
Pruning tools and other horticultural implements	13	1,577
R. L. Mhote wheels .. .	78	601
Triangular harrow	..	29
Bund former	3	726
Planet junior hoe	..	28
Buck scraper	..	128
Chaff cutters	1	19
Turmeric polisher	..	4
Sprayers and dusters	..	400
Wet land puddler	2	230
Seed drill	..	25
G. M. Trampler	..	208
Sugarcane mills	47	45
Ridgers	2	142
Wooden rice huller	4	124
G.S.T. Burners	139	45
Floating lamps	69	70
Iron gratings	39	32
Juice boiling pans	60	..
Spare parts	1,972	..

C. MANURES.

18. (i) *Farmyard manure.*—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 regularly and cover them with earth. To collect urine by use of dry earth in cattle-sheds and construct loose box cattle-sheds for stalling of animals. As a result of this propaganda 24,824 manure pits and heaps were maintained on improved lines. Four thousand five hundred and eighty-five dry earth and 389 loose box sheds were constructed.

(ii) The composting of all kinds of farm and habitation waste material was also demonstrated in 603 cases. Composting of municipal rubbish with nightsoil was undertaken by 18 municipalities and unions during the year.

(iii) *Greenmanuring*.—Growing of greenmanure crops such as kolingi, daincha, sunnhemp, indigo and pillipesara has become an established practice in paddy areas where the conditions are favourable. The total quantity of greenmanure seeds sold during the year both by the department and the private dealers was 177,629 lb. and the area grown to these crops during the year was 99,899 acres.

(iv) *Concentrated manures*.—Intensive propaganda was undertaken by the department for liberal use of oil cakes for paddy and sugarcane as artificial manures could not be had. Cakes in large quantities were applied to these crops during the year. About 24,038 tons of oil cakes and 562 tons of bonemeal and other fertilizers were supplied to the ryots by the department as well as by private agencies and the estimated area that was manured with cakes, bonemeal and other fertilizers was about 194,700 acres.

D. SUBSIDIARY INDUSTRIES.

19. (a) *Apiculture*.—Bee-keeping as a cottage industry is popular in the districts of Chittoor, North Arcot, South Arcot, Chingleput and Salem. Five bee-keepers associations are functioning in Salem district. There is an apiary training centre at Chittoor which was visited by a number of ryots interested in bee-keeping. Three persons and four District Board school teachers were given training in bee-keeping. Twenty colonies were working successfully at this centre. Out of 91 colonies hived of which 44 were sold to private parties and five were transferred to Agricultural Demonstrators. During the year under report 799 bee-hives were maintained and of these 285 were newly hived. The number of honey extractors and bee-hives supplied to the ryots was 4 and 39 respectively.

(b) *Malt making*.—There are three private concerns at Chittoor preparing ragi malt on a commercial scale. There was a great demand for the product from all the principal towns in the Presidency.

E. PESTS AND DISEASES OF CROPS.

20. The outbreaks of red hairy caterpillar on groundnut and cereal crops were not severe during the year. They were brought under control by enforcing the Pest Act with the special staff engaged for the purpose in the districts of Chittoor, North Arcot and South Arcot. Blast on paddy in South Arcot, and rust on korra in Cuddapah and Anantapur appeared in a serious form reducing their yields. The efficacy of treating jonna with sulphur against smut is well realized by the ryots and it is estimated that an area of 27,122 acres were sown with treated jonna seed. The area has gone down when compared to that of last year as fungicides were not available in sufficient quantities. The other pests and diseases controlled during the year were thrips on chillies and onions, paddy swarming caterpillar, paddy ear-headbug, grosshopper on millets,

Epilachna on brinjal, mango hopper, plant lice on citrus and grapevine, and frenching, dieback and Gammosis on citrus. The demonstrators in Entomology and Mycology working in this division attended to 213 special calls in connexion with the attacks of pests and diseases on fruit and vegetable crops. Four hundred and sixteen spraying and dusting demonstrations were conducted by the district staff during the year. The quantity of insecticides and fungicides supplied to the ryots was 1,300 lb.

F. LEGISLATION.

21. (a) *Cotton Ginning and Pressing Factories Act*.—The number of cotton ginning and pressing factories inspected during the year was 29. Owners of three factories were prosecuted during the year for offences under sections 3 and 6.

(b) *Agricultural Pests and Diseases Act*.—The provisions of this Act were enforced in the whole of Sidhout taluk, Cuddapah district, prohibiting the use of oil-cakes as manure for melon crop grown in the bed of the river Pennar as a measure to prevent the annual outbreak of cattle fly pest.

(c) The Cambodia Pest Act and Cotton Transport Act were in force. Both the Acts were enforced successfully without penal clauses being utilized. The Madras Market Dealers Licensing Order came into effect during the year with the help of which the department is now in a position to gauge the production and utilization of oil-cakes in the districts.

G. DEMONSTRATION AND TRIAL PLOTS.

22. The agricultural demonstrators with the help of their maistris arranged demonstration plots as usual on cultivators' fields to convince them of the superiority of the strains, implements, methods of cultivation and manuring pertaining to paddy millets, cotton and oil-seeds. There were 2,101 demonstration plots conducted in the division during the year.

23. *Trial plots*.—The superior strains evolved at the Agricultural Research Stations are not immediately advocated to the cultivators. They 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 throughout the division. There were during the year 463 trial and observation plots.

In the trials conducted with the three strains of ragi, E.C. 3735, E.C. 800 and E.C. 382 in Cuddalore taluk, E.C. 382 gave higher yield while E.C. 800 gave 5 per cent less yield than the local.

Trials were conducted with two strains of Cholam, A.S. 1093 and A.S. 3313 in Tirukkoyilur taluk. These strains gave increased yields of 14 per cent and 10 per cent respectively over the local. Of the six cotton strains tried on dry lands in Tindivanam taluk,

Co. 3 dried up on account of severe summer. The yields obtained from other strains by the first picking indicate that 6097, 5682 and Co. 2 are better yielders than 6113 and Co. 4.

H. WORK DONE WITH OTHER DEPARTMENT.

24. 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 Departments 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 the villages along with other departments.

Two paddy seed multiplication schemes were run through the co-operative societies in North Arcot and Salem districts. A quantity of 94,835 lb. of paddy seed was produced and distributed by the societies. An amount of Rs. 15 was disbursed as bonus to inner area seed-farm ryots and the concerned co-operative societies at Attur in Salem district.

The Co. 3 cotton seed multiplication scheme which is working through the Tiruchengode Co-operative Marketing Society is in its third stage. During the year the scheme is extended to Rasipuram and Salem taluks. The quantity of seed supplied to the cultivators was 96,245 lb. which covered an area of 4,500 acres.

I. SPECIAL SCHEMES.

25. *Paddy multiplication schemes.*—Paddy seed multiplication scheme in South Arcot district was sanctioned for two years. This is the second year of the scheme. The strains selected to be multiplied in the seed farms are P.L.R. 1, G.E.B. 24, Adt. 1, Adt. 2, Adt. 3, Adt. 8, Adt. 9, Adt. 11, Adt. 17, Adt. 21, Co. 2, Co. 5, Co. 6 and Co. 19. An area of 3,200 acres was put under seeds farms as against 3,500 acres proposed for the year. During the year 1,759,967 lb. of paddy seeds were purchased for distribution to the ryots.

The scheme for multiplication of paddy seed was worked in Chingleput district during the year and 17 units of seed farms were arranged in the district in an area of 750 acres under various strains. The District Agricultural Officer reports that he could get only 3,700 bags of seed as against 6,000 bags aimed at due to abnormal seasonal conditions. This is estimated to cover about 10,000 acres against 18,000 proposed in the scheme. Arrangements are now being made for running 2,500 acres of seed farms for further multiplication of seed and spread of strains for the year 1944-45.

A scheme on similar lines is being run in Chittoor district also. During the year an area of 600 acres was put under seed farms as against 750 acres proposed in the scheme. The quantity of seed purchased was 4,857 bags or 723,262 lb. The area proposed for seed farms during 1944-45 is 2,800 acres.

J. EXHIBITION AND SHOWS.

26. Nineteen exhibitions on a large scale and ninety-one small exhibitions were held in connexion with fairs, festivals, conferences health weeks and grow more food week celebrations. The most important and the biggest of these was the exhibition held at Madras during the war service exhibition. This exhibition attracted a very large number of people. A fruit show was arranged at Rajampet under the auspices of the Kodur Fruit Growers Co-operative Society. A cattle show was held for the first time at Cuddalore. During these occasions the district staff delivered 17,166 lectures on agricultural improvements.

K. AGRICULTURAL ASSOCIATIONS.

27. The object of these associations is to effect agricultural improvements on a large scale and also to create activities in connexion with grow more food campaign. With the help of these associations various agricultural improvements were pushed through. There were 351 agricultural associations functioning during the year. The district staff held 1,821 meetings and explained to the ryots on the necessity of increasing the area under improved strains and also to heavily manure the irrigated food-crops so as to obtain increased yields.

L. LOANS.

28. During the year the District Agricultural Officers granted takkavi loans amounting to Rs. 3,82,961 to 7,827 ryots for the purchase of seeds, manures and implements. The amount given for implements was Rs. 1,832. A statement showing the details of loans granted is given below :—

District.	Number of applicants.	Amount granted. Rs.
Anantapur	278	11,600
South Arcot	453	20,087
North Arcot	1,287	56,392
Cuddapah	700	30,598
Chingleput	..	34,731
Salem	675	30,275
Chittoor	4,434	1,99,278
Total	7,827	3,82,961

M. PUBLICATIONS.

29. The number of villagers' calendars, bulletins and other publications sold during the year was 3,177 and 211 respectively in addition to the free distribution of leaflets.

N. ARBORICULTURE.

30. Tree-planting and seed-sowing weeks were observed in all the districts of the division and the district staff distributed large quantities of seeds and seedling of *Prosopis juliflora*, *Glyricidea maculata*, tamarind neem, babul and casuarina. Three hundred and twelve pounds of seed and 565,174 seedlings were supplied to the ryots during the year under report for raising trees for fuel, timber, green manure leaf and live hedges.

V. AGRICULTURAL RESEARCH STATION.

31. *Agricultural Research Station, Palur*—(1) *Season*.—There was a total rainfall of 54.30 inches as against an average of 56.75 inches for 39 years. The south-west monsoon started late and sowings of dry crops were delayed. For wet lands there was no water in the channel till August. North-east monsoon commenced rather early and continued till December. Summer was hot and the wet crops had to be constantly irrigated. The season was normal on the whole.

(2) *Crops*—(i) *Paddy*.—16.11 acres were under paddy and the average acre yield was 2,014 lb. The low yield was due to adverse seasonal conditions at the time of flowering and harvest. Of the varieties grown Co. 19 gave a good yield of 3,270 lb. per acre while Berhampur No. 3 gave 2,592 lb.

(ii) *Sugarcane*.—This was raised in 6.32 acres. The floods that occurred in May 1943 damaged the young cane crop at the time of tillering and so much so, several tillers began to rot. An average acre yield of 27.75 tons was obtained as against 26.26 tons of 1942-43. Among the early varieties Co. 548 and Co. 508 were found to be better than others and have given an acre yield of 46.98 and 38.24 tons respectively. Among the mid-season canes Co. 446 and Co. 450 have fared better than the rest, giving an acre yield of 35.87 and 32.87 tons respectively.

(iii) *Millets*—*Cumbu*.—In the study to find out the direct and residual effect of different manures at different dosage, only the direct effect of farm-yard manure at 10 tons dose per acre was statistically significant.

Varagu.—The usual selection work was in progress along with the trials to test the yields. Cultures A. 104 and 124 have given significantly higher yields than the local.

Cholam.—Of the two strains tried for fodder A.S. 29 gave an acre yield of 14,156 lb.

Ragi.—E.C. 3735 during May-September season gave an acre yield of 1,150 lb. In the series where R. 382, R. 800 and

E.C. 3735 were compared, R. 382 has again given the highest yield. In bulk trials conducted both at the farm and in seven ryots' fields, R. 382 has consistently given higher yields—15 to 28 per cent over E.C. 3735.

(iv) *Cotton*.—Four strains under irrigation were compared with Co. 2. Co. 4 and Co. 3 gave the highest yield. Similarly five strains under rain-fed conditions were compared with Co. 2. The highest yield was given by X. 7795.

(v) *Fodder*.—A.S. 29 grown as a fodder crop gave an acre yield of 14,156 lb. Lucerne was grown in a small area of 12½ cents towards the close of the official year with a view to feed to milch cattle and poultry. At an average 7 lb. of green lucerne was obtained per day.

(vi) *Green manure crops*.—Sunn hemp was sown in 7.20 acres of garden lands and gave an acre yield of 2,709 lb.

(vii) *Orchard*.—This is the fifth year of plantation. The plants are having a satisfactory progress. Sapota and pomegranates have come to flowers.

(3) *Seed distribution*—

Name of seed.	Quantity.	
	LB.	OZ.
Paddy	9,798	8
Ragi	5,041	0
Cumbu	29	0
Groundnut A.H. 334 and A.H. 25 ..	3,830	0
Pillipesara	200	0
Daincha	8	0
Vegetable seeds	133	4 and 36 packets.
Chilly seed	0	2
Napier grass slips	3,000	0
Guinea grass slips	..	2,000
Chilly seedlings	..	200
Sugarcane sets	..	21,000
Paddy seedlings from 46½ cents.		
Ragi seedlings from 5 cents.		

32. *Demonstration Farm, Kalahasti*.—Due to excessive rainfall no semi-dry paddy was raised as usual. Due to same reason vegetables raised in September and October were spoiled. In January-February season, the following quantities of seeds were obtained :—

	LB.	Paddy—		PMS ACRE.
Brinjal	57			
Cowpea	26			
Ladies finger	33	Adt. 3	..	3,410
Cluster beans	8	Adt. 9	..	3,600
		Co. 13	..	3,350

194 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

Chinese budding work.—The demand for plants was great as usual. About 1,667 plants were sold during the year and indents were registered for 600 plants, with cost fully paid in advance. Over 8,000 Jamberi seedlings were transplanted for budding.

Rubber vine—Cryptostegia grandiflora.—Five acres of dry land were reserved for experimental work, of which 2 acres were transplanted with seedlings and 3 acres were sown with seeds. The work was done under the guidance of the All-India Controller of Rubber. The transplanted seedlings have established very well, while the plant raised from seeds have failed.

Eri-silk work rearing.—Two broods were raised. Extreme heat and non-availability of castor leaves all the year round are the two handicaps. The work had to be given up.

Seed distribution.—The following quantity of seed was produced and disposed as shown below :—

	LB.
Paddy	22,010
Ragi	2,581
Vegetables	61
Cholam	..
Total ..	24,652

Expenditure Rs. 3,517; Receipts Rs. 4,793

VI. PROGRAMME OF WORK FOR 1944-45.

33. *Agricultural Research Station, Palur.*—Paddy seed multiplication of improved strains, selection work, yield trials of kar sanba and green leaf experiment will be continued.

Millets.—The selection work on varagu, varietal trials of ragi, to study the direct and residual effect of different manures onumbu and the trial of cholam strains will be continued.

Sugarcane.—Trial of new varieties, comparative trials with the early and mid-season varieties and yield trials of early varieties.

34. *Demonstration—Crops.*—(1) Reduction in area under cotton cultivation and sowing the area so released with food-crops.

(2) Bringing uncultivated lands under cultivation wherever possible.

(3) Increasing the area by double-cropping the lands where irrigation facilities exist.

(4) Extension of areas of improved varieties and strains of paddy, sugarcane, millets, cotton, oil-seeds, pulses, vegetables extension of fruit cultivation, thin sowing of paddy nurseries, economic planting, line sowing of cotton and inter-cultivation with bullock power, trenching of sugarcane, and introduction of improved practices and measures for preventing soil erosion.

Implements.—Introduction of improved implements such as ploughs, guntakas, roll easy mhote wheels, improved water lifts, ridge ploughs, chaff cutters, buck scrapers, sprayers, turmeric polishers, green-manure trampler and wetland puddler.

Manures.—Conservation of cattle manure in pits on improved lines, preventing wastage in urine by spreading dry earth in cattle sheds, preparation of composts with organic waste, extension of green manuring and the use of oil cakes and other concentrated manures. Issue of loans for the purchase of seeds and manures will be continued.

Pests and diseases.—Control of pests and diseases and demonstration of remedial measures.

Miscellaneous.—Exhibitions, formation of Agricultural associations, distribution of villagers' calendar and leaflets, sale of bulletins, introduction of subsidiary industries such as poultry rearing and bee-keeping, close co-operation with Revenue, Co-operative, Veterinary Health, Public works department and National war front organisations for introducing all departmental activities.

Seed supply.—Seed farms for the multiplication and distribution of improved strains of paddy,umbu, ragi, cholam, cotton, oil seeds, will be conducted as usual. Special schemes sanctioned by the Government for the multiplication of paddy seed will be continued. Paddy seed farms will be arranged in an area 8,800 acres.

B. RAMAIAH,
Deputy Director of Agriculture, Central Division.

CHITTOOR,
14th August 1944.

196 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, COIMBATORE, FOR THE YEAR
1943-44 (FROM 1ST JULY 1943 TO 30TH JUNE 1944).

I. CHARGE.

The southern division comprises of nine districts of Coimbatore, Nilgiris, Madura, Ramnad, Trichinopoly, Tinnevely, Tanjore, Malabar and South Kanara and Sri C. Ramaswami Nayudu was in charge of the division from 1st July 1943 to 10th February 1944 forenoon when he handed over charge to me. I continued to hold charge of the division till the end of the year. The following statement gives the names of the District Agricultural Officers in charge of the districts in this division and the duration of their holding charge of the districts 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 M. U. Vellodi (1st July 1943 to 27th March 1944).	10
	Sri T. G. Ananda Rama Iyer (28th March to 24th April 1944).	
	Sri M. Anandan (25th April to 8th May 1944)	
	Sri N. Subramania Iyer (9th May to 30th June 1944).	
<i>Nilgiris district.</i>		
Ootacamund	Sri P. A. Nathan (1st July 1943 to 30th June 1944).	3
<i>South Kanara district.</i>		
Mangalore	Sri G. Sakkaram Rao (1st July to 14th July 1943)	6
	Sri K. K. Raghavan (15th July 1943 to 30th June 1944).	
<i>Malabar district.</i>		
Calicut	Sri A. Gopala Nair (1st July 1943 to 3rd May 1944).	9
	Sri M. P. Sankara Nambiar (4th May to 30th June 1944).	
<i>Madura district.</i>		
Madura	Sri N. Subramania Iyer (1st July to 15th July 1943).	8
	Sri R. Chockalingam Pillai (16th July 1943 to 10th February 1944).	
	Sri M. P. Sankaran Nambiar (11th February to 28th April 1944).	
	T. G. Ananta Rama Iyer (29th April to 30th June 1944).	

Head quarters.	District Agricultural Officer in charge.	Number of taluks in the district.
<i>Tanjore district.</i>		
Tanjore	Sri K. K. Raghavan (1st July to 6th July 1943).	11
	Sri M. Anandan (7th July 1943 to 20th February 1944).	
	Sri S. R. Srinivasa Ayyangar (21st February to 30th July 1944).	
<i>Tinnevely district.</i>		
Tinnevely	Sri V. Sathagopan (1st July to 31st July 1943).	8
	Sri T. G. Muthuswami Iyer (1st August 1943 to 30th June 1944).	
<i>Ramnad district.</i>		
Sattur	Sri M. P. Sankaran Nambiar (1st July to 23rd July 1943).	3
	Sri N. Subramania Iyer (24th July to 28th September 1943).	
	Sri G. Sakkaram Rao (9th February to 21st March 1944).	
	Sri M. P. Sankaran Nambiar (29th September 1943 to 8th February 1944).	
	Sri K. Avudainayakam Pillai (22nd March to 30th June 1944).	
<i>Trichinopoly district.</i>		
Trichinopoly	Sri T. G. Anantharama Iyer (1st July to 17th November 1943).	7
	Sri M. Anandan 18th	
	Sri G. Sakkaram Rao (19th November 1943 to 4th February 1944).	
	Sri N. Subramania Iyer (5th February to 2nd May 1944).	
	Sri G. Sakkaram Rao (3rd May to 30th June 1944).	

II. AGRICULTURAL EDUCATION.

Agriculture was taught as a "C" group subject for the S.S.L.C. in the Board High Schools at Bhavani, Gobichetty-palayam and Peelamedu in Coimbatore district, Puzumalai and Usilampatti in Madura district and Koilpatti in the Tinnevely district.

The servants of India Society Institute, Mayanoor, S. P. G. Mission School at Mahimaiparam and Sendurai in Trichinopoly district continued to impart practical instruction in Agriculture to the students through the School Farm attached to them while horticulture was taught at St. John's School at Palamcottah and vegetable gardening in the Government Training Schools at Tinnevely and Koilpatti taluks in Tinnevely district.

Propaganda for school gardening particularly for growing vegetables in School gardens was greatly intensified during the year and a considerable degree of success was achieved in all the districts. The use of the limited garden space in schools for raising vegetable nurseries was distribution of seedlings for planting in backyards of houses was recommended to the school authorities in the Tanjore district.

The District Educational Officers and headmasters of Schools generally took very lively interest in this work.

III. DEMONSTRATION.

Season.—The south-west monsoon in Malabar and South Kanara districts on the west-coast started by the middle of May in 1943, definitely two weeks in advance of the usual period and continued to be strong till the middle of August when it slackened off for a fortnight with bright sunshine.

The heavy rains of May and June caused flooding in many places in these districts and damaged young paddy crops in low lying areas. The north-east monsoon rains from September to November in the above two districts were also unusually heavy during the year and as a result first crop paddy ready for harvest and the second crop nurseries were damaged. The plantation crops were very much benefited. Heavy rains of October and November were taken advantage of in Malabar for raising a second crop of paddy in places where it was not in vogue before and also for planting tapioca and sweet potato on hill slopes and in single crop wet lands after the harvest of paddy. Shedding of spikes was bad in pepper and chillie; gingelly and horse-gram crops were also adversely affected by the heavy rains in October-November. The summer rains from December to April were very inadequate on the west-coast. The pre-monsoon showers in May 1944 were quite adequate for starting of the 1944-45 season crops. The south-west monsoon started in the first week of June 1944 but was feeble and did not extend to the eastern districts.

South-west monsoon rains were poor in June in East coast districts so much so the sowings of rainfed crops were delayed. Rains in July were very heavy in the Nilgiris which caused damage to paddy crops in Gudalur taluk and to potato crops in the Coonoor and Ootacamund taluks, and fairly heavy in other districts, except in Coimbatore district where both the monsoons were quite feeble and only scattered rains were received at long intervals so much so both rainfed crops as well as well irrigated crops suffered for want of sufficient water-supply to mature the crops normally. North-east monsoon-rains started well in October but slackened off towards the middle of November with the result that rainfed crops in the dry lands were below normal in yield. There were unusually heavy rains in the months of January, February, March in the

districts of Tanjore, Trichinopoly, Madura, Ramnad and Tinnevely which affected adversely most of the crops but they helped to fill rainfed tanks which enabled a short crop of paddy to be taken in the southern districts and also gave a second flush to cotton in Tirunelveli district resulting in a fair yield of cotton.

The season conditions were only fair in all districts, except in Coimbatore district where they were definitely unsatisfactory.

A. CROPS.

(a) *Cereals.*

Paddy.—This staple food crop received considerable attention during the year at the hands of the district staff and every known method for increasing its yield per acre and total production was employed. The extension of the area under it, large scale multiplication and wide spread distribution of high yielding strains to replace unselected varieties, conversion of single crop into double crop areas, and the popularisation of green manures, oil cakes and commercial fertilisers as manure for increasing acre yields, and the prevention of wasteful methods of raising nurseries and planting were the chief methods advocated.

2. *Distribution of improved strains.*—The strains evolved on the Agricultural Research Stations at Coimbatore, Aduturai, Pattambi and Ambasamudram numbering over 60 strains have established their superiority over the ryots' bulk varieties in large areas of this Division and have therefore, been multiplied in large quantities for large scale distribution to replace the unselected varieties.

7,547.5 acres of seed farms against 3,263.50 acres of the previous year were run on ryots' lands departmentally for mass production of improved seeds. Out of this area 6,966.86 acres were run in the Tanjore district with the help of the special staff of maistries engaged for the purpose with the funds provided by the Imperial Council of Agricultural Research and the Provincial Government. It is hoped that 11 lakhs of acres out of a total area of 12½ lakhs of acres under paddy in this district would be covered by the end of the 1944-45 paddy season, with improved strains of paddy.

1,392,556 lb. of seed of improved strains were so multiplied and distributed during the year against 864,853 lb. It is estimated that improved strains of paddy occupied 1,563,985 acres against 1,406,006 acres registered during the previous year. There are still 2½ million acres under paddy in this division to be covered by improved strains. It is hoped that as a result of the launching of big scale seed multiplication schemes in all the paddy growing areas in the 1944-45 season, a major portion of this area would be grown with pure strains before long.

Three Co-operative Societies in Malabar undertook seed multiplication work during the year and distributed 35,360 lb. of seed of improved strains.

3. *Methods of cultivation.*—The use of labour saving and efficient implements like light mould board ploughs, the green manure trampler, Buremese Setton and the wet land puddler for the preparation of the transplant fields and the use of the hand levelling board for final levelling of narrow plots known as "Cent nurseries" is becoming popular in the Tanjore district though it was not possible for the ryots to purchase them in numbers due to their scarcity and high cost.

The seed rate commonly used by the rice grower for broadcasting his crop or for transplanting it in an acre is very high, sometimes as high as 50 Madras measures per acre. As a result of persistent propaganda carried on during the last 30 years, several thousand have reduced the seed rate to 30 Madras measures and a few hundreds to the standard rate of 10 to 15 Madras measures recommended by the Department. Side by side with the campaign for reducing the seed rate, propaganda for reducing the number of seedlings planted per hole was also carried on. So far it has been possible to extend these practices in 916,858 acres. This means that more than 3 million acres are still being sown with high seed rate in this Division. If every rice grower in this Division makes up his mind to reduce the seed sown in each acre by 1 Madras measure, there will be 4 million Madras measures of seed saved for feeding the population in it. If it is done by all the rice growers in this province, the saving would be 10½ million Madras measures each year. But the scope for reduction on an average, is 15 Madras measures per acre which means a saving of 150 million Madras measures of excellent paddy grain each year. In case we could succeed in persuading the rice growers to withhold this huge quantity of seed from being wasted by sowing in the puddle, perhaps there may be no need to do anything more to meet the deficit in rice in this country. In addition to the direct saving of such huge quantity of seed, there is the indirect benefit of reaping a better crop resulting from robust seedlings raised in thinly sown nurseries. The average increase in yield by adopting the improved method of sowing and planting has been noted to be 100 lb. per acre.

A campaign to refine the method of preparing the nurseries and for sowing measured quantity of seed at 1 Madras measure or 1½ Madras measures of seed per cent by dividing the nursery fields into narrow 8 feet wide strips with 1 foot channels dividing each cent plot of 54 feet × 8 feet known as "Cent nurseries" was launched in the 1940-41 paddy season in the Tanjore district and intensified each year. As a result of this campaign 343,307 cent nurseries were prepared and sown by the cultivators against 181,748 of the previous year. This system is getting fairly established in this district and it is being introduced now in other districts in this division, wherever swamp paddy is grown transplanted.

4. *Manuring.*—Another sure method of increasing the yield of paddy is by adequate manuring on rational basis. It has been found from experience that green manuring is the cheapest method of manuring a paddy crop to substantially increase the yield. So every effort was made to popularise green manure growing in the division. The cultivators also have begun to appreciate the value of green manure but have not yet begun to realise the importance of collecting seeds for future sowings from their own green manure crops, with the result that the demand for seeds could not be met to the full. Vigorous propaganda has, therefore, been stated to induce the cultivators to collect green manure seeds, with a certain amount of success. Kolingi, daincha, sunnhemp, pillipesara, indigo and sesbania speciosa are the green manures advocated in the division and are becoming increasingly popular. Three hundred and ninety-nine thousand four hundred and five pounds of seeds of all varieties of green manure crops were distributed during the year, and the total area under green manure crops was 529,082 acres against 464,886 acres of the previous year. There is yet a long way to go before we could cover the whole area of 4 million acres of paddy land with green manure. If this could be done, it means not only an increased yield from paddy crops but increased yield from dry lands crops as the cattle manure now applied to paddy lands could be diverted to the extensive areas of dry lands which at present hardly get any cattle manure.

(i) *Groundnut cake* has become very popular among the paddy growers in the absence of artificials like ammonium sulphate and ammonium phosphate. Twelve thousand two hundred and twenty-four tons of cakes were distributed during the year against 7,782 tons of the previous year. Much more could have been distributed but for the difficulty of transport of the cake from the producing centres to the paddy-growing areas. It is estimated that 271,835 acres were manured with oil-cakes against 164,130 acres of last year.

(ii) *Cholam.*—Promising strains like A.S. 2095, 29, 369, 1548 and 1595 are becoming popular in the division and the area under these strains during the year was 38,075 acres against 18,356 acres. Forty-nine thousand one hundred and forty-seven pounds of seed were distributed during the year against 31,819 lb. of the previous year. Seed farms for increasing the quantity of seeds of the above strains are now being run and it is hoped that substantial increase in area under these strains would result.

(iii) *Ragi.*—E.C. 593 is a very high-yielding strain but its duration is longer than many varieties grown. Its spread, therefore, have been governed in most cases by the supply of irrigation water in wells. Wherever water-supply is ample, this strain has become popular. E.C. 3517 is becoming popular in many places because of its shorter duration and higher yield than the local varieties. The prospect before this strain is, indeed, very bright. E.C. 24 is becoming popular in Tinnevely and Ramnad districts. Vigorous propaganda was carried on for the popularization of the improve strains. Fifteen thousand four hundred and fifty-five

202 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

pounds of seed were distributed during the year, and it is estimated that 39,220 acres are now occupied by these strains against 24,449 acres in the previous year.

(iv) *Cumbu*.—Cumbu occupies a prominent position as a cereal in Tinnevely and Ramnad districts while it is cultivated in comparatively small areas in the other districts. In Tinnevely and Ramnad districts, strains like K.C. 8, 105 and 458 are popular of which K.C. 8 is more cosmopolitan in the tract. P.T. 409 and 720 are finding favour in Tiruchirappalli district in limited areas while P.T. 700 is doing well in the Coimbatore district. Twenty-three thousand eight hundred and eighteen pounds of seeds were distributed against 14,547 lb. of the previous year. Forty-four thousand three hundred and ninety acres are estimated to be under these strains against 21,026 acres in the last year.

(v) *Wheat*.—This crop is grown only in a few thousand acres in the Nilgiris and the Kodaikanal Hills and in the Coimbatore district in the plains. Five hundred and thirty-five pounds of seeds were distributed by the department.

(vi) *Barley*.—Twenty-four pounds of seed of barley were distributed during the year.

Rye.—Ten pounds of rye seed were distributed during the year. This crop is assuming importance in the production of ergot in the Nilgiris as it has been found that it is easy to artificially infect the ears of rye with ergot culture by spraying.

(viii) *Oats*.—Four pounds of resistance oats were distributed by the department while a ryot who had gathered 2,500 lb. of seed of this from the previous season's crop grown with the seed supplied by the department, distributed the whole of this seed among his neighbours and friends. An area of 25 acres was covered by this variety.

(b) *Fibres*.

Cotton.—Cotton forms the only important fibre crop in the Division. Cambodia cotton and Karunganni are the chief varieties extensively grown in the division.

Cambodia is a very important crop in Coimbatore, Mathurai and Ramnad districts but as a result of the evolution of the Masipattam strains like Co. 3 and Co. 4, the cultivation of these is spreading into Trichinopoly and Tirunelveli districts. Karunganni is grown extensively in Tinnevely and Ramnad and Coimbatore districts and to a limited extent in Madura and Trichinopoly districts.

2. *Cambodia cotton*.—Co. 2 strain has totally replaced the original cambodia in the districts of Coimbatore and Madura while Co. 3 and Co. 4 are becoming increasingly popular in Madura, Ramnad, Tinnevely and Trichinopoly districts in the Masipattam season, beginning in February. Strains 920, X 4463 are found popular in the Coimbatore taluk while 920 is also found to thrive well in isolated places in Madura and Tinnevely districts. For large scale multiplication of cambodia strains 3,692.92 acres of

seed farms were run during the year against 2,380 acres of the previous year. Five hundred and forty-five thousand four hundred and forty-nine pounds of seeds of these strains were distributed during the year against 570,215 lb. of the previous year. It is estimated that Cambodia strains occupied 299,246 acres during the year against 289,703 acres of the previous year.

3. Forty-two thousand six hundred and fifty-four acres were sown in lines against 47,275 acres of the last season.

4. *Karunganni*.—This variety of cotton is grown extensively in the black cotton tracts of Tinnevely, Ramnad, Coimbatore, Madura and Trichinopoly districts. K. 1 strain, a selection from the variety, has spread in large areas. Large-scale multiplication of seed of this strain was arranged during the year for meeting the demand for seed. Acres 3,692.62 were grown as seed farms during this year. Three hundred and thirty-five thousand eight hundred and seventy-six pounds of seed were distributed during the year.

Twenty-five thousand seven hundred and thirty acres are estimated to have been sown in lines during the year.

(c) *Sugarcane*.

Sugarcane is grown in large areas in Coimbatore and Trichinopoly districts and in smaller areas in South Kanara, Malabar, Tanjore, Madura, Ramnad and Tinnevely districts in this division, while it is not grown in the Nilgiris district. There was considerable increase in area under this crop as a result of the jaggery prices remaining high and steady at the planting time.

2. Co. 419, Co. 421, Co. 413, Co. 281, and P.O.J. 2878 are the important strains grown in the division of which Co. 419 is the most popular cane now. It is estimated 29,818 acres were under the improved varieties during the year against 22,855 acres of last year. Three hundred and twelve thousand two hundred and thirty-one sets were distributed by the department and 150,000 sets by private agencies during the year.

3. Trench planting, proper spacing of the lines, correct doses of manures and periods of manuring, use of improved mills and construction of improved furnaces and preparation of clean jaggery were popularized through propaganda and actual demonstration. Improved method of planting was demonstrated in 6,615 acres, while 431 improved furnaces were constructed and 194 demonstrations held in clean jaggery making.

4. Due to the ban on the export of viscous jaggery from South Kanara district and through the propaganda and demonstration conducted by the special staff of demonstration maistris appointed for the purpose, the process of making solid jaggery in the place of viscous jaggery was taught to cane-growers with considerable success.

(d) *Fodders*.

Intensive propaganda was carried on during the year for popularizing fodder crops of different kinds and as a result 5,154 lb. 3 oz. of seeds of fodder crops and 57,579 slips of fodder grasses

were distributed during the year. As there was scarcity of cotton seed for cattle food and as the price was abnormally high, the department undertook to procure cotton seed from outside the Province and stock it for sale at the depots during the year. Nine million six hundred and ninety-eight thousand eight hundred and four pounds of cotton seed were obtained and distributed during the year in this division alone.

(e) *Fruits.*

The importance of fruits in the dietary of the nation is being increasingly realized by the public as a result of propaganda and in consequence, the demand for fruit plants is rapidly increasing. Many people are getting their supplies direct from the well-known nursery-men in the Province and outside. The departmental Fruit Stations are unable to meet the demand on them for grafts and seedlings in full. During the year under report 2,386 budded Sathugudi plants, 730 sapota, 7,286 mango grafts, 509 plantain suckers, 6 mangostein, 200 lime plants, 8 grape vine cuttings, 200 jack seedlings, 16,918 pineapple suckers, 100 pomogranate seedlings, 100 pears, 3,526 grafts and plants of miscellaneous kinds were distributed. Two thousand six hundred and sixty-two and a half pounds of cashewnuts seeds also were supplied. It is estimated that there was an increase of 4,155 acres under fruit cultivation in the year.

The regional Fruit Shows were organized during the year, one at Tiruchirappalli and the other at Mangalore. These shows were a great success and helped greatly to stimulate the interest of the public in fruit and vegetable cultivation.

(f) *Vegetables.*

1. *Potatoes.*—Great impetus was given to potato growing in the Nilgiris and the Kodaikanal hills during the year under the 'Grow More Food' Campaign. The demand for potatoes from the military authorities and from dehydration factories also gave added stimulus to its cultivation. The total area under potatoes was 22,315 acres, of which 21,930 acres were in the Nilgiris hills against 18,000 acres in the previous year. The area occupied by 'Great Scot' variety was 21,155 acres.

During the year 84 acres were grown under seed farms to increase the quantity of seed potato for distribution. Three hundred and six thousand and eight hundred and ninety-nine pounds of seed potato were distributed during the year against 202,440½ lb. in the previous year. Sixty-four thousand pounds of seed potato were treated with carbon bisulphite for hastening sprouting. As the first-crop seed is too fresh for planting the second-crop potatoes the area under second-crop potato is limited by the availability of seasoned seeds. In the absence of seasoned seed potato, fresh seed has to be treated with carbon-disulphite to get uniform and quick sprouting of such seed. If more of this chemical could be made available there is great scope for using fresh tubers for planting.

The supply of manure was inadequate this year also. The price of manure mixtures sold by different manure firms ranged between Rs. 29-8-0 and Rs. 34 a bag of 2 cwt. A scheme sanctioned for preparing a manure mixture departmentally had to be given up under the orders of Government. It is hoped that, with the help of the Manure Dealers' Licensing Order, 1943, it should be possible to prevent profiteering in the manure mixtures sold by the dealers.

The price of potato harvested in different seasons was fixed by the Ceiling Price Committee set up by the Government and it ranged between Rs. 23 and Rs. 26 per bag of 200 lb. during the year.

2. *English and Indian vegetables.*—'Grow More Vegetables' Campaign was intensified during the year and as a result an increase of 7,512 acres under vegetables of all kinds was registered against 6,000 acres of last year. Agriculturists and non-agriculturists took keen interest in growing vegetables in house compounds, in vacant sites, etc., and the demand for vegetable seeds from all quarters was, indeed, unprecedented. Two thousand six hundred and twelve pounds of seeds of all kinds, 71,064 seedlings, 2,398 suckers and 57,223 cuttings were supplied during the year.

A new research station for the production of seeds of English vegetables was started at Wellington in the Nilgiris in August 1943 and placed in charge of the Special Officer for Vegetables, Coonoor. The layout of the station was almost complete during the year. It is hoped that this station would be able to produce seeds of all English vegetables and make this Province independent of outside supply.

A scheme for the supply of English vegetables to the Military was started in the Nilgiris during the year. Under this scheme seeds, manures and loans for cultivation expenses are advanced by the special staff of Agricultural Demonstrators and the Revenue Inspectors.

The first supply of vegetables raised under the scheme was begun in May 1943 and by the closing months of the year, the daily supply exceeded 25 tons. This scheme is also under the control of the Special Officer for Vegetables, Coonoor.

Another scheme for the supply of English vegetables to the Military was organized in the Kodaikanal hills towards the middle of the year but the supply could not be started before the close of the year.

A similar scheme for the daily supply of Indian vegetables to the army was started in Trichinopoly district during the year and the supply of vegetables was actually started on 1st March 1944 under this scheme. A separate scheme for the production of Indian vegetables departmentally in about 210 acres was sanctioned towards the close of the year. The land for the scheme was taken on lease in three villages within easy reach of Coimbatore town. A Special Officer for Vegetables in the gazetted rank with the necessary staff

was appointed for working the scheme. He took charge of the scheme on 1st April 1944 and started cultivation before the close of the year. The supply of vegetables has started since.

As the supply of vegetables to the civilian population in certain important towns was found inadequate due to the sudden influx of people from danger zones into them, special Agricultural Demonstrators for increasing the area under vegetables in the vicinity of such towns were appointed in the course of the year, one at Tiruchirappalli and another at Coimbatore. They carried on intensive propaganda among the agriculturists and owners of house-compounds for growing vegetables in all available areas. The proposal for appointing a demonstrator at Kozhikode was also approved before the close of the year.

3. *Onions*.—There was considerable demand for onions from the dehydration factories and the Military, particularly for Bellary onions. Seven hundred and sixty-four pounds of Bellary onion seeds and 5 lb of seeds of ordinary onions were distributed during the year. The demand for Bellary onion is daily on the increase and proposals are under consideration to expand the area under this variety to meet it.

(g) *Oil-seeds*.

Groundnut.—The groundnut strains A.H. 25, 32 and 45 evolved by the Oil Seeds Specialist are finding favour with the cultivators and the area under these is steadily expanding. Schemes for large-scale multiplication of seeds of these strains were under active consideration of the Government and arrangements are being made to start the schemes immediately they are approved. Twenty-four acres of seed farm were run during the year for the multiplication of seed. Nineteen thousand six hundred and thirty-eight pounds of seeds of the above strains were distributed during the year.

As a result of the high prices ruling in the groundnut market, the area under groundnut has been increasing and if the high level of prices is maintained in coming years, one could expect a rapid expansion of the area under this crop.

2. *Coconut*.—This is the most important oil seed crop of the West Coast and is also important crop in the Tanjore district. The demand for seednuts and seedlings from heavy-bearing trees on the Government Research Stations on the West Coast is very great. The supply available on these stations is not able to meet the demand and the supply has, therefore, to be met partly from private gardens by selecting nuts from heavy-bearing trees or from reliable nursery men. Fourteen thousand two hundred and eighty-nine seednuts and 2,081 seedlings were distributed during the year. Besides the supply of seednuts and seedlings, garden owners are given advice on the proper spacing, manuring, intercultivation of coconut plantations and the selection of seednuts.

3. *Gingelly*.—S.I. 89 strain in gingelly is becoming popular in the division. 2,085½ lb. of seed were distributed during the year against 1,120 lb. in the previous year.

4. *Castor*.—This crop is not generally grown as a pure crop but is grown mixed with other dry and garden crops or as fence lines. 321 lb. of seed were distributed during the year against 172 lb. of the previous year. As the price of castor seed has been ruling high, cultivators take keen interest in growing this crop now.

(h) *Pulses*.

As Pulses form an important article of diet for their protein value and as the production in the country is far short of the requirements of the population, intensive propaganda was carried on in all the district for a large scale expansion of the area under these 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. The area under various pulses has considerably expanded as a result of the vigorous propaganda carried on and due to the high prices obtained for them. The following quantities of seeds of various pulses were distributed during the year.

	LB.
Greengram	18,196
Blackgram	11,567
Redgram	5,220
Horsegram	865
Soya beans	713
Other pulses	37½

(i) *Miscellaneous*.

Pyrethrum.—Three thousand four hundred acres were planted under this crop by the Forest Department of which 3,000 acres were in the Nilgiris and the rest in Kodaikanal hills. The crop was in flower in both the places and collection of flowers had started. It is reported that the pyrethrum content of the flowers grown in Kodaikanal is higher than in other places in the province.

2. *Cryptostegia grandiflora* (wild rubber vine).—The cultivation of this wild rubber creeper was taken up as an experimental measure in the Tanjore district during the year. 26,750 seedlings and 7½ oz. of seed were distributed. This plant was found to do well in deep clay soils as well as in red loams. The black cotton soils of Ramnad and Tirunelveli are also quite suitable for the growth of this plant. The economic method of extracting the latex from this plant is the real problem to solve now, as there is no difficulty in establishing plantations on a big scale in suitable tracts.

3. Propaganda for increasing the area under casuarina for fuel, cashewnut trees, Kapok, Pungam, tapioca, sweet potato, etc., was carried on throughout the year; 948 lb. of seeds, 9,241 seedlings and 2,660 cuttings were distributed during the year.

B. IMPLEMENTS.

The demand for implements of various kinds could not be fully met because of their scarcity in the market as the iron and steel for their manufacture were in short supply. Every effort was made to secure supply of iron and steel for agricultural implements though the quantity so obtained was quite meagre. The implements kept for demonstration at the agricultural depots were utilized for demonstrating their use and efficiency. The number of demonstrations conducted and the sales effected of various implements are given below:—

Kind of implement.	Number of demonstrations.	Sales.
Mould board ploughs	5,145	274
Other labour savings implements	5,951	394
Cane mills	1	8
Chaff cutters	25	2
Spare parts	..	1,338

C. MANURES.

The preservation of cattle manure including urine to increase its bulk and quality received considerable attention at the hands of the district staff. The propaganda carried out persistently during the past quarter of a century for the proper preservation of farmyard manure has begun to produce results in an increasing measure. Cultivators in general have realised the value of the methods suggested such as the use of bedding in cattle sheds either of refuse straw or dry earth for absorbing cattle urine, covering of manure heaps with tank silt or earth, preserving the cattle manure obtained in well designed pits, protecting the pits from seepage and from sun and rain. Propaganda for composting of organic wastes with and without night soil in municipalities, Panchayats and in rural areas was also intensified during the year to increase the quantity of manure in the country. As a result of the propaganda, 11,410 manure pits were newly laid, 4,201 old pits were rectified, 2,653 manure heaps properly covered with earth or tank silt and 1,235 dry earth sheds or little beds were made. Composting of municipal rubbish with night soil was demonstrated in 30 places and 1,910 ordinary compost pits for organic wastes were also laid.

2. *Green manure.*—The use of green manures like daincha, Kolingi, Pillipesara, Sunnhemp, Indigo and Seshania speciosa is becoming more and more popular among the cultivators in general and paddy growers in particular, but they have not yet got into the

habit of collecting their own seed from their crops for future sowings. Vigorous propaganda was carried on to induce the people to collect seeds from their own crops, with a certain amount of success. The following were the quantities of seeds of different varieties of green manures distributed during the year.

	LB.
Kolingi	93,822
Daincha	77,067½
Sunn hemp	49,035½
Pillipesara	1,25,326
Indigo	52,337
Seshania speciosa	1,448½
Lupin seeds	200
Karumpayaru	163

529,082 acres received green manuring during the year against 464,886 acres in the previous year.

3. *Concentrated fertilisers.*—Due to war conditions, artificials like ammonium sulphate, ammonium phosphate and superphosphate were not available in any appreciable quantities. So intensive propaganda was carried on to use oil cakes, particularly groundnut cake as substitutes; 12,224 tons of oil cakes were distributed during the year against 7,782 tons of the previous year. There is still scope for using oil cakes in very much bigger quantities, if transport is available to move the cakes to consuming centres in the right season, particularly in view of the fact that huge sums have been allotted for the purchase of oil cakes under the Trading Schemes; 606 tons 13½ cwts of commercial fertilizers were also distributed during the year.

D. PESTS AND DISEASES.

Control of pests and diseases.—The common insect pests that cause damages to crops in this division are paddy stem borer, rice bug, rice hispa, paddy thrips, swarming caterpillar 'Surai' mealy bug, cholam ear-head bug; aphids on vegetables, epilachina beetles on brinjals shoot and fruit borers, Nephantis serinopa on coconuts, coconut beetles; hairy caterpillars on groundnuts and millets, thrips on chillies; while among diseases, blast on paddy, wilt on betelvines, mildew on grape vines, budrot of palms, Mahali on arecanut trees, gumm ois and die back of fruit trees, bleeding disease of coconuts and ring disease of potatoes are the common ones.

There was not a general outbreak of insect pests or diseases of a serious nature in the division except in isolated localities and wherever they occurred prompt measures were taken to check them.

Stem borers on paddy were noted to do damage in parts of Tanjore, Trichirappalli and Malabar, Surai mealy bug was found wide spread in Tanjore district and to a lesser extent in Trichirappalli on rice; *Spodotera* was noted on paddy in Malabar and rice hispa in South Kanara. Chillie thrips were noted in Madura, Ramnad and Tinnevely districts while aphids on vegetables were noted in all the districts. Red hairy caterpillar pest on groundnut was noted only in a mild form in Tanjore, Trichirappalli, Mathurai, Ramnad, Coimbatore and Tirunelveli district.

Nephantis serinopa (the black headed caterpillar of coconuts) continued to be in a pest form in Malabar and South Kanara districts during the year and it was kept under check by the liberation of parasites bred by the Special Staff appointed for the purpose, 262,700 parasites were bred and liberated in Malabar alone and a fairly large number in the South Kanara district. The severity of the attack has been considerably reduced as a result.

Preventive spraying against Mahali disease of arecanuts has become a normal practice among the areca nut growers of South Kanara district in general and during the year it was done on a large scale. The departmental advice in controlling this disease is fully acted on. Sprayers and Copper Sulphate stocked in the depots in the district were freely availed of by the small growers, while the Mahali Prevention Co-operative Society at Puthur stocked large quantity of Copper sulphate and a large number of sprayers as usual, for timely spraying of the gardens.

The following were the demonstrations and sales of insecticides effected during the year:—

	Sale.	Demonstrations.
Sprayers	1	848
Dusting	..	495
Hooking coconut beetles -	..	492
Bagging and netting	..	203
Poison traps	..	55
Light traps	..	175
Flooding nurseries	..	88
Operations for <i>Nephantis</i>	..	75
Stem bleeding operation on coconut trees	..	1,417 trees.
Trees sprayed against Mahali disease ..	..	250,000 trees.
Copper sulphate sold	3,867 lb.	..
Calcium and lead arsenate	103 lb. 1 oz.	..
Fish oil soap	767 lb.	..
Other insecticides and fungicides ..	586 lb. 9 oz.	..

2. *Pest Act* against water hyacinth was in force throughout the Tanjore district and parts of Mathurai, Tirunelveli and Malabar districts this year also.

3. *Cotton Pest Act*.—Cambodia Cotton Pest Act was in force in Coimbatore. Mathurai and Trichirappalli district. The eradication of cotton plants on the ground was completed before the due

date except in portions of Bhavani, Gobichettipalayam, Coimbatore and Palladam taluks in the Coimbatore district and in portions of Periakulam and Nilakottai taluks of the Mathurai district. Nineteen prosecutions were launched against the defaulters.

4. *Cotton Control Act*.—This Act was in force in the districts of Mathurai, Ramnad and Tirunelveli. The educative propaganda carried on during the previous years coupled with the prosecutions of very recalcitrant cultivators has a marked effect on the incidence of Pulichai cotton in the cotton crops grown in the above districts. The stray plants met with in rare cases were pulled out by the ryots themselves. There were no prosecutions in Mathurai and Ramnad districts and only very few prosecutions were launched in the Tirunelveli district. Only Rs. 70 were collected as fines from the defaulters during the year. The prohibition of import of cotton seeds from outside into the above districts during the sowing season has also helped greatly in reducing Pulichai cotton in the Tinny Cotton area.

5. *Red hairy caterpillar*.—Pest Act against red hairy caterpillar which attacks groundnut and millets in dry lands was in force in Mathurai, Tiruchirappalli and Tanjore districts during the year under report and the Act was enforced with the help of the Special staff engaged for the purpose. In addition to the educative campaign carried on with the co-operation of the Revenue Department, demonstrations of picking of egg masses, caterpillars and trapping and destroying of the caterpillars in trenches and the use of light traps and bon fires to attract and kill the adult moths were conducted in several villages.

6. *Budrot on coconut and Palmyra*.—The Madras Agriculturists Pests and Diseases Act continued to be in force in Palghat, Walluvanad and Ponnani taluks of the Malabar district against Budrot on palms. The Special staff visited 138 villages, marked out 7,361 trees, conducted 89 demonstrations and trained 58 coolies for the work.

7. *Wheat rust*.—The Pest Act was enforced in the Ootacamund and Coonoor taluks and Kodaikanal taluk of the Madura district with the help of the Special Demonstration Staff appointed for the purpose. They were successful in prohibiting the growing of wheat and barley during the season from April to September. Stubbles of old crops and voluntary seedlings noticed here and there were pulled out and destroyed. Educative propaganda was carried on among the villages on the need for observing this close period in wheat and barley sowing.

E. DEMONSTRATIONS.

Two thousand two hundred and forty-one Demonstration plots and 321 trial and observation plots were laid out during the year to convince the cultivators of the superiority of strains on methods of cultivation in various localities.

2. *Firka Maistry Scheme*.—The Firka Maistry Scheme started in the year 1940 in the three districts of this division—in Koilpatti taluk of the Tinnevely district, Palladam and Avanashi taluks of the Coimbatore district and Sattur and Aruppukottai taluks of the Ramnad district was continued during the year. These special maistries were mainly engaged in the popularization of improved strains, in the preservation of cattle manure and in the increase of the area under food crops on a mass scale.

During the year under report, with a view to intensify the 'Grow More Food Campaign,' the Government were pleased to restore the Demonstrators of the Headquarters Taluk in each district and a Demonstration Maistry in each of the Firkas in all the districts in the Division.

F. WORK WITH OTHER DEPARTMENTS.

The District Agricultural Officers attended the Periodical Conferences of district Officers and Food Council meetings and meeting of National War Front in all the districts of the Division, and enlisted the co-operation of the several departments like the Revenue, Co-operative, Health, Irrigation, Education, etc., As a result of such co-operation, the 'Grow More Food Campaign' undertaken by the Department was helped forward to a very great extent. In fact, the 'Grow More Food Campaign' was a common subject for propaganda among all the Departments of the Government and National War Front.

G. EXHIBITION AND SHOWS.

Two hundred and thirty-three Agricultural exhibitions were put up during the year by the Department. Eight thousand three hundred and fifty-two lectures without magic lantern and 164 lectures with magic lanterns were also delivered on various agricultural subjects.

H. AGRICULTURAL ASSOCIATIONS.

Thirty-five Agricultural Associations were newly started during the year and there are now 477 such associations functioning in this Division. All these associations are taking keen interest in adopting improved agricultural practices advocated by the Department. One thousand one hundred and thirty-eight meetings were held during the year and suitable action 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 supplying seeds of fodder crops and grass slips. Advice on poultry rearing was also given freely by them.

J. SIDE LINES AND COTTAGE INDUSTRIES.

Apiculture.—Apiculture is becoming more and more popular among the people in the division. The celebration of honey week each year has encouraged to stimulate the interest of the people in bee-keeping. One thousand four hundred and thirty-three hiving demonstrations were carried out during the year. Four thousand six hundred and forty-four bee-hives were in working during the year. Seventy-four hives were sold and 705 honey extractions with the help of the honey extractors were demonstrated to the public. Two thousand three hundred and fifty-nine pounds of honey were extracted by the staff in these demonstrations.

K. LOANS.

Rupees 5,706-8-0 were granted as loans to 119 cultivators for the purchase of 335 implements of various kinds during the year under report.

Large scale loans were granted for the purchase of seeds and manures during the year. Rupees 4,17,525 were granted to 9,564 applicants as loans against Rs. 74,598-6-0 of the previous year. These loans are becoming very popular and are freely being asked for by the cultivators, particularly small holders.

L. PUBLICATIONS.

Eleven thousand six hundred and forty-one villagers' calendars and 1,045 other priced publications were sold during the year, besides the large scale distribution of leaflets and posters of various kinds designed to stimulate the interest of the people in the 'Grow More Food' Campaign.

M. CONTROL OF SOIL EROSION.

The propaganda for adopting anti-soil erosion methods was continued in an intensified form during the year in all the districts, particularly in districts where large areas of dry lands exist. Contour bunding, terracing, digging contour drains with silt traps, gully plugging. Contour planting and planting trees in waste lands were the methods advocated and as a result 2,494 acres were bunded and levelled, 800 acres were terraced and 1,078 acres were contour planted.

The two maistries appointed in the Nigiris for soil erosion work demonstrated the method of contour planting of potatoes, construction of contour drains with silt traps and terracing of lands.

N. GROW MORE FOOD CAMPAIGN.

In fact, the major part of the time and energy of the district staff was utilized in furthering the Grow More Food Campaign in the division. Targets were fixed for each district for the year in

the matter of this campaign under various items and definite instructions issued to work towards the targets so fixed. The results obtained have been very encouraging, indeed. 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 measure by the people.

Special emphasis was laid on the conversion of waste lands for cultivation, on the conversion of single crop lands into double crop lands, intensive cultivation of already cultivated areas by adequate manuring and on the use of high yielding strains of crops. To meet the greatly increased demand for such seeds, large scale multiplication of seeds in seed farms with special staff for the work was undertaken. Village committees and Grow More Food Committees were organized for furthering the food production drive in the division. Special loans for reclamation of waste lands and loans for the purchase of seeds and manures were given in large numbers. The closest co-operation was maintained with the Revenue, Co-operative, Irrigation Health and War Front departments for popularising the Campaign. Special mention may be made of the fact that towards the close of the year, a special District Agricultural Officer with a staff of six special Agricultural Demonstrators was appointed for bringing under cultivation in 1944-45 seasons, 40,000 acres reclaimed in the Cauvery-Mettur Project area during the year.

The trading schemes for the purchase of seeds, manures, cattle food and iron and steel were started during the year with the huge amount running to several lakhs placed at the disposal of the department by the Government. With this amount, it has been 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 during the year under report 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. Seven thousand six hundred and seventy-one applications were received for licences and 6,735 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 achievements:—

Number of food committees formed newly—119.

Number of meetings held—1,569.

Number of Public and War Committee meetings—285.

Lectures given on Grow More Food Campaign—1,614.

Amount collected for War Fund including Defence Savings Movements, Cash Certificates, Stamps, Hundi collections, etc.—Rs. 50,987-5-9.

Estimated area of waste lands brought under food crops and vegetables—16,820 acres.

Area of single crop lands converted into double crop lands—56,506 acres.

Estimated area of new lands assigned for food production—3,090 2 acres.

Increased area brought under food crops during 1943-44—228,651 acres.

Quantity of improved strains distributed and the area covered by them—

	LB.	Area in acres.
Seeds	1,518,779	47,852
Vegetable seeds—		
Onion seeds	769½	136
Potato seeds	306,899	191
Other seeds	2,612	2,400·80
Seedlings—		
Tomato, etc., seedlings ..	71,064	10
Suckers	2,398	0·7
Cuttings	57,223	5·7
Sugarcane	462,231	38·5
	setts.	

Quantity of manure distributed and area manured.

Quantity in tons.	Area in acres.
52,604·92	347,937

Percentage of increase in the production of food crops as compared with the previous fasli—15 per cent.

216 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

*Brief Programme of Work for 1944-45, Southern Division,
Coimbatore, for food crops.*

	Area. AOS.
Area under improved paddy	1,972,217
Economic planting	784,630
Green manuring	526,742
Application of oil cakes and fertilizers ..	274,713
Cholam improved strain	469,253
Ragi	177,905
Cumbu	504,170
Other minor millets	291,145
Pulses	437,010
Sugarcane	8,534
Vegetables and fruits	65,664
Potatoes	22,650
Sweet potatoes	44,045
Paddy seed farms proposed	8,700
Wheat and barley	1,000

IV. AGRICULTURALS RESEARCH STATION.

(1) AGRICULTURAL RESEARCH STATION, ADUTURAI.

Charge.—Janab A. Abdul Samad Sahib was in charge of the Station during the year.

Season.—The season was unfavourable for the Kuruvai crop and normal for the Samba and Thaladi.

Crops—Paddy.—The 22 strains of paddy already released were multiplied for distribution. Yield tests of pureline cultures and cross progenies were carried out.

Manurial trials with steamed bonemeal, different oil cakes and a complex experiment with green leaf, groundnut cake, super phosphate and ammonium sulphate were conducted.

Irrigation and spacing experiments were also carried out.

Ninety-eight thousand two hundred and twenty-nine pounds of seeds of various strains were distributed.

Others Crops.—Six varieties of sugarcane in 47 cents gave an acre yield of 22.5 tons of Co. 419 being the heaviest yielder. The six varieties which were ratooned gave an acre yield of 29.6 tons. Twenty-six thousand sets were distributed.

Plantains and vegetables were also grown. One lakh sixty-six thousand three hundred and sixty pounds of green manure crops were raised on the station. Eight hundred and sixty-two pounds of sesbania speciosa seeds, 231 lb. of daincha and 148 lb. of pillipesara seeds were sold. Three thousand two hundred and fifty of napier grass were distributed.

Livestock.—Besides seven pairs of work animals, a herd of five Sindhi cows and two breeding bulls were maintained. One hundred and eighty-one services were performed 4,255½ lb. of milk were received of which 4,082½ lb. were sold to customers and the rest fed to calves and chicks.

Poultry.—The flock consisted of 9 pure birds, 8 chicks and 20 country hens at the close of the year. One thousand two hundred and seventy-nine eggs were collected.

Apiculture.—Eight colonies were active at the close of the year, 6 lb. and 15 oz. of honey were extracted.

Pisciculture.—389 lb. 1 oz. of fish were caught and sold.

Petty construction and repairs.

The annual repairs to office buildings were carried out.

(2) AGRICULTURAL RESEARCH STATION, TALIPARAMBA.

Season and rainfall.—Total rainfall was 148.6 inches as against 151.3 inches of the previous year. The South-west Monsoon started a fortnight earlier and in continuation of Summer Showers of May. The North-east Monsoon was heavier, but December onwards it was completely dry. Heavy rains of November and the cloudy weather delayed the cold season and the flowering of mangoes and jacks. The yield of coconut trees was good in the succeeding season. Mango crop was poor. The regular monsoon of 1944 commenced in the last week of May and the rains in June were normal and well distributed.

2. *Crops—Dry land Modan paddy.*—Continuous rains with no bright weather checked the growth of the modan paddy and dry crops, and the average yield was only 440 lb. as against 1,220 lb. of previous year. A new clearing gave an acre yield of 802 lb.

Ginger.—The yield figures are furnished below:—

	1943-44.	1942-43.
Ernad	7,704	5,245
Bengal	6,005	2,690
Trinidad	7,056	5,149
B. Jamaica	4,400	4,428

The yield as well as the price was not encouraging and the neighbouring ryots have reduced the area under ginger.

Chillies.—Heavy and continuous down pour was not conducive to the nursery and the planted crop in the early stages. The acre yield was 1,398 lb. The experiments were discarded due to bad weather.

Turmeric.—Grown in school dry land gave 6,900 lb. green rhizomes to the acre.

Fodder cumbu in coconut area fared well and an acre yield of 10,890 lb. was returned.

Tapioca.—Suffered due to the ravages of wild boar; porcupine and bandicoot. Seventeen thousand six hundred and fifty setts were distributed. Butterstick and valenca gave 5 lb. and 4 lb. yield per plant, respectively.

Horsegram.—After paddy yielded 408 lb. per acre.

Gingelly.—Was a victim to bad weather.

Groundnut.—AH 25 and AH 45 performed better during the year—

		This year.	Last year.
AH 25	.. .. .	2,024	702
AH 45	.. .. .	1,501	1,000

Season was favourable, the yield and price were both encouraged and the ryots in the neighbourhood are trying this new crop.

Ragi.—Returned only 250 lb. to the acre due to heavy rains in the young stage.

Wet land.—Paddy was manured with bonemeal at 112 lb. in conjunction with green manure crops ploughed in situ. The yield is tabulated below.

Variety.	Yield in lb. per acre.	
	This year.	Last year.
Ptb. 9	2,888	2,494
Ptb. 8	2,715	1,830
Rajakayama	1,816	1,791
Kuramkayama	2,740	2,408

This indicates that the monsoon was ideal for wet paddy as all the varieties have given higher yields. Comparative trials of Vatakkan, Thonnuran and Keeripala were continued.

Sugarcane.—The area was small and crop was not impressive both in ratoon and planted plots. The yield ranged from 2,688 lb. to 5,968 lb. of jaggery per acre.

Areanuts.—In wet land are coming up splendidly well with irrigation in hot weather. The crop in dry land returned Rs. 144-5-0.

Garden land.—Pepper in 8.85 acres of cultivated and 17.2 acres of uncultivated area gave 3,637 lb. as against 392 lb. of previous year. Average yield of a vine was 2 lb. green. Observation in the experimental plot of standards showed the casualties highest in garugapinnata, next in spondias, and Erythrina with 'no casualty,' there by confirming ryots' preference to the 'Muruku.' In the varietal collections the development of vines is not uniform. In Travancore variety 60 vines have come to flower out of 180 planted in 1942, whereas in others only a few stray vines have flowered.

Coconuts.—Green dressing and ashes were the chief treatment with usual cultivation. Nine thousand eight hundred and fifty-three nuts were gathered instead of 7,561 of the previous year.

Vegetables were grown both as rainfed and irrigated, mainly for seed production and distribution. One hundred and fifteen pounds of seeds of select fruits were supplied to the district staff.

New crops.—Bodantum, Glyrocidia and Derris plants have survived the summer. But about 50 per cent of the Cryptostegia plants (rubber) died in spite of the care and the surviving plants too have not made any headway. Seventy-five per cent of the seedlings of fodder trees have established themselves.

3. Fruit nursery—

Mango—

Number of grafts separated	.. .. .	3,672
Do. sold	.. .. .	2,506
Casualties in the hardening bed	.. .. .	1,156

Sapota—

Number of successful grafts separated	.. .. .	218
Number sold..	.. .. .	147
Casualties	.. .. .	71

Other plants sold 2,538

Banana trials.—Of the nine varieties Mauritius and local Nendran have done the best.

Pine apple.—Jackals and crows were nuisance and a menace to the fruits. Only 826 lb. of fruits were harvested and sold. Three thousand and forty-seven suckers were sent out. Twenty pounds of the apple fibre was supplied to the military.

Mangoes.—Flowering was unduly late and poor. One thousand and sixty-one pounds of fruits were sold.

Cashew.—Yield was only 413 lb.

Jack fruits.—Though late returned Rs. 439-2-0 as against Rs. 97-8-0 of the previous year.

Mangosteen.—Seven trees have begun to bear and 63½ lb. of fruits were harvested and sold.

4. *Condition of cattle.*—'Foot-and-mouth' disease gave a setback to the condition of animals. Five calves died. The other animals have picked up well and are giving normal performance. Out of 44,540 lb. of forest grass ensiled 18,070 lb. was obtained in good condition and fed to cattle in summer.

5. *Sales.*—The following seeds and other planting materials were sold from the farm:—

Paddy seeds	16,397 lb.
Pepper cutting	2,525 (number)
Coffee seedlings	387 „
Brinjal seedlings	145 „
Chilli seedlings	6,000 „
Chilli seeds	11 lb.
Groundnut seed	850 „
Pine apple suckers	3,047 (number)
Cashewnut seed	42 lb.
Plantain suckers	345 (number)
Vegetable seeds	4,568 tolas
Fruit plants	1,827
Graft mangoes	2,506
Sapota grafts	147
Arecanut seedlings	711

(3) AGRICULTURAL RESEARCH STATION, NANJANAD.

(a) *Season and rainfall.*—The south-west monsoon rains, 1943 commenced early in all vigour but fell far below the average during June. Good rains were received from July to September. These rains interfered with the harvest of irrigated and main crops of potato and planting of second crop.

The north-east monsoon rains started early in October with great promise and when the rains ceased on the last day of October, frost set in and cut the young crop of potato. Frost during October is very unusual particularly in the immediate wake of continuous rains. November recorded good rains. Frost again appeared towards the end of the month. As usual, slight showers were received during December. Typical cold weather conditions prevailed during January. The hot-weather rains were about average although it was unusually heavier during March and low during April and May. The season, on the whole, was normal and the rainfall about average. The total rainfall recorded was 57.24 inches on 171 rainy days during the year.

(b) *Potato.*—As usual, three crops were grown, the main crop over 9.82 acres, the second crop over 18.26 acres and the irrigated crop over 4.90 acres and they gave an average acre yield of 317.157 and 198.4 maunds respectively.

(c) *Resistance oats.*—This useful fodder crop was raised on 0.55 acre and the acre yield obtained was 311 lb. of grain and 4,471 lb. of straw.

(d) *Rye.*—The area under this crop was increased to 32.84 acres in order to meet the demand for ergot production and large scale production of seed. The spraying and picking of ergot was done by the Assistant Mycologist and his staff. The yields of grain and ergot respectively were 4,756½ lb. and 517½ lb.

(e) *Sweet Lupin (Lupinus augustifolius).*—This is good substitute for horsegram for cattlefood and can also be used for human consumption as green peas or dhol. The area under this crop was uniform and good and gave an acre yield of 614 lb. of seed.

(f) *Lupinus Termis.*—Acres 1.50 were under this crop for seed production. It is a very useful green-manure crop, being a heavy yielder. Six hundred and seventy-five pounds of seed per acre was obtained.

(g) *Pyrethrum.*—A new clearance of 1.01 acres has been made mainly for experiments on this crop, thus making up a total area of 3.91 acres. Harvest of flowers and dry heads for seed was continued.

(h) Trial crops like mustard, perennial castor, clover varieties, pusa strains of oats, wheat and barley, chenapodium, rubber (*Cryptostegia grandiflora*), *melinis minutiflora*, sweet yellow lupin, sugarcane, were under trial during the year.

(i) *Vegetables.*—The area under vegetables was 2.70 acres mainly intended for collection of seeds. The flowering in cabbage was very rare and the seeds produced turned out to be natural crosses with other cruciferae. Cauliflower flowered more freely but percentage of natural cross was very high. The seed collection will be confined to peas, beans and radish during next year. Thirty-seven pounds of vegetable seeds were either sold or transferred.

(j) *Works.*—The annual repairs to non-residential and residential buildings and repairs to the farm road were undertaken. A new potato store was constructed at a cost of Rs. 2,500. The potato seed store was remodelled by fixing fire clay pipes and perforated stoneware tubing for conducting experiments on Black-heart of potato.

(k) *Seed distribution.*—During the year 2,470 maunds 19 lb. of seed potatoes, 3,115 lb. rye, 555 lb. lupin, 62 lb. local ragi, 37 lb. ½ oz. vegetable seeds, 7 lb. resistance oats, 14 lb. local barley, 2 lb. 4 oz. castor and 42 lb. of Pyrethrum seeds were supplied from the station.

222 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

(4) AGRICULTURAL RESEARCH STATION, KOILPATTI.

Season.—The rainfall at the station was a little over 30 inches being slightly in defect of the normal and was evenly distributed throughout the year. The rainfall during the south-west monsoon though below normal was favourable for timely cultivation of crops in red and black soil areas of the station. Sowings of cotton were done early in October. Continuous wet weather in November retarded the growth of cotton and other crops and the bright weather following in December pulled up the crops. Rainfall in summer, though below normal, was favourable to the cotton crop in that a fair yield during Kar pickings was obtained. On the whole, the season was favourable to crops raised on the station.

2. *Crops—Cotton.*—It occupied 53.62 acres in the black soil of which 39.52 acres were grown with K. 1. The average acre yield of K. 1 and C. 7 were 427 and 350 lb. respectively. Breeding and Agronomical experiments were in progress as per cropping plan. Two strains P.B. 72 and 4706 evolved at the station are better in quality and yield than K. 1. They are under trials in the district.

Cumbu.—Rainfed crop occupied 33.60 acres of which 27.41 acres were under K.C. 8 and it gave an average acre yield of 460 lb. Nearly 7,000 lb. of seed were made available for distribution to ryots of the district.

P.T. 2229 and K.C. 292 were grown under irrigation in a small area for seed multiplication.

Ragi.—This occupied 0.60 acre including trial and seed multiplication plots. An acre yield of 1,283 lb. was obtained. Of the various cultures under trials K.R. 21 recorded an yield of 29 per cent over E.C. 24 the control. It is proposed to grow it in observation plots in the district during the next season.

Cholam.—Irungu fodder cholam K. 1. 14 occupied 10.97 acres in the black soil and gave 2,600 lb. of dry fodder per acre. It was grown in 2.18 acres in the red soil area for seed purposes and an yield of 430 lb. of gram and 6,900 lb. of straw per acre was obtained.

Irrigated Vellai cholam was grown in 1.46 acres and 2,583 lb. of grain were obtained per acre. Of the various cultures evolved K.S. 170 was found superior to A.S. 2095.

Vegetables.—English and Indian vegetables were grown in 0.72 acre mainly for seed purposes and 83 lb. of different vegetables were obtained.

Miscellaneous crops.—Tapioca was planted along the irrigation channels and 500 lb. of roots were got and sold mostly as green. Blackgram was raised in 4.30 acres and a good yield of 460 lb. per acre obtained. Wheat was tried and it proved a failure. Rubber vine is grown as rainfed and irrigated in 1.00 and 0.74 acre respectively. The crop came up well but the severe

summer experienced this year told upon its further growth. Small areas were devoted to guinea grass, lucerne and Napier grass (thin) and these helped to supply a small quantity of green fodder daily to the dairy herd.

Livestock.—Following is the strength of the animals, on the station at the end of the year:—

Breeding bulls	...	...	...	...	...	4
Work bullocks	...	...	...	...	...	10
Cows	...	...	...	...	...	8
Calves	...	...	...	...	...	9

The breeding bulls rendered 219 services. A pair of work animals was sold in auction and a pair was temporarily transferred to Rice Research Station, Ambasamudram.

3. *Poultry.*—During the year 5 Rhode Island Reds, 2 Black Minorcas and 15 White leghorns were sold, 3 birds died of chicken-pox and there was at the close of the year a strength of 32 leghorns and 3 country hens.

There was a total production of 1,408 eggs of which 426 were sold for hatching and the rest for table.

4. *Ginning.*—During the year, 48,261 lb. of Kapas were ginned which included 44,174 lb. of seed farm produce of 12 ryots. The ginning percentage was 31.

5. *Seed distribution.*—The quantities of seeds distributed are as follows:—

	LB.
K. 1. cotton	4,048
Cumbu seeds	5,578
Irungu for fodder	6,229
Cholam seeds	2,198
Ragi	382
Kolukattai grass seeds	23
Grass slips	14,800 (slips).
Vegetable seeds	81

(5) AGRICULTURAL RESEARCH STATION, PATTUKOTTAI.

Charge.—Sri R. Krishnamurthi Ayyar.

Season.—Though the monsoon showers were far below normal, the steady supply of water in the Grand Anicut Canal was helpful to irrigate wet lands.

I. Varietal studies.

Crops—Paddy.—(a) Kuruvai and kar recorded a very high yield of 3,000 lb. per acre. Co. 10 gave a phenomenal yield of 3,400 lb. per acre.

224 ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE

(b) Among the Samba varieties, Adt. 11 was outstandingly the best, with an acre yield of 3,132 lb. Among the varietal trials Co. 19 and Adt. 11 recorded the highest yield.

(c) Among the Thaladi crops Co. 19 was the best with an acre yield of 2,520 lb.

II. Manurial studies.

(i) *Green leaf and super.*—Eight thousand pounds of leaves and 1,000 lb. of super had given the highest yield in the series.

(ii) *Oil-cake applications.*—Groundnut cake, castor cake and neem cakes were tried on a 60 lb. "N-Basis". Castor cake proved to be the best.

(iii) In the trial of raw bonemeal and calcined bones, the former was found to be superior to the other.

(iv) In garden lands, ragi and groundnut trials were conducted. Ragi as a late season crop did not fair well. A.H. 25 groundnut have a good yield of 3,960 lb. of pods per acre.

(v) Vegetable cultivation was a special feature. Seeds and seedlings were distributed in a large quantity. Cowpea Newera gave an acre yield of 140 lb. of seeds.

(vi) *Fodder crops.*—C. 472 Cowpea gave 20,000 lb. of green stuff per acre. Kaka cholam gave 9,550 lb. of green fodder per acre.

(vii) *Sugarcane.*—Four hundred and nineteen was found to give the highest tonnage.

III. Among the dry land crops.

(a) A.H. 25 groundnut gave an acre yield of 2,536 lb. and was found to be the best among the varietal trials.

(b) Redgram did not come up well due to adverse seasonal conditions.

(c) Among gingelly crop S.I. 89 gave an acre yield of 200 lb. per acre.

IV. Rubber vine.

Rubber vine was grown as a special crop for trial. The result is not yet conclusive.

(6) AGRICULTURAL RICE RESEARCH STATION, AMBASAMUDRAM.

Season.—During the year 44.37 inches of rain were received. The south-west monsoon was active besides the unusual rains of hot weather and this told adversely on the Kar crop. North-east monsoon rains were normal and favourable.

2. *Crops—Paddy.*—Four hundred and eighteen seed beds in Kar cultures and 1,008 beds in Pishanam cultures and bulk were sown. Acres 7.86 were devoted to comparative yield trials of the strains

isolated at the station, and seed multiplication. Strain No. 1055—a Kar samba red selection has again shown its superiority over the unselected bulk of Kar samba and Katti samba of Tenkasi and gave an increased yield of 21 per cent over them. Kar samba white culture No. 1946 and Veedividangan culture No. 2325 have maintained their increased yields over their respective controls for the past four years; the increase being 10.5 and 12.5 per cent respectively. They did equally well in the district trials and are being issued for seed multiplication on a bulk scale.

Another culture No. 3224, a selection from Karthigai Samba and Kuruvaikalayan No. 21 have done better than their controls this year also; the increased yields being 15 and 33.6 per cent respectively. The district trials and observation plots results corroborate the results obtained on the station. Anai Komban culture No. 2927 is ready for issue for running observation plots in the district.

Green manures.—*Dhaincha* and *Sesbania speciosa* are eminently suited for the tract. The average yield of these per acre was 8,285 and 7,888 lb. of green stuff respectively.

Seed distribution.—Fifteen thousand two hundred and twenty pounds of paddy seeds were distributed.

COIMBATORE,
4th September 1944.

M. ANANDAN,
Deputy Director of Agriculture,
Southern Division.

ADMINISTRATION REPORT OF THE CURATOR, GOVERNMENT BOTANIC GARDENS AND PARKS, OOTACAMUND, FOR THE YEAR 1943-44 (FASLI 1353).

Charge.—I was in charge of the office of the Curator, throughout the period under report.

2. *Government Botanic Gardens, Ootacamund*—(i) *Staff.*—Two proposals were submitted to the Director of Agriculture, Madras, during the year—one for the increased nursery production of vegetable, ornamental and other economic plants to meet the public demand and the other for strengthening the Garden staff by reviving the two posts of the Assistant Curator and the Nursery Farm Manager for the proper maintenance of the Government Botanic Gardens to serve as a pleasure resort for the numerous all India visitors and the permanent residents on the Nilgiris.

Government were pleased to approve both the proposals resulting in immediate sanction of the Nursery Scheme and the two posts. Accordingly, Sri S. Madhava Rao was posted as Assistant Curator in the gazetted rank from 10th April 1944 and Sri B. G. Narayana Menon as Nursery Farm Manager from 9th February 1944. The Farm Manager, Government Botanic Gardens, Ootacamund, was absent on other duty at Kodur from 9th January to 24th March 1944 and the substitute posted in his place did not join duty so far.

(ii) *Season and rainfall.*—A total fall of 61.06 inches was received in 169 days ranging over the 12 months against 53.70 inches received in 166 days of the previous year. The heaviest fall of 2.17 inches occurred on the 7th June 1944. The maximum and minimum temperatures ranged between 90° and 73° and 52° and 36° respectively. Frost fell on 23 nights from 31st October 1943 to 10th February 1944 against ten frosty nights of previous years.

The rains were satisfactory to the growth of the perennials; but had to be supplemented by pot-watering for maintaining the steady growth of the annuals in numerous flower beds.

(iii) *The Nurseries and the Nursery Scheme.*—Prior to the starting of the Nursery Scheme on 9th February 1944, the nurseries and glass houses were run as in previous years, mostly for supplying the requisite planting materials for planting at the Government Botanic Gardens and Parks at Ootacamund and the Sim's Park at Coonoor. Only surplus plants and seeds in excess of garden requirements were sold out. Subsequent to the introduction of the Nursery Scheme on 9th February 1944 for popularising the nursery plants as per G.O. Ms. No. 14, Development, dated

3rd January 1944, expansion of the existing nursery works was started under two main divisions:—

- (a) The Vegetable section, and
- (b) The Ornamental Plant propagation section.

(a) *Vegetable section.*—Tillage preparatory to sowing was started on 9th February 1944 and by the end of June 1944, terrace Nos. I to X, 0.53 acres in extent, were got ready for sowing 220 raised beds, each of 9 feet by 3 feet size. The first instalment of vegetable seed sowing was done by the middle of March in 36 raised beds with special reference to English vegetables and the first opening sale of vegetable seedlings occurred on 6th May 1944. To meet the steadily increasing demand for vegetable seedlings and to ensure prompt and bulk scale supplies to ryots and garden visitors, a fortnightly sowing schedule has been adopted. So far, 88 orders for 70,870 seedlings for Rs. 630-13-0 have been complied with during the last two months ending 30th June 1944 from 179 beds of six fortnightly sowings.

(b) *The Plant Propagation Glass Houses section*—Seed propagation.—Three hundred and eighty-one packets and 3 lb. 2½ oz. of tree and flower seeds were sown under glass and in the open, over a lakh of seedlings pricked, 3,289 plants potted and 367 plants top-dressed.

Vegetative propagation.—Nineteen thousand nine hundred and forty-three cuttings of various ornamental plants and 3,775 layers of carnations, camellias, magnolias and dracaenas were inserted and over 200 plants obtained by division of orchids, rare succulents and chrysanthemums. Over 200 buds of rose and abutilon were budded on their own root stocks and a few graftings made of carnations.

Different kinds of bulbs like begonias, dahlias, lilies, freesias, achemines, etc., resting underground and in the bulb-room were treated for growth and flowering at such intervals as to keep on a rolling stock of these plants in bloom for the two conservatories and a few selected beds.

Seed and plant collection.—This work was continued throughout the year and gave a surplus of 54 packets, 16 lb. 13¾ oz. of tree and flower seeds in excess of nursery sowings. Valuable additions were also made to the existing nursery stock by purchase of seeds and plants from and outside India in addition to obtaining on exchange some rare plant kinds from the Government House and other local Palace gardens; and the usual collection of lily bulbs and wild orchids from the jungles was attended to. One ounce of snake fighting grass (*Melinis minutiflora*) seed received from the Lecturer in Botany was sown on 29th August 1943 in an area of 2 cents. The germination was fairly good and the grass has flowered and commenced seedling.

Of the 24 derris cuttings inserted in September 1943, only two have survived as rooted cuttings.

The extent of these propagational activities in the garden nurseries as a whole can be gauged from the volume of sales of 70,870 vegetable seedlings, 12,196 plants, 58 bulbs, 290 cuttings, 65 packets, 18 lb. 10½ oz. of tree, flower and vegetable seeds, and over 500 baskets of cut flowers in the shape of bouquets, sheafs, button-holes, crosses, wreaths and loose flowers, amounting in value of Rs. 5,528-1-9 against Rs. 4,565-5-7 in the previous year after meeting the requirements of the Government Botanic Gardens and other public parks at Ootacamund and Sim's Park at Coonoor.

(iv) *The conservatories*.—Both the green house and flower house served as two main beauty spots to all visitors, daily exhibiting a galaxy of about 2,000 best flowering and foliage plants in pots received from the above nurseries and glass houses.

(v) *Plantings*.—Over a lakh of flower seedlings were raised from seed at the nurseries and glass houses and three-fourths of these planted out in numerous flower beds and borders; and about 250 of perennial shrubs, trees, bulbs, rock plants and creepers planted at the borders, shrubberies, terraces, arches, slopes, pond margins and rockeries.

(vi) *Works*.—(a) All the terraces at the seed testing garden were forked, cleaned and relaid into beds for sowing the valuable imported flower seeds.

(b) The numerous flower beds all over the gardens were all forked, cleaned, limed and manured and then planted with flowering annuals in definite colour schemes.

(c) The terraced flower beds below the public conservatory were all filled in and turfed to form a natural slope.

(d) Fifteen Malabar lotus roots presented by Sri P. Narayanan Nayar were planted deep in the mire of three large ponds in the garden.

(e) Silt was cleared from two ponds in the lower garden and pond weeds and rushes from all the ponds.

(f) The terraces above the new band stand were reshaped into convenient nursery beds by cutting off the elevations and filling in the hollows.

(g) Seven hundred and fifty pits (1½ feet by 1½ feet by 1½ feet) were dug in the shola areas and these planted with bluegum seedlings during rains.

(h) Fifty-one pits (3 feet by 3 feet by 3 feet) were dug open, filled in and planted with 28 ornamental tree kinds and another 120 pits (1½ feet by 1½ feet by 1½ feet) were dug in and planted with suitable perennials in the gaps of the borders and shrubberies.

(vii) *Trial of medicinal and other economic plants*—(a) *Jalap (Ipomea purga)*.—Cultivation of this was continued but on a smaller scale owing to difficulties in the disposal of its green tubers.

(b) *Pyrethrum (Chrysanthemum cinerariaefolium)*.—Small scale cultivation of this insecticidal plant was continued by planting about 400 suckers in three ornamental beds from the old stock plants and preserving the original mother plants at the Todamund side under uncultivated conditions just for demonstration to garden visitors.

(c) *Celtuce*.—Although the seed germinated well and the seedlings stood transplanting fairly well, the plants failed to flower and seed in spite of satisfactory vegetative growth.

(viii) *Annual repairs*.—Various items of annual repairs to residential and non-residential buildings, repairs to paths, fence and garden benches at a cost of Rs. 900 were attended to.

(ix) *General*.—Routine works of attending on visitors for selection of plants and demonstration of plant propagation methods, identification and labelling of plants, packing and despatch of cut flowers, plants and seeds, pruning, mowing, spraying, etc., were attended to.

Two hundred and sixteen mirror carps (fish) were removed from the Crescentic pond at the Government Botanic Gardens, to the Shevroy Hills for further breeding by the Fisheries Research Officer.

(x) *Sales and transfer supplies*.—Next in importance to the proper maintenance of these gardens was the prompt execution of 1,068 orders from all over India for seeds, plants, cut flowers, botanical specimens, etc., amounting in value of Rs. 5,528-1-9 against 831 orders for Rs. 4,565-5-7 in the previous year.

(xi) *Food production*.—An area of 2.70 acres from the shola lands adjoining the nurseries leased to some applicants among the poor garden coolies for cultivation during last year was continued to be raised with food crops by them with seed material supplied by the department.

(xii) *Exhibitions*.—The Annual Dog Show and Flower Show of the Nilgiri-Agri-Horticultural Society, Ootacamund, were held at the Government Botanic Gardens. Two large groups of valuable ornamental plants and rare succulents and orchids were exhibited at the Flower Show. Myself and my three Assistants acted as Judges for different sections of the Flower Show.

(xiii) *Visitors*.—The gardens continued to serve as the chief pleasure resort in India of every season visitor to the hills in addition to the several daily visitors from among the hill residents throughout the year. Over 40 batches of students and staff from various colleges and schools in India were shown round the Gardens and the nurseries with practical lessons in botany and ornamental gardening.

3. *Other Government Public Parks, Ootacamund*.—As usual, these parks were kept in good condition to serve as a pleasant

retreat for the neighbouring residents. Routine work of planting and watering flower beds, swording grass, clipping hedges, pruning, general cleaning and impounding trespass cattle was attended.

Thirty-eight heads of cattle were impounded.

4. *Sim's Park, Coonoor*—(i) *Season and rainfall*.—A total fall of 65.03 inches was recorded in 138 days as against 67.18 inches recorded in 136 days of the previous year. The heaviest fall of 2.90 inches was received on the 11th November. The season was practically normal.

The maximum and minimum temperatures ranged between 88° and 60° F. and 62° and 39° F. respectively. The highest and lowest temperatures were recorded on 24th April 1944 and 26th January 1944 respectively. Ground frost occurred on three successive nights in the middle of January 1944.

(ii) *Condition and maintenance of the park*.—The park was maintained in good condition throughout the year in spite of difficulties in getting labour. The flower beds and borders were planted with suitable seedlings in colour designs. Taking advantage of the rains during the monsoon, turfing was done alongside the paths and planting grass in the lawns. Two rockeries were overhauled and planted with suitable succulents and rock plants received from the Government Botanic Gardens, Ootacamund. A new rectangular bed was opened near the island bed and planted with choice Dahlia bulbs. The footpaths were rectified wherever necessary and grass spikes sworded at intervals. A new rockery was prepared on the slope near the fourth terrace and planted with mixed dwarf flowering seedlings and a few rock plants. One dozen "*Impatiens-Hookeriana*" plants were planted in different parts of the park. *Ficus stipulata* was planted along the rivetment below the agricultural demonstrator's quarters with a view to cover the rivetment in due course. A small patch of "*dianella*" was removed near the picnic ground and suitable shrubs were planted instead. The shrubs have established themselves and a few flowered during the season. An arch was provided at the entrance to the island bed. The children picnic ground was provided with steps and an opening was made from the picnic ground to the shrubbery with a view to give more space for the children to play about. Fish-oil soap solution was sprayed against 'sooty-mould' on the hakea hedge. *Bucklandias* and *Cupressus knightiana* were planted in different parts of the garden. On the slope near the tennis court, *cupressus* seedlings were planted to serve as a hedge. A swing was provided in the picnic ground. Parasites from trees were removed and hedges clipped. An oval shaped bed was made and planted with different varieties of standard roses.

(iii) *New introduction*.—Twelve rose plants were purchased from Messrs. Darlington Nursery, Calcutta. These have been potted and buds will be taken from these plants and inserted on

rose briars for propagation. Four dozen dahlia bulbs, two dozen gladioli bulbs, six standard roses and one dozen madona lily bulbs were purchased from Mr. M. G. Joseph, Coonoor.

(iv) *Nursery propagation*.—Propagation of the flowering shrubs and plants was the main item of work that is being done in the hardy nursery. A large stock of camellias, azalias and standard roses are now available for sale to the public. In all, 425 briars were inserted and 265 roses were budded. Three thousand and six hundred cuttings of different plants were inserted and a large number of seedlings were raised for planting in the park and also for sale to the public. Convenient plots were made in the vacant space in the lower part of the nurseries to be planted with rose briars for budding purposes. The failures along the hedge in the agricultural demonstrator's compound were filled in and the plots were weeded round about his office.

(v) *Distribution of plants and seeds*.—Fifty-eight standard rose plants, 488 shrubs and plants, 1,765 flower seedlings, six packets of flower seeds, 30 bulbs of different varieties were sold to the public, besides 13 oz. of seeds, 42 plants and 61 standard roses were supplied to the Government Botanic Gardens, Ootacamund.

(vi) *General*.—The Director of Agriculture inspected the park. The 'Mirror Carps' stocked in the lake are flourishing and they have been the main attraction of the visitors.

5. *Agricultural Research Station, Nanjanad*—(a) *Season and rainfall*.—The south-west monsoon rains of 1943 commenced early in all vigour but fell far below the average during June. Good rains were received from July to September. These rains interfered with the harvest of irrigated and main crops of potato and planting of second crop.

The north-east monsoon rains started early in October with great promise and when the rains ceased on the last day of October, frost set in and cut the young crop of potato. Frost during October is very unusual particularly in the immediate wake of continuous rains. November recorded good rains. Frost again appeared towards the end of the month. As usual, slight showers were received during December. Typical cold weather conditions prevailed during January. The hot-weather rains were about average although it was unusually heavier during March and low during April and May. The season, on the whole, was normal and the rainfall about average. The total rainfall recorded was 57.24 inches on 171 rainy days during the year.

(b) *Potato*.—As usual, three crops were grown, the main crop over 9.82 acres, the second crop over 18.26 acres and the irrigated crop over 4.90 acres and they gave an average acre yield of 317, 157 and 198.4 maunds respectively.

(c) *Resistance oats*.—This useful fodder crop was raised on 0.55 acre and the acre yield obtained was 311 lb. of grain and 4,471 lb. of straw.

(d) *Rye*.—The area under this crop was increased to 32.84 acres in order to meet the demand for ergot production and large scale production of seed. The spraying and picking of ergot was done by the Assistant Mycologist and his staff. The yields of grain and ergot respectively were 4,756½ lb. and 517½ lb.

(e) *Sweet lupin* (*Lupinus angustifolius*).—This is good substitute for horsegram for cattlefood and can also be used for human consumption as green peas or dholi. The area under this crop was uniform and good and gave an acre yield of 614 lb. of seed.

(f) *Lupinus termis*.—One acre 50 cents were under this crop for seed production. It is a very useful green manure crop, being a heavy yielder. Six hundred and seventy-five lb. of seed per acre was obtained.

(g) *Pyrethrum*.—A new clearance of 1.01 acre has been made mainly for experiments on this crop, thus making up a total area of 3.91 acres. Harvest of flowers and dry heads for seed was continued.

(h) Trial crops like mustard, perennial castor, clover varieties, pusa strains of oats, wheat and barley, chenopodium, rubber (*cryptostegia grandiflora*), *melinis minutiflora*, sweet yellow lupin, sugarcane, were under trial during the year.

(i) *Vegetables*.—The area under vegetable was 2.70 acres mainly intended for collection of seeds. The flowering in cabbage was very rare and the seeds produced turned out to be natural crosses with other cruciferae. Cauliflower flowered more freely but percentage of natural cross was very high. The seed collection will be confined to peas, beans and radish during next year. Thirty-seven lb. of vegetable seeds were either sold or transferred.

(j) *Works*.—The annual repairs to non-residential and residential buildings and repairs to the farm road were undertaken. A new potato store was constructed at a cost of Rs. 2,500. The potato seed store was remodelled by fixing fire clay pipes and perforated stoneware tubing for conducting experiments on black-heart of potato.

(k) *Seed distribution*.—During the year, 2,470 maunds 19 lb. of seed potatoes, 3,115 lb. rye, 555 lb. lupin, 62 lb. local ragi, 37 lb. ¾ oz. vegetable seeds, 7 lb. resistance oats, 14 lb. local barley, 2 lb. 4 oz. castor and 42 lb. of pyrethrum seeds were supplied from the station.

OOTACAMUND,
2nd August 1944.

P. A. NATHAN,
Curator and District Agricultural Officer.

FINANCIAL STATEMENT FROM 1ST JULY 1943 TO 30TH JUNE 1944.

Receipts—XXIX. a. Agriculture—Agricultural Receipts.

	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.	4,287	11	0	384	5	0	..		
Miscellaneous	300	9	9	102	9	6	418	12	0
Rent on buildings	..			129	0	0	..		
Recoveries of overpayments ..	30	2	0	..			..		
XLV. Stationery and printing ..	15	2	0	1	0	0	..		
	4,633	8	9						
	17	8	0						
Deduct refunds									
Total ..	4,616	0	9	616	14	6	418	12	0

Charges—40. g. Agriculture—Botanic 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 allowances including dearness allowance.	10,152	10	0	1,572	4	0	..		
Contingencies—Voted—									
Petty construction and repairs ..	749	14	0	149	14	0	..		
Capital outlay	234	11	6	115	4	6	..		
Working expenses	9,919	2	7	4,326	14	6	701	2	0
Other contingencies	1,218	6	6	205	6	0	..		
Dearness allowance	2,048	3	0	795	7	0	117	8	0
Total ..	24,322	15	7	7,145	2	0	818	10	0

ADMINISTRATION REPORT OF THE SPECIAL OFFICER FOR VEGETABLE CULTIVATION, COONOR, FOR THE YEAR 1943-44 (FASLI 1353).

I submit herewith my administration report on the working of the Nilgiris Scheme for the production of fresh vegetables for supply to the army for the year ending 30th June 1944.

I was in charge of this scheme during the entire period under report, except for 15 days when I was on leave and the Farm Manager, Agricultural Research Station, Wellington, attended to the current duties of my office in addition to his own. I was assisted by two Special Demonstrators and clerical staff, which has since been practically doubled, to cope with the increased production.

2. *Steady expansion.*—Since the submission of my last report, the Nilgiris scheme has undergone enormous expansion (vide paragraph 10). It has also worked smoothly and satisfactorily from the point of view of every one concerned, namely, the growers as well as the military authorities who receive and distribute the produce to the units. The details of the working have already been explained by me in my report for last year.

3. *Initial difficulties.*—When production was first arranged for in May 1943, the situation was very disheartening, largely on account of the unreliable quality of the seed available in the country, and consequent reluctance on the part of the growers to undertake any large-scale production. There was also a certain amount of distrust among them that the prices to be fixed for the produce might prove too low and unprofitable, as also to some extent that the whole undertaking might bring them into clash with a scheme intended primarily for the benefit of the Military department or that the growers might be let down if the war ended abruptly and production intended for supply was no longer required. After a great deal of propaganda to remove these prejudices, it was found possible to convince the growers that the difficulties they anticipated were purely imaginary and that the scheme contained every safeguard to protect the growers, as the contracts for the produce were on a crop-by-crop basis and that the prices were to be fixed by a neutral body in consultation with the representatives of growers.

4. *Supply of reliable seeds.*—By far the most stimulating factor which operated in favour of the scheme was that my urgent requests for the supply of high grade imported seed under lease/lend were readily responded to. The first consignment arrived in July 1943. A second consignment reached me in August 1943. But the quantities allotted were altogether inadequate. An effort to get an enhanced quota having failed, I got further consignments to

the extent available from certain seedsmen in Calcutta and Saharanpur to whom lease/lend seed had been issued for sale to the public at controlled prices. But even this did not fully meet my requirements, as the area under production was being continually extended. Some of acclimatised seed received from Fyzabad, etc., proved disappointing. In the meantime, arrangements had been made with the Directors of Agriculture of Kashmir and Quetta for obtaining the balance of my requirements from the seed grown in that area. These supplies proved a great standby. For although it must be confessed with regret that the quality of this seed was the best obtainable in Indian grown seed. One chief difficulty still remained, namely, that neither Kashmir nor Quetta was able to supply seed of cauliflower and the latter obtained from other sources (including lease/lend) was subject to 'bolting'. This difficulty however was overcome in part by making use of a local strain which proved far more dependable than the supplies got from outside. The military authorities had arranged for a further consignment of lease/lend seed for 1944 and had obtained indents as early as December 1943 for a supply to arrive in March 1944. But unfortunately this consignment has been late in arriving and at the date of this report news has just been received that the seed has arrived and is under despatch.

5. The total quantity of lease/lend and other seeds purchased for distribution under the scheme up to 30th June 1944 is 6,319 lb. at a cost of Rs. 37,953. If the 1944-45 supply of lease/lend seed had arrived in March 1944, as was expected, production at this date, would have been still higher; for, it was found that the growers who had obtained their seed direct from some Indian firms failed with them completely in some cases, due to the bolting of turnips and cauliflower, and in cabbage the crop was only 40 per cent of the normal produce, consequent on the inferior quality of the seed.

6. In the case of lease/lend seed, the results were all eminently satisfactory, except in regard to cauliflower which failed because of bolting. The lease/lend cabbage "Copenhagen Market", carrot "Chantenay" and "Imperator Half long", turnip "Purple Top white Globe" and beet "Early Wonder" and "Detroit Dark Red" gave splendid crops and enhanced the popularity of the scheme.

7. The supply of manures and fertilizers did not present any serious difficulty, since the growers of vegetables depended primarily on the use of cattle manure. Those growers who could not obtain the fertiliser requirements direct from the trade, selecting their own favourite brand of mixture, were supplied with a vegetable fertiliser obtained at a special wholesale rate from Messrs. Parry & Co. and this was supplemented by a supply of ammonium phosphate for use as a straight manure.

8. *Area under cultivation.*—The demand for increased production presented considerable difficulty in respect of finding suitable new areas, as only lands with all three facilities existed, namely, irrigation, labour and accessibility by road for motor transport, could be cultivated with vegetables under the scheme. This problem was solved to a large extent by opening up swamps by means of effective drainage channels which served also as a source of water-supply to the reclaimed lands. The original estimate of production was from an area of 250 acres. Present production to maintain a regular supply of 30 tons a day * represents the yield from an area of nearly 3,600 acres a year. Supplies have already reached 25 tons a day and further expansion is going on already.

9. *Kinds of vegetables grown.*—As already agreed upon, only the more important kinds of vegetables were grown under the scheme, namely, cabbage, cauliflower, beet-root, carrot, turnips, peas, french beans, runner beans and broad beans. To these were added lettuce, radish and brussels sprouts in consultation with the army headquarters.

10. *Quantities and cost of vegetables produced.*—Supplies under the scheme were started from August 1943 and the quantities supplied from month to month are given as under:—

Month.	Quantity.	Cost.
	TONS.	RS.
1 August 1943	32	9,870
2 September 1943	48	* 9,736
3 October 1943	50	18,337
4 November 1943	† 265	54,913
5 December 1943	† 239	46,799
6 January 1944	† 255	49,023
7 February 1944	241	43,800
8 March 1944	196	35,036
9 April 1944	404	70,091
10 May 1944	541	99,851
11 June 1944	750	1,37,002
Total	3,021	5,81,068

* A revision of the prices with effect from 1st September 1943 resulted in a substantial reduction of costs. Hence, for nearly the same cost as in August 1943 a large quantity could be purchased.

† Includes a supply of 135 tons and 99 and 66 tons respectively during November and December 1943 and January 1944 taken over from growers under contract with Messrs. Parry & Co., for supplies for dehydration but no longer required by the latter.

11. *Prices.*—There was difficulty in the initial stages in arriving at prices which were satisfactory to the grower and purchaser alike. This was solved by arranging for the Prices Fixation Committee to meet periodically at Ootacamund. This committee which is presided over by the Commissioner of Civil Supplies includes representatives of the growers as also of the Military Department and has been able to fix prices which are reasonably remunerative to the grower and acceptable to the army.

12. *Quality of the supplies.*—The quality of the supplies has been generously acknowledged from time to time in appreciative

terms by the service units at the consuming centres. Reports, if any, of damage in transit were promptly investigated and improved methods of packing adopted in the light of experience gained. The United Kingdom Dehydration Mission visited the production area, and the members who inspected the standing crops of cabbage, carrots, turnips, etc., remarked that those were as good as could be grown anywhere in the world. There is every expectation that this quality as well as the present high level of production can be maintained as long as may be necessary, if dependable supplies of seed were forthcoming, and it may very soon be possible to step up production under the scheme to quantities beyond the requirements of the army and to release the surplus for civil consumption at controlled rates.

13. *Seed production in the Nilgiris.*—The scheme for the production of seed of the more important kinds of the European type of vegetables at Wellington reached a further stage during the year under report. The land intended for the purpose was released by the military and transferred to the Agricultural Department in November 1943, and the operations were started almost immediately for getting the land layed out into plots, graded and levelled. This involved very considerable labour; the ground being a hill side dotted with rocks and pits, but the work progressed steadily and as speedily as was possible under the difficulty of securing adequate labour. As each plot became ready for use, it was planted with an interim crop of vegetables for testing the quality of the soil and to get the ground into tilth, since the actual seed crop for which the land was intended could not be started before September. The produce is being sold to the military under the general scheme for vegetables in the Nilgiris.

It is understood that this scheme for the production of seed of English vegetables has been sanctioned for only two years. I submit that, apart from the large waste of initial expenditure that would occur in that event, the present scheme has a definite and integral place in the economy of seed production in India as a whole, since the Nilgiris is known to produce high grade seed of certain kinds, notably cauliflower which is not obtainable from the areas newly developed for seed production in Kashmir and Quetta under a subsidy. Parts of the United Provinces and some areas near Patna are no doubt producing a limited quantity of cauliflower seed, but this seed is suited only to certain areas, and the local demand, which is considerable, can be met in this respect only from seed produced in this area, while it may be in request in other provinces also. It is, therefore, proposed to concentrate the activities of this farm to the production of those kinds of seeds of which the quality is expected to be better than that of seeds obtainable from outside.

COONOR,
6th August 1944.

B. S. NIRODY,
Special Officer for Vegetable Cultivation.