THE MADRAS AGRICULTURAL JOURNAL

Vol. XXXIX NOVEMBER 1952 No. 11

CONTENTS

PAGE

Editorial 541

Letter to the Editor 543

New Patron 543

Obituary 544

Original Articles :

1. Studies on the Purity and Performance of Rice Strain 545

   By P. Uttaman, P. C. Sahadevan and M. Kelukutty Menon

2. Mandarin Orange Cultivation in the Agency Tract 552

   By S. Muthuswamy, C. Venkatesan and C. Srinivasan

3. Peculiarities of Viticultural Practices in Madurai District (South India) 558

   By V. S. Rangacharlu

4. A Little Known Spice Plant *Zanthoxylum Rhetsa* DC 563

   By S. N. Chandrasekharan

5. An Easy Method of Colour Preservation in Plant Specimens for Museums and Herbaria 565

   By T. Venkatapathi

CONTENTS *(Contd.)*

6. A Review of the Rural Economic Conditions of the Coimbatore District as Revealed in the Economic Surveys of Some Villages in the District ... 569

By S. V. Duraiswami and V. S. Narasimhan

College Notes and News 580

Gleanings 581

Golden Jubilee Celebrations of the Agricultural Research Station, Samalkot ... 581

Weather Review — for October 583

Departmental Notifications 586

The Madras Agricultural Journal

Vol. XXXIX November 1952 No. 11

Editorial

Much is being written of and talked about food shortage, increase of population, failure of monsoons, shortage of labour and the like, in recent times, which seem to frighten the human race with starvation, misery and chaos. Yet, every cloud has a silvery lining in it. Progress of humanity is linked up with rise of intellectual power. Every time there is catastrophe, crisis of cataclysmic changes, new discoveries are made, as steps to human progress. Hopeful signs are not wanting. There are increasing efforts in evidence, to tap the natural resources available in plenty. The natural resources that are being explored are sun, the atmosphere and the ocean.

It is stated that the 'Solar' energy is made use of in France in a much better manner than in any other part of the world. With the help of large aluminised mirrors, the French scientists have evolved 'Solar Furnaces' with a temperature of 3500°C to 4000°C and these furnaces are put to maximum use by the Industrialists. H. C. Hottel, of Massechusetts Institute of Technology has given a figure of about 50 horse power per acre per year on the average that man might make available from the solar energy that reaches Arizona. In a multifarious manner this solar energy is being explored in other countries.

In regard to atmosphere it has a very good picture. Plenty of details are available regarding the economic use of wind as an energy giver. Wind mills are put to innumerable uses, at times as electricity generators under very favourable conditions. Further, this atmosphere is responsible for the formation of clouds at different heights. It needs no mention that for normal precipitation there should be good cloud formations.

The recent failures of the monsoon not only in India but also in other countries have instigated the scientists, so to say, to study in greater detail the physics of cloud formation and condensation. As more and more knowledge is gained both under the laboratory and open conditions the scientists are tempted to-day to produce artificial rain. To get the maximum benefit from the cloud formations

that are likely to be dissipated without producing showers attempts are being made in almost all the countries to gather more details on 'Artificial Rain Production' and to examine the possibility of making it a practical proposition. Various techniques have been evolved, with and without aircrafts, and their relative importance under different conditions of cloud formations is also being scientifically studied. The readers of this journal may be delighted to know that an all India Symposium on this important subject of 'Rain to order' is likely to be held shortly at New Delhi. The public may expect a good deal of benefit to the country from this proposed symposium.

As regards ocean, this again, in its turn, is a rich and inexhaustible store, from which much can be drawn for the benefit of humanity. Desalting of sea water has become, of late, as fascinating a topic as stimulation of a cloud to give rain. It is interesting to note that a group of gentlemen in Cambridge converted 1000 gallons of sea water into drinking water by using only twenty kilowatts of electricity as energy. This achievement is due to the discovery of a process of continuous production, whereby coal tar and petroleum materials become a membrane that will remove salts from sea water. The question that one is tempted to ask is "Can we desalt sea water, pump it up and irrigate lands of insufficient rainfall?". The answer is in the affirmative, but what is required is "Mechanical power."

The ocean is likely to come to our rescue as a great source of power as well. Years ago Georges Clande, the French Inventor of the neon light, performed some suggestive experiments with getting heat from the tropic ocean surface. Clande's principle is now being examined by the French Government. Vast research is being conducted. Elaborate details are being worked out to get energy at reasonable cost from the vast ocean. Perhaps long and costly experiments may have to be undertaken.

If success is achieved in the above huge propositions, it may be possible to bring even the vast deserts under plough and this seems to be the only possible s olution of olving the food problem of the world, since no legislation is possible of enforcement to check up the present rate of population increase.

Let scientists, statesmen and the public all work hard individually and collectively for realising better deal from Nature and for the good of humanity.

Letter to the Editor

The Editor has received a letter from Sri A. P. Krishnaswami, Avarampalayam, Coimbatore. The subject dealt with in the letter is 'Rains in Coimbatore'. The author relates his experience that in recent years there is the decreasing intensity of monsoon showers in Coimbatore District and the consequential lower depths of water levels in the wells and dislocation of cultural practices. As reasons for decreasing rainfall the following are adduced:

(i) Deforestation
(ii) Undue spreading of electric system.
(iii) Too much of industrialisation.

He concludes his letter with a plea that these aspects should be studied scientifically with reference to conditions in this district and elsewhere.

New Patron

It is indeed with very great pleasure that we welcome our new patron Sri M. S. Palaniappa Mudaliar, B. A. He is not only a leading agriculturist of the Coimbatore district but also a renowned co-operator, closely associated with the various co-operative concerns, in the Madras State, particularly in the Coimbatore district. He started the Coimbatore Co-operative Milk Supply Union and did a lot as its honorary Secretary for nearly eleven years for its present perfect state of utility to this growing city. In rightful recognition of his intimate knowledge of Indian Dairying he was appointed as a member of the Milk Sub-Committee, constituted by the Government of India in 1944. As a member of the Animal Husbandry Wing of the Indian Council of Agricultural Research, he had an invitation to prepare a pilot scheme on 'Cattle Insurance'. This scheme coming from the Managing Director of an Insurance Company, interested in cattle welfare, won the admiration of the Council and is now in the hands of the Central Government. He is also a journalist and a great philanthrophist. At present he is the Honorary Secretary of the Tamil Nadu Co-operative Federation and also the Perundurai Sanatorium.

Above all, Mr. Mudaliar, is a practical agriculturist, following keenly the activities of the Madras Agricultural Department with appreciation and interest, and has been always willing to extend his co-operation.

We appeal to all leading personalities in our State to follow his example and enroll themselves as patrons and bring new life to this useful organisation of the Madras Agricultural Students' Union.

OBITUARY

V. MUTHUSWAMI AYYAR

V. Muthuswami Ayyar, Retired Lecturer in Agriculture, Agricultural College, Coimbatore, died on November 19 at the age of seventy-three at R. S. Puram, Coimbatore.

In the death of Muthuswami Ayyar the Madras Agricultural Students' Union, loses one to whom it owes much. His services to the Union were manifold and distinguished. He was closely associated with its activities from 1920 to 1932 and served it in many capacities, as Secretary, Vice President and Editor of the Journal. It was during his Editorship that the transition of the Madras Agricultural Journal from a College Magazine to a Scientific periodical, was effected, in order to increase its scope of usefulness and make it as a medium for the publication of work done by the members of the Agricultural Department in Madras. If it is remembered that the total strength of the Department was about a hundred at the time the conducting of a monthly Journal with the available resources and without any financial aid from other sources, the task which Muthuswami Ayyar undertook was by no means an easy one. But his sincere devotion to the Union and his selfless efforts helped him to overcome all difficulties and place the Journal on a secure and sure foundation. The Madras Agricultural Journal, places on record its deep sense of gratitude to Muthuswami Ayyar for his services to the Union during the difficult period of the Journal's infancy.

Besides his services to the Union, Muthuswami Ayyar's contribution towards the welfare of the students of the College and the residents of the Agricultural College Estate deserve special mention. By his simple and unassuming manners and readiness to help those in need, Mr. Muthuswami Ayyar endeared himself to every one with whom he came in contact.

The Madras Agricultural Journal records its deep sense of sorrow at his death and conveys its sympathy to all the members of his bereaved family. May the soul rest in ever-lasting place.

Studies on the Purity and Performance of Rice Strains

By

P. UTTAMAN, P. C. SAHADEVAN

AND

M. KELUKUTTY MENON

Agricultural Research Station, Pattambi

Introduction: In breeding superior rice strains at the Agricultural Research Station, Pattambi, the method of pure line selection has been the most fruitful. For instance, all the 30 improved strains of rice which, on an average, give an increase of 16·7 per cent in yield, are the products of selection. These strains are very popular. Their capacity for higher yield is never disputed by the cultivators. In assessing increased yield brought about by strains in ryots' fields, the accepted method is to calculate it at a 10 per cent increase in most cases, while in a few cases the limit may even be lowered to five per cent. It is not known how far influences other than genetic factors account for the lowering of this level. The genetic factors should more or less remain stable in homozygous lines in rice, reproducing as it does essentially by self-fertilization although a knowledge of polyploids, structural hybrids and high frequency of mutations amply justifies the view that a pure line does not exist in practice. Even a haploid vegetatively propagated will not assure purity due to variation by mutation, position effect and crossing over. It is, therefore, believed that in an aggregate of plant population, there exist genetic variabilities caused by slow, small mutations and by natural crosses involving such mutants. This may ultimately result in a certain degree of contamination with inferior lines leading to considerable degeneration in the productive capacity. It may be that the types desired by man are seldom favoured by nature. The fact that among hundreds of plants selected, it is only one or two that ultimately result in a superior strain would support this contention.

A strain, once released, is generally grown by ryots without much of a breeder's concern for purity. A gradual process of genetic deterioration as indicated above, might set in and cause the strain to revert to one of low productive capacity. At such a stage reselection becomes necessary. It would be interesting to have some idea of the extent of such a genetic deterioration a strain might undergo, especially under conditions where chances of mechanical mixture and dangers from inter-varietal crossing are eliminated by careful roguing.

Data relating to three first crop (autumn) strains and two second crop (winter) strains are gathered in the present paper.

Previous work: In naturally self pollinated groups of plants, remarkable improvements were effected by pure line method of breeding. A number of instances are cited by Hayes and Immer (1942). Even in pure lines heritable variations were however found to exist as a result of gene mutations (East, quoted by Hayes and Immer, 1942). East classified these mutations as physiological defectives and non-defective genes. Such mutations may be favourable or un-favourable. Studying a series of inter-varietal crosses, Dolgusin (1941) observed that loss of vigour occured even in self-pollinated crops and suggested interstrain crossing in order to restore vigour. Delaunay and Didusi (1946) also found such variations in the pure lines of wheat and barley.

Experimental: 1. *Origin of strains and their performance:* Each strain represents the progeny of a single plant selected from an average of 100 to 150 plants from representative samples of ryots' bulk. By elimination of inferior lines by visual test in successive seasons, the number is reduced to manageable sizes. They are then put under comparative yield trials against the original ryots' bulk in replicated, randomized blocks for three or four seasons. On the basis of yield, two or three cultures are finally selected and put under yield trials in ryots' fields (district trial) for one or more seasons as the case may be, under duplication on the farm. The best culture is finally released as strain. Percentages of increased yields on the farm and in the district together with other particulars of the strains are given in table I.

It will be seen that the strains maintained increased yields over the ryots' bulk in all years of trial irrespective of seasonal influences. The average increase in the district is more than what is recorded on the farm in the case of four out of the five strains. In each strain the increases in yields are found to fluctuate presumably due to seasonal factors. They range between seven and 17 per cent in the strain Ptb. 2, eight and 27 per cent in Ptb. 5, four and 19 per cent in Ptb. 9, nine and 18 per cent in Ptb. 12 and eight and 28 per cent in Ptb. 20. The average yield increase is 14 per cent in the case first crop strains and 23 per cent in the case of second crop strains.

2. *Extent of genetic contamination:* In the year 1949–'50, 100 single plants were selected from each of the five Pattambi strains namely Ptb. 2, Ptb. 5, Ptb. 9, Ptb. 12 and Ptb. 20 after a lapse of 15, 15, 14, 10 and five years respectively since their release. These were put under yield trial against the respective strains as standards in replicated randomized blocks. On the basis of yield, 10 best cultures were selected in each for final yield trial. The results are presented in table II.

In all cases excepting one, the results did not satisfy the 'z' test. Even after a period of 15 years, as in the case of Ptb. 2, the bulk strain

maintained the original yield. In the case of Ptb. 5, two cultures out-yielded the parent strain.

Discussion: From the results presentsd in table I, it will be found that every pure line culture consistently maintained increased yield. It must be mentioned that the plots under these trial were never given any heavier dose of manure than the ordinary. In the majority of cases, the average increase of yield over control (ryots' bulk) is higher in ryots' own lands than on the farm. In the light of these facts, the opinion that high yielding strains maintain superiority only under conditions of high soil fertility (Hunter and Leake, 1933) would appear to need qualification with reference to variety, tract and cultural practices.

The variations in increase of yield are different in different strains. They range between an average minimum of 7·2 per cent to an average maximum of 21·8 per cent. The lowest figure of four per cent is given by Ptb.9 in one season. Presumably this variety is likely to be the worst affected in an un-favourable season. Even on this basis, putting down the average increased yield in ryots' fields to five per cent (Burns, 1944) will not be justified especially in a tract like Malabar where Ptb.9 is only one of the many varieties grown in the same season. It must also be noted that the average maximum recorded by these strains is more than 20 per cent.

In any field scale estimate, therefore, the area occupied by individual strains as also the fertility of the soil on a zonal basis, have to be taken into account.

The results presented in table II would show that the gene content of four out of the five strains has not presumably been affected. Rather, any genetic disturbance (due to small mutations and natural crosses) that may have taken place did not materially affect their over-all capacity for higher production. Mutable genes get transformed constituting individual biotypes that are able to react genotypically with success to a wide range of ecological requirements without losing its general common morphology. It may be possible to isolate such biotypes. Existance of two such types differing in characters like tillering and length of ear have been recorded in the rice variety *Chornali* (Narasinga Rao and Sahadevan, 1951). It might be possible to get a combination of such characters in one biotype. Outstanding instances of the the presence of such biotypes in ryots' unselected bulk are afforded by the strains Ptb. 18 and Ptb. 19. Strains Ptb. 3 in *Eravapandy* and Ptb. 6 in *Athikraya* which were originally released, recorded on an average 8 and 18 percent increased yield respectively. Reselection from the ryots' bulk of each variety resulted in the isolation of still better

cultures and they were released as strains Ptb. 18 and Ptb. 19 to replace Ptb. 3 and Ptb. 6 respectively. The strain Ptb. 18 recorded 23 percent increased yield over Ptb. 3 and Ptb. 19, 16 percent over Ptb. 6.

It is a known fact that action and reaction of genes constitute the most critical mechanism in genetics for the quantitative hereditary characters like yield. Several genes in different loci contribute to the one effect with some times considerable interactions. It is also well known that certain loci have more mutable genes than others at a given stage in the development of the plant (Sansome and Philip, 1939). The mutant homozygote may be very much less frequent in a population than the heterozygote after a factor mutation has taken place with a very small frequency. It is possible that gene mutation in the Ptb. 5 strain has perhaps been more frequent than in the other strains under study. This phenomenon perhaps accounts for the behaviour of the strain Ptb. 5 in which two cultures selected within the strain recorded increased yields, the difference being statistically significant (Table II).

As long as mechanical mixtures are avoided, the genetic purity and performance in rice are maintained by most of the strains for many generations. On a bulk scale also the strains have continued to give statisfactory yields. Periodical selection of single plants and isolation of the best lines may, however, be desirable if only for the chance they afford in getting an outstandingly superior strain. There is reason to believe that small genetic variabilities exist even in a pure line (Delaunay and Didusj, 1946). But continued selection within successive pure lines might result in pointed improvement in one particular direction. This may however prove deleterious in the long run. Isolation of superior lines and mixing them to form a mass bulk for serving as nucleus seed should meet the requirements well and maintain the performance of a strain for a number of generations.

Summary: 1. Increased yields recorded by five improved strains of rice and the fluctuations in percentage of increased yields in different seasons are given.

2. The need for specifying tracts, cultural practices and nature of the soil in the field scale estimation of increased yields due to improved strains, is stressed.

3. Genetic variability for yield was studied in five rice strains isolated by pure line method after five to 15 years since their release.

4. The possibility of isolating superior biotypes within a strain later and its limitations are discussed.

5. Purity and performance of pure lines in rice could be maintained for a number of generations as long as mechanical contamination is avoided. However, the need for vigilance in maintaining an elite mass bulk is felt necessary.

Acknowledgment: Our thanks are due to Sri. M. B. V. Narasinga Rao, Paddy Specialist, for his helpful criticism and able guidance in the preparation of this paper.

SELECTED REFERENCES

Burns, W. (1944) Technological possibilities of Agricultural Development in India; Quoted in A Food Plan for India, 1945: Oxford University Press.

Dolgusin, D. A. (1941) Seed Production of grain Crops: Pl. Br. Abst. Vol. 12. 1946.

Delaunay, L. N. and Didusj, V. I. (1946) The efficacy of intra-varietal selection in varieties of self-pollinated crops: Pl. Br. Abst. Vol. 18. 1948.

Hunter, H. and Leake, H. M. (1933) Recent Advances in Agricultural Plant Breeding: The Blakiston Company, Philadelphia.

Hayes, H. K. and Immer, F. R. (1942) Methods of Plant Breeding: Mc. Graw-Hill Book Company, New York.

Narasinga Rao, M. B. V. and Sahadevan, P. C. (1951) Studies on the depth of colour in Rice Foliage: Madras. Agrl. Journal XXXVIII April, 1951.

Sansome, F. W. and Philip, J. (1939) Recent Advances in Plant Genetics: J and A. Churchill Ltd., London.

TABLE I

Performance of cultures released as strains on the farm and in the district

Strain number	Year of release	Comparative yield trial				District Percent increase
		Year	Acre yield in lb. Culture	Acre yield in lb. ryots' bulk	Percent increase	
Ptb. 2	1934 – 35	1929 – 30	2691	2348	14·6	..
First		1930 – 31	3807	3267	16·5	..
Crop		1931 – 32	4084	3492	16·9	..
		1932 – 33	4667	4109	13·6	..
		1933 – 34	3331	3105	7·3	59·1
		1934 – 35	..	..	..	35·2
				Average	13·8	47·2

Strain number	Year of release	Comparative yield trial				District Percent increase
		Year	Acre yield in lb. Culture	Acre yield in lb. ryots' bulk	Percent increase	
Ptb. 5	1934 – 35	1929 – 30	2406	1902	26·6	..
First		1930 – 31	3607	3224	11·4	..
Crop		1931 – 32	1846	1665	10·9	..
		1932 – 33	2144	2022	6·0	..
		1933 – 34	1653	1527	8·2	..
		1934 – 35	1953	1650	14·4	14·7
		..	1953	1523	21·9	29·4
				Average	14·2	22·1
Ptb. 9	1935 – 36	1930 – 31	4135	3629	14·1	..
First		1931 – 32	3902	3756	3·9	..
Crop		1932 – 33	2870	2467	16·4	..
		1933 – 34	2123	1846	14·6	..
		1934 – 35	1705	1480	15·1	4·7
		1935 – 36	3230	2714	19·0	19·5
						19·5
				Average	13·9	14·6
Ptb. 12	1939 – 40	1931 – 32	1338	1154	15·9	..
Second		1932 – 33	1636	1461	12·1	..
Crop		1933 – 34	1434	1316	8·8	..
		1935 – 36	2095	1782	17·6	..
		1936 – 37	2227	1933	15·0	..
		1937 – 38	2001	1833	9·2	..
		1938 – 39	..	..	..	62·0
			..	..	..	27·6
			..	..	..	12·8
		1939 – 40	..	..	46·4	25·6
			..	..	30·6	15·1
			..	..	26·2	7·0
				Average	20·2	25·0
Ptb. 20	1944 – 45	1939 – 40	3794	3522	7·7	..
Second		1940 – 41	2437	2186	11·5	..
Crop		1941 – 42	4061	2513	61·6	..
		1942 – 43	3057	2393	27·8	..
		1943 – 44	3703	3063	20·9	31·7
		..	..	..	..	20·2
				Average	25·9	26·0

TABLE II.

Results of comparative yield trial with cultures selected within strains.

Sub plot: 4′ × 10′. Layout: 11 × 4 randomized blocks.

Culture Number	Ptb. 2		Ptb. 5		Ptb. 9		Ptb. 12		Ptb. 20	
	Acre yield in lb.	% on gen. mean	Acre yield in lb.	% on gen. mean	Acre yield in lb.	% on gen. mean	Acre yield in lb.	% on gen. mean	Acre yield in lb.	% on gen. mean
1.	2155	89·9	2397	102·5	2822	108·1	2491	98·1	3290	104·9
2.	2308	96·3	2087	89·2	2758	105·7	2601	102·4	2950	94·1
3.	2325	97·0	2720	116·3	2733	104·7	2452	96·6	2805	89·4
4.	2329	97·2	2223	95·0	2695	103·3	2656	104·6	3149	100·4
5.	2661	111·0	2614	111·7	2495	95·6	2639	103·9	3196	101·9
6.	2911	121·4	2758	117·9	2796	107·1	2431	95·7	3158	100·7
7.	2236	93·1	2074	88·7	2431	93·2	2533	99·7	3179	101·4
8.	2176	90·8	2257	96·5	2304	88·3	2614	103·4	3158	100·7
9.	2427	101·2	2151	91·9	2614	100·2	2477	97·6	3264	104·1
10.	2457	102·5	2168	92·7	2542	97·4	2758	108·8	3103	98·9
Control	2393	99·8	2274	97·2	2516	96·4	2282	89·9	3239	103·2
Gen. mean:	2398	100·0	2338	100·0	2610	100·0	2539	100·0	3136	100·0
% S. E.	285·8	11·9	194·8	8·3	201·7	7·7	136·6	5·4	264·7	8·4
'Z' test:	Not satisfied.		Satisfied.		Not satisfied.		Not satisfied.		Not satisfied.	
C. D.	587·7	24·3	397·7	17·0	411·7	15·8	285·6	11·0	540·3	17·2

Mandarin Orange Cultivation in the Agency Tract

By

S. MUTHUSWAMY,
Fruit Assistant, Mettupalayam
C. VENKATESAN,
Fruit Assistant, Peddapuram
and
C. SRINIVASAN,
Plant Protection Assistant, Chittoor

Introduction : The Godavari and Vishakapatnam Agency constitute one of the vast and hitherto undeveloped hill regions of the Madras State and lie for the most part in the thickly wooded jungles of the Eastern Ghats. Due to their inaccessibility and unhealthy nature, these regions have remained largely unexploited, particularly in respect of the horticultural resources they possess. Nearly 60 or 70 years ago some Christian Missionaries and a few enterprising European planters made an attempt to develop portions of these tracts by introducing crops such as the mandarin orange, pineapple, coffee, ginger, chiratta, etc. These pioneering efforts, however, did not meet with any large measure of success due to the extremely adverse natural conditions of the tract. Some of the orange and other plantations have completely disappeared due to lack of attention and a few are found in greatly neglected state.

Among the various fruits that are grown in the Agency tracts, the mandarin oranges have a reputation for fruit quality in the plains of the East Coast and the produce has always a keen demand. It was thus felt that a survey of the tract may be made with a view to study the conditions under which this fruit is being grown at present and to formulate steps to improve the industry. Accordingly the authors, (under instructions of the Director of Agriculture, Madras) undertook a tour for a period of one month in the Rampachodavaram and Gudem Agencies in which mandarin orange is grown fairly extensively. The salient features of the cultivation of this fruit in these tracts are set out below with a gist of the recommendations for the development and extension of the area under this fruit.

Climate and soil features: The Rampachodavaram taluk of East Godavari district covers an area of about 700 sq miles and the Gudem taluk of Vishakapatnam district, 1868 sq. miles, composed mostly of hilly tracts with table lands between the hills. In both the regions much of the area has not been surveyed. There are some villages which lie scattered about along the banks of the jungle streams connected only by footpaths and occasionally by bad roads.

The average annual rainfall in the interior places of the Rampachodavaram Agency is about 70 inches while in the Gudem Agency, it is about 40 inches. Though exact information on the range of temperatures is not available, it is estimated to be between 50°F and 100°F. The tract may be said to have the characteristics of a warm humid climatic zone. In general, Rampachodavaram presents more humid conditions over a greater part of the year than Gudem.

The land on which the mandarin orange is grown is very undulating, interspersed with rocky patches. The soil depth varies from a few inches to about 10 feet. The soils of Rampachodavaram vary from sandy loam to clayey loam and are fairly fertile. The better types of soils met with in Gudem are utilised for cultivation of other crops such as millets, ginger, banana, etc., and mandarin orchards are raised on poorer types of soil.

Age of existing mandarin orange groves, their area and location: It is said that the first introduction of the mandarin orange to this tract was made by a Christian missionary in Dumma Gudem of Badrachalam taluk. The extension of the area under this fruit in the two taluks of Rampachodavaram and Gudem is claimed to be from this source. The present areas in Rampachodavaram and Gudem are estimated at 300 and 200 acres respectively. About half of the estimated area consists of trees over 25 years old, while the rest is composed of younger orchards. The groves are mostly situated at altitudes ranging from 1000′ to 2500′ in the valleys and on hill slopes, and are surrounded by fairly dense rain forests which ensure the maintenance of highly humid conditions throughout the year – a feature considered essential for the successful culture of the mandarin orange in South India. The grove sites are invariably selected on both banks of the jungle streams which flow along the hill slopes, with a view to take advantage of the moist soil conditions. Due, however, to the slopy nature of the land and the close proximity to the streams which overflow during the floods, the orchard sites are badly eroded leading to extensive exposure of the roots of the fruit trees. Constant soil wash also leads to loss of plant nutrients by leaching.

Varieties: The main variety under cultivation is known locally as "Kamala". The fruits are of orange colour, surface smooth but somewhat ribbed, shape oblate to spherical, base necked, apex depressed, rind, medium thick, loosely attached, axis hollow, segments easily separating, pulp dark orange, tender, juicy and flavour rich and and sprightly. Apart from this variety, another small fruited and loose skinned type resembling mandarins (except in regard to fruit shape, size, colour and taste and flavour of pulp) has been noticed. The fruits of this type are deep orange in colour, oblate in shape and flattened at both ends, small in size with juicy and subacid pulp. This is said to occur in a wild state in the forests.

Cultural practices: The oranges in the Agency tract are wholly seed propagated with no parental selection whatsoever. The seeds are sown in beds in November – December and the seedlings are transplanted in the orchard sites when they are two to three years old. The land is cleared of trees and scrub jungle growth in summer. Soon after the receipt of rains in June – July, small pits are dug (1′ x 1′ x 1½′) and the seedlings lifted from the seed beds with naked roots are planted. No regular spacing is given in planting the trees and the distance between the trees ranges as widely as six to twenty feet. The shorter spacing is preferred by most of the growers. As a result of close planting, trees grow tall and lanky.

Systematic cultivation of orchards is unknown in these parts and the wild plants and creepers grow unchecked over long periods smothering the orange trees wholly at times. Once in a year, during the fruiting season in November – December, the weed growth is cut close to the ground, mainly to facilitate movement in the orchard and to enable harvesting of fruits

The groves are neither manured, nor irrigated. The newly planted seedlings are hand watered during rainless periods for two or three years after planting.

In Rampachodavaram no intercropping in the alleys is practised; nor is it feasible due to the irregular planting and close spacing. On the other hand, a regular utilisation of the alleys is practised in certain parts of Gudem where successive intercrops of chiratta and ginger are taken even in bearing orchards much to the detriment of the orange trees.

Season of cropping, yields and longevity of trees: Only one crop is borne in the year from November to January in the Agency tract in contrast to the bi-annual cropping in Wynaad and Nilgiris. The range in the yield of trees is very wide and is conditioned by the age of the trees, fertility of the soil and the care bestowed on the unkeep of the orchard. The yield of a tree varies widely and range from 100 to 500 fruits, the latter being exceptional. The trees commence bearing in six to eight years after planting. In normal trees the profitable bearing age is between the 12th and 25th years and the longevity is estimated at 45 years. But such trees are few and a majority of the trees become uneconomic within about 25 years of planting.

Pests and diseases: The more important pests of oranges in the areas surveyed are, in the order of their importance, the fruit sucking moth, citrus butterfly, leaf miner and white ants. The fruit sucking moth is the most serious of all the pests, the incidence being heavy in October and November and is said to be at its minimum towards the

close of the fruiting season. *Tinospora cordifolia*, host plant for the larval stage of this moth is found in great abundance in the neighbourhood of the orchards. Citrus butterfly, particularly *Papilio demoleus*, is found to be a serious pest of young plants, especially in the late summer months of May – June. Curryleaf trees found everywhere in great numbers act as an alternate host for the caterpillars. Leaf miners and white ants also cause some damage, the former to tender leaves and the latter by eating away the bark near the base of the tree. Of the non-insect pests, monkeys rank foremost while rodents like squirrels also cause some amount of damage to mature fruits.

Among diseases, the most serious is the dieback caused by decline in the health of the trees. It is common to see more than a third of the trees having extensive dieback symptoms. Other diseases of importance are leaffall, yellowing and mottling of leaves and powdery mildew. The complete neglect of the orchards, absence of proper cultural operations, selection of shallow soils for growing mandarins in some cases, soil erosion and consequent loss of fertility, all these individually and collectively form the predisposing causes for the general decline in the health of the trees which results finally in decaying and deadwood. Leaf fall caused by Phytophthora is common during the monsoon months between July and September and its intensity is said to decrease by December – January, when most of the leaves would have shed. Ganoderma rot was noticed in Rampachodavaram. Powdery mildew and yellowing and mottling of leaf occur on a small scale. Bark rot characterised by white froth exuding from cracks on the bark of the trunk, sooty mould, and pink disease have also been noticed and the persistance of the last-mentioned may contribute to the death of branches of the trees in the absence of proper control measures. On account of the humid conditions prevalent, lichens were found growing on almost all the trees.

Packing, grading and disposal of the produce: The usufructory rights are sold to the merchants or alternatively, the fruit is harvested and taken to the shandies and sold. Due to lack of facilities for vehicular transport, the fruits are carried by men or on pack-bullocks to the shandies. Sometimes, a rough grading of the fruits by hand into big, medium and small sized fruits, is resorted to before reaching the market. The produce is brought to the weekly shandies held at nearby places on the plains and purchased by middlemen in the trade by open bid system. These middlemen form a clique to bring down the price of the produce and also adopt other dubious methods to deceive the illiterate and simple aboriginal tribes of the agencies. As a result, the prices are brought down at times to such a low level that they meet only the expenditure incurred on the transport of the produce.

Economics of cultivation: The details furnished below give an account of the economics of cultivation of mandarin orange in the Agency tract based on prevalent practices.

Expenditure		*Rupees*
Cost of clearing the land	...	100
Cost of raising 120 seedlings required for an acre and planting	...	40
Watering for the first two years	...	200
Clearing jungle growth in the orchard every year for six years	...	60
Total upto 6th year (i. e.) bearing year	...	400
Clearing jungle growth from 7th to 20th year	...	140
Picking the fruits in the season from 7th year to 20th year	...	280
Total upto 20th year	...	820

Income		*Rupees*
Yield – 6000 fruits per acre for 3 years (6 – 8 years)	...	360
12,000 fruits per acre from 9th to 13th	...	1,200
60,000 fruits per acre from 13th to 20th year	...	3,840
Total	...	5,400
Average income per year from bearing age	...	360
Average income per year from planting	...	270
Average expenditure per year	...	41
Net income per acre per year	...	229

Average return per tree on the above basis works out to Rs. 1. approximately.

From the above, it can be seen that the owner is satisfied if he gets a return of Rs. 2/- per tree. But by a systematic adoption of proper cultural methods, this return can be increased considerably

Suggestions for improvement: The improvement of orange cultivation in the Agency tract resolves in practical terms into mainly a problem of renovation of the orange gardens. It is essential that the resources and limitations of the people engaged in the industry are duly taken into account before any improvement is thought of. The people, belonging to the aboriginal tribes, are generally lazy and contented. They live mainly by a form of shifting cultivation, called "podu". They are illiterate, simple and generally of a weak constitution. They also suffer from chronic malaria. Their antipathy to the people of the

plains is well known. Most of the orchards have been mortgaged for periods ranging from ten to fifteen years and this constituted one of the most important reasons for the present neglect of the orchards. The people of the Gudem Agency are more advanced and less primitive. The people are relatively rich, deriving considerable income by growing crops such as ginger and chiratta. They are cheerful and energetic. But as far as orchard management is concerned, they are as conservative as the people of the other taluk. It is therefore seen that the improvement of the mandarin orange industry in the Agency tracts is closely linked with the improvement of the socio-economic conditions of the people. The following lines of improvement of the industry, so far as the orchards are concerned, suggested themselves on the basis of the observations made. They are :- (1) Steps to prevent soil erosion, (2) systematic and efficient control measures against the various pests and diseases, (3) a liberal fertiliser programme along with raising of green manure crops, (4) provision of summer irrigation, (5) improvement in grove sanitation, pruning of dead-wood and living parasites, (6) moderation in intercropping in the Gudem Agency, and (7) the provision of proper marketing facilities. For any extension of area contemplated in future it will be necessary to confine plantings with selected nursery stock preferably propagated by budding on a suitable and hardy rootstock which would confer resistance to the die-back. Attention to other cultural aspects, such as proper spacing, irrigation, manuring, inter-cultivation etc., must also be bestowed. The benefits of systematic and sound methods of orange culture can be impressed upon the people only by the aid of a demonstration orchard as any amount of mere propaganda by words and posters would hardly impress the backward people of this tract. With the programme for development of the mandarin orange industry on sound lines, steps should also be taken to improve the lot of the people inhabiting this area providing proper communication facilities, improving the health of the people by eradicating malaria, education and an improvement of their economic condition by means of cottage industries and other subsidiary occupations.

Acknowledgement: Our grateful thanks are due to Sri U. Narasinga Rao, Fruit Specialist to the Government of Madras, to Sri T. S. Ramakrishnan, Government Mycologist and Sri S. Ramachandran, Government Entomologist for their valuable guidance in the preparation of this paper.

Peculiarities of Viticultural Practices in Madurai District (South India)

By

V. S. RANGACHARLU
Assistant Fruit Specialist, Coimbatore

The district of Madurai in Madras State produces heavy crops of grapes in two clearly marked seasons of the year, a feature rather uncommon in other viticultural areas of temperate zone. It is known that grape is essentially a temperate region fruit. However the growers in Madura district have proved that in suitable situations and under intelligent culture, it is possible to produce grapes in large quantities even under tropical conditions. According to some estimates, the annual acre-yields in some of the well kept vineyards amount to more than 50,000 lb., as against the average yields of 7,380 lb. for the whole country and 7,678 lb. for an advanced grape growing region like California.

The unique double-cropping nature of the locally grown vines has enabled the growers to market the produce at high prices at a time when the supplies from the northern and north-western States which provide the bulk of Indian grapes, are scarce. This has greatly stimulated the local viticultural industry, particularly during the post-partition period, when some of the main grape producing areas like Baluchistan and North-West-Frontier Province went out of the Indian Union. Although the present area under this fruit in this district is believed to be in the neighbourhood of about 300 acres, as against 150 about a decade ago, the impetus given to the industry in recent years, has been responsible for a progressive annual increase in the area ranging from 15 to 20 acres.

The details embodied in this paper are as result of a tour by the author. This information would serve a useful purpose in indicating the economic possibilities of viticulture in this and other districts on the plains where similar conditions for the successful culture of grapes may exist.

Climate: This chief climatic features prevailing in two of the important taluqs, viz., Periyakulam and Nilakottai, where the vineyards are largely distributed are furnished below.

1. *Rainfall distribution:* (Average of about 60 years)

(a) South-west monsoon period (June to September)	7·36 inches on 13·8 days.
(b) North-east monsoon period (October to December)	14·35 inches on 21·3 days.
(c) Hot weather period (January to May)	9·17 inches on 14·2 days.
Total	30·88 inches on 49 3 days.

2. Mean maximum temperature 92·6° F (highest 98·8° F in May)
3. Mean minimum temperature 74·2° F (lowest 68·4° F in January)
4. Average humidity 72 per cent (from 60 to 83 per cent)
5. Wind velocity 3·9 M. P. H. (4·9 in June—July to 2·7 in October)

The tract possesses a fairly equable and mild climate, with a well distributed rainfall. The range of humidity, at no part of the year goes below 60 per cent. The severities of heat and cold characteristic of other grape producing regions in the north are also absent here. These factors combined with a fairly high level of humidity in the atmosphere almost throughout the year with no excessively dry or wet periods at any time appear to be largely responsible for a relatively long growing period and the consequent ability of the vines to flower in two distinctly different seasons of the year.

Varieties: The chief commercial variety is what is locally known as "Pachaidrakshai." This is a seeded type producing large, round, greenish coloured berries, with soft and juicy pulp, tasting sweet, but somewhat piquant, when fully ripe. The bunch is compact and medium in size, cylindrical and tapering at the lower end. This variety is largely preferred on account of its heavy bearing nature and the fairly good keeping quality of the berries.

The "seedless" grape known locally under the general name "Kishmish" was introduced some years ago from Baluchistan. Under this name, two distinct varieties producing greenish yellow to whitish berries with thin skin and soft to firm flesh have been favoured mostly for their sweeter taste than the local acclimatised Green variety and the almost seedless nature of the berries. But from the point of view of bearing and hardiness, the seedless varieties are shorter lived, being less hardy and yield less returns per acre as compared with the Green Seeded grapes. For this reason, most of the fresh plantings, have been confined largely to the latter.

Soils: The soils are mostly gravelly with a fair admixture of sand, deep to light red in colour, and are very well drained. The soil depth varies from six to eight feet with soft, friable rock below to a depth of nearly 25 to 30 feet. Chemical analysis of a representative sample taken near Periyakulam indicates that the soil is generally deficient in organic matter, nitrogen and is slightly alkaline in reaction.

Water table: The tract is characterised by a fairly low water table ranging from 20 to 25 feet rarely rising to more than 10 to 15 feet in the wettest part of the year. In some of the wells, the level of water goes down to 55 feet in the hot summer months. Water, although slightly brackish, seems to be well suited for the crop.

Culture: The vines are usually raised from unrooted cuttings (taken from one year old vines) planted *in situ* at the rate of four to five cuttings per hole, of which only two strong growing plants are ultimately allowed to develop. About six months prior to planting, pits (3′ × 3′ × 3′) are dug at distances varying from eight to ten feet in the row and 25 to 30 feet between rows and large quantities (150 to 200 lb.) of leguminous green leaves such as Kolingi (wild indigo), Cassia, etc. are composted in the pits by mixing them in layers of tank silt, ant-hill earth, etc. and watering them at intervals, to aid quick decomposition. Planting is normally done in December after the pits have well settled. A mixture of neem cake powder and sand is some times sprinkled around the freshly planted cuttings to prevent white ant attack. In about four to six months the vines grow to a height of about five to six feet. These are allowed to grow straight with *Agati* (*Sesbania* spp.) twigs or other cheap supports. Growth of side shoots on each main stem is suppressed during the initial growing period to develop a strong trunk and ultimately a strong frame work. At this stage, pandals, eight feet square, and six feet high from the ground are erected by planting live supports of *Commiphora beryii* ("Kiluvai") or *Erythrina indica*. When the vines reach the top of the pandal, the growing point is nipped off and the side shoots that develop are systematically trained to spread evenly over the pandals. This initial training of the vines to regulate growth to the desired extent requires some skill. Intelligent pruning of unwanted growth is also necessary.

In about 18 to 22 months after planting of the cuttings, the vines yield their first crop, but commercial bearing commences from about the third year. In some of the well kept vineyards, the vines have yielded fair-sized crops even in the second year of planting.

Regular pruning of the vines is practised after they reach the bearing age. The method adopted locally appears to be somewhat simpler than that practised elsewhere. Pruning follows each harvest which usually takes place once in March—April for the first crop and again in October—November for the second. Pruning, accordingly, is taken up in May—June for the second season crop and in December—January for the first. The time at which the pruning has to be done is decided by the absence of fresh growths soon after each harvest. Usually, water is withheld from the vines about a fortnight before pruning. Before actually commencing the pruning of shoots, green leaves are incorporated into the soil by digging around each vine, during which process some of the fibrous roots get pruned or exposed.

The degree and extent of pruning are decided by the general vigour of growth of the vines and the nature of the shoot to be pruned. After leaving aside the main leaders and laterals which form the central frame

work, each side cane which has attained pencil thickness and which contains well formed buds (this is considered as a potential fruit bearing cane) is cut leaving three to five buds on it. Weaker or thinner canes are cut back severely to one or two buds only to allow them to develop later into fruiting canes in the subsequent year. The local growers usually consider green and pale green canes as immature and light greyish ones as mature. The former are rubbed off as and when they appear and the latter pruned to form fruiting or renewal wood. Diseased wood is also systematically cut off. At the time of pruning complete defoliation of the leaves is also done in most of the vineyards. Some enlightened growers, however, adopt lighter pruning in December—January and severe cutting back in May—June, apparently to regulate cropping.

Soon after pruning, heavy doses of cattle manure at the rate of nearly one-fourth to half a ton per vine are applied, followed by copious irrigation. Cakes or chemical manures are not usually applied.

The vines thereafter are weeded and irrigated regularly. As a rule, four irrigations per week in summer and about two per week in winter are given, depending on the rainfall and its distribution. Weeding is done at least once a month. Of late, systematic spraying of the vines with Bordeaux mixture against mildew is adopted as a routine orchard operation.

The most outstanding feature of the local viticultural practices is the exceptionally heavy annual applications of organic manures. An acre of vineyard receives annually on an average 25 tons of green leaves and about the same quantity of cattle manure. The benefits of such heavy manurial applications are reflected in the remarkably robust growth and heavy yields of the vines.

Yields: Exceptionally high yields are reported from some of the well kept vineyards. On an average, 12,000 to 15,000 lb. of Green grapes (Variety: Pacchadrakshai) in the main (March—April) season and 7,000 to 8,000 lb. in the second (October—November) season may be expected from an acre of adult bearing vines. Higher yields upto 50,000 lb. and 20,000 lb. respectively have been reported by some growers. Individual bunches of the local seeded Green Variety are known to weigh as much *as two pounds each.*

Marketing of the produce: A major portion of the fresh produce reaches Madurai city, the main pooling centre, from where it is transported to different places in the South after meeting the local demand. Of late, considerable quantities are being exported to far off places such as Vijayawada, Tenali and Guntur in the northern portions of the State and Calcutta where good demand for these grapes exists. Enquiries reveal that in March—April every year (in the main cropping season) more than

twenty maunds of fresh fruit are exported by rail to some of the places mentioned above. The demand from places outside the State is also reported to be steadily increasing.

Cost of production and net returns. (For one acre):

A. *Expenditure:*

First year:

1.	Preparation of land including digging of pits and basal applications of leaf composts, tank silt, etc.	Rs. 250/-
2.	Planting, staking and erection of pandals, including cost of materials	Rs. 700/-
3.	Manuring — top dressings with green loaves and cattle manure including cost of manures	Rs. 300/-
4.	Irrigations	Rs. 75/-
5.	Other cultural operations like weeding and hoeing, training of vines, spraying with B mixture, etc.	Rs. 150/-
	Total	Rs. 1,475/-

Second year:

1.	Manuring as above including cost of manures	Rs. 500/-
2.	Irrigations	Rs. 150/-
3.	Other cultural operations like pruning, weeding, spraying etc.	Rs. 200/-
	Total	Rs. 850/-

Third year:

1.	Manuring	Rs. 800/-
2.	Irrigations	Rs. 150/-
3.	Weeding and hoeings	Rs. 100/-
4.	Pruning	Rs. 150/-
5.	Spraying including cost of materials	Rs. 100/-
6.	Harvesting and other transport charges	Rs. 150/-
	Total	Rs. 1,450/-

Receipts:

1. *Second year*—(First bearing)

Value of 200 maunds of fresh grapes (2,500 lb.) @ Rs. 7/- per maund .. Rs. 1,400/-

2. *Third year:*

(a) Value of 480 maunds or 12,000 lb. @ Rs. 7/- per maund (first crop) .. Rs. 3,360/-

3. Value of 280 maunds or 7,000 lb. @ Rs. 6/- per maund. (Second crop) .. Rs. 1,680/-

Total .. Rs. 5,040/-

Grand Total .. Rs. 6,440/-

Deduct expenditure till the end of third year .. Rs. 3,775/-

Net income at the end of third year .. Rs. 2,665/-

B.

1.	Gross receipts from the fourth year onwards. Value of 800 maunds or 20,000 lb. at a flat rate of Rs. 6—8—0 per maund (for both crops)	.. Rs. 5,200/-
2.	Expenditure from the fourth year at Rs. 1,450/-	.. Rs. 1,450/-
3.	Net return	.. Rs. 3,750/-

The above figures are based on conservative estimates of yields obtained from a small holding owned and managed by a grower of average means. In some of the well kept vineyards owned by enlightened growers with adequate means and facilities, the yields are reported to be as high as 1,000 maunds or 25,000 lb. for both the seasons, ensuring an annual return of nearly Rs. 5,000/- per acre.

A Little Known Spice Plant

Zanthoxylum Rhetsa, DC.

By

S. N. CHANDRASEKHARAN, M. A.

Government Lecturing and Systematic Botanist (Retired)

Description and distribution: *Zanthoxylum Rhetsa* Dc., termed fittingly as the Assembly tree by Roxburgh because of its large size and spreading branches under whose shade the hill tribes used to conduct their meetings belongs to the family Rutaceae. In Malayalam it is called Kattamanakku, or Mullilam, in Tamil as Elavangam and in Telugu as Rhetsa maram. The tree has a wide distribution at low elevations in the forests of the Eastern ghats from Ganjam to the Godavari upto 3,000 feet and in the Western Ghats in South Kanara, Mysore, Malabar and Travancore at about the same altitudes. Plants collected from most of these places are preserved in the Madras Herbarium at the Agricultural Research Institute, Coimbatore. The tree has a very striking appearance with prominent spines which clothe densely the trunk, branches and petioles. In the older parts of the trunk and the branches, the spines have a solid conical base. The bark is cream coloured. The leaves are alternate, imparipinnate, leaflets opposite, entire, strikingly oblique base

and acuminate tip. The flowers are small, borne in terminal cymose panicles. They appear from June to November and the fruits are seen from October to January. The bark, pericarp and seed are all aromatic.

Economic importance: The plant is essentially of spice value. In South Kanara, the fruits are gathered during the season, preserved and used as a condiment in all culinary preparations, both sweet and savoury. The bark is used as a substitute for lime. The essential oil is used medicinally as an antiseptic, disinfectant and also in Cholera. The corky enlarged base of the spines are used for making seals or stamps.

Remarks: The tree belongs to the well known family of lime and orange. Economic botanists know full well the value of such members of the family as have been investigated. In my opinion, the plant *Zanthoxylum Rhetsa*, deserves greater study and wider use. It is possible it is rich in some vitamins and we are yet to know more of its medicinal properties. At a time when we want to grow our own spices and drugs, there is an opportunity for investigation. Fortunately, the tree is in abundance and has a splendid distribution. On research, it may even lead us to think of cultivating the plant in forest areas. It is not unlikely it will prove of as much value as Vanilla, for flavouring confectionery.

REFERENCES

1. Gamble, J. S. 1915 – Flora of Madras, Vol. I, Page 150.
2. Watt. George. Dictionary of the Economic Products of India, Vol. VI, Part IV, Page 325 – 226.
3. Rama Rao, M. Flowering Plants of Travancore, Page 61.
4. Brandis. Indian Trees - Page 118.

An Easy Method of Colour Preservation in Plant Specimens for Museums and Herbaria

By

T. VENKATAPATHI, M. Sc.

Introduction: The preservation of colour of the botanical specimens has been a serious problem for those working in Herbarial botanical gardens, museums and in fact, all those interested in plants and their preservation. In the usual method of pressing plant specimens between drying sheets and mounting the dried specimens, the natural colour of the flowers and the leaves fade away in a very short time, and later on turn to brown or dark brown colour except in a few cases like *Helichrysm bracteatum*, Andr., *Limonium sinuata* and *Angalis* spp. If only the natural colour of the plant parts, especially of the flower, could be preserved in the dried specimens, it will be great help to the students of taxonomy and curators of Herbaria and museums.

Andrino and Tabije (1934) have suggested a number of chemical methods for natural colour preservation in plant materials as wet specimens for exhibition purposes. These authors have also referred to some useful and interesting methods adopted by other workers on the subject. In 1887, Schonland reported on the preservation of colours in dried specimens. These chemical methods are not only costly but are not sure and easy ones to be followed when the material to be dealt with are large and many. A simple and a very successful method as arrived at from trials here is dealt with in this note.

Method adopted – Sand treatment: The plant specimens as collected fresh for preservation, are dried in layers of sand instead of pressing them in between drying sheets. Fine sand is obtained after seiving out bigger particles. A layer of 2 inches thick sand is spread in shallow rectangular iron or wooden trays of 5 to 6 inches height. The specimens are spread over this layer of sand and covered with further addition of sand to about $1\frac{1}{2}$ to 2 inches. These trays are kept in the shade. For most of the flowers and leaves 4 to 6 days will be sufficient for this method of drying. The sands absorbs moisture from the specimens and they become quite well dried and fit for mounting. The original colour of the leaves and flowers are preserved in the sand-dried specimens

Trials conducted and Observations: Trials were conducted both at the Herbarium and Botanic Gardens, Coimbatore. Flowers and leaves of ornamental plants in different colours were selected for the purpose and given the following treatments. (i) Drying by sand treatment done, under open sunlight. (ii) Drying by sand treatment done under shade. (iii) Drying by sand treatment under shade and poisoning the dried material with saturated solution of corrosive sublimate (Mercury

bichloride) in rectified spirit. (iv) Control – dried by pressing in between drying sheets.

The colour of the material before and after the treatment were judged with the colour standards of Ridgway (1942). The results of the trials are tabulated under Table I.

It is seen from the table that out of the 25 materials tried, there was retention of colour in all except *Hibiscus rosa – sinensis* and the red variety of *cannandica* under drying sand treatment. There was fading of the colour. Between the sand treatment under open sunlight and under shade, there was no difference in colour; but the drying of the specimens which was quicker under open sunlight, made the specimens brittle and too difficult for handling.

Some points to be noted: Most of the thin leaves and flowers dry up easily while the succulents do not yield easily under the treatment. For succulent leaves and fruits the changing of the layers of sand has to be done often; however the results were not quite satisfactory. For normal leaves and flowers there is no necessity to give change of sand at frequent intervals The specimens of the leaves and flowers dried by the sand treatment should not be allowed to become too dry as there will be the difficulty of mounting them as the material becomes very brittle. This is overcome by mounting the fresh specimens to the mounting boards by stitching at a number of points and then keeping the specimens with the mounting board inside the sand. After 4 – 6 days the sand can be removed and the mounting board brushed to remove any dust and sand particles sticking on. Specimens prepared in the above manner are suited best for keeping in show cases in Herbaria or for putting with glass frames for exhibution purposes Soaking of the dried specimens in the poisoning fluid also results in the fading of the colour. As such either fumigation of the specimens or dusting with napthalene powder are the methods by which insect or fungus attack can be warded off.

Acknowledgement: The author is greatly indebted to Sri C. Rajasekhara Mudaliar, M. A., Government Lecturing and Systematic Botanist, Lawley Road P O., and to Sri Daniel Sunderaraj, B. sc (Ag) M sc., Assoc. I. A. R I., Assistant Lecturing and Botanist, Lawley Road P O. for their untiring encouragement in the prosecution of this work and for affording maximum fecilities for the same both in the Herbarium and Botanic Gardens and for their valuable suggestion and help in the preparation of this article.

LITERATURE CITED:

1. Adrino F. T. and Tabije (1934). The relative merits of different Storage solutions. Philip J. Agric. 5 : 157 — 168.
2. Ridgway (1912). Colour standards and Nomenclature Hoen & Company, Baltimore.
3. Schonland Selmar (1887 — 88). Method for preserving the colours of flowers in dried specimens. Annals of Betamy. Vol. 1 : 179.

TABLE.

No.	Plants under trial	Family	Original colour	Observations under Treatment: Sand treatment under open sun	Observations under Treatment: Sand treatment under shade	Sand treatment poisoning	Control Pressed in between the drying sheets
Flowers :							
1	Canna indica, L. ..	Cannaceae	(a) Spectrum red	Not retained	Not retained	Deep levid brown	Brown
2	,, ,, (2 varieties) ..	,,	(b) Wax yellow with flame scarlet dots	Retained	Retained	Napthalene yellow with brown dots	Napthalene yellow with snuff brown dots
3	Hibiscus rosa-sinensis, L. ..	Malvaceae	(a) Rose red	Carmine	Carmine	(Deep purplish Vinaceous)	(Deep purplish (Vinsceous)
4	,, ,, (2 varieties) ..	,,	(b) Spectrum red	,,	,,	Deep Heilebore red	Bordeaux mixed with white
5	Althaea rosea, Hohen ..	,,	(a) Amaranth purple	Retained	Retained	White	White
6	,, ,, (Holyhock) (2 varieties) ..	,,	(b) Spinel piak	,,	,,	White	,,
7	Bougainvillaea spectabilis, Willd...	Nyctaginaceae	(a) Carrot red	,,	,,	Whitish red	,,
8	,, ,, ..	,,	(b) Phlox purple	,,	,,	White patches	,,
9	,, ,, 3 varieties ..	,,	(c) Malla purple	,,	,,	,,	,,
10	Helianthus annuus, L. ..	Compositae	Light Cadmium	,,	,,	Light Cadmium	Light cadmium
11	Tayetus patula (Sun flower) ..	,,	(a) Orange	,,	,,	Orange	Orange
12	,, (Margold) French (2 varieties) ..	,,	(b) Light cadmium	,,	,,	Light cadmium	Light cadmium
13	Gaillardia picta, Sweet ..	,,	Amaranth purple	,,	,,	Garnet brown	Garnet brewn
14	Chrysanthemum coronarium, Linn. ..	,,	White	,,	,,	Light brown	Light brown

TABLE—*(Contd.)*

No.	Plants under trial	Family	Original colour	Observations under Treatment: Sand treatment under open sun	Observations under Treatment: Sand treatment under shade	Sand treatment poisoning	Control Pressed in between the drying sheets
15	C. Carinatum. Schousb. ..	Compositae	Yellow	Retained	Retained	Yellow	Yellow
16	Cosmos sulphureus, Cav. ..	,,	Cadmium orange	,,	,,	Cadmium Orange	Cadmium Orange
17	Solidago nemoralis, Am. Golden rod ..	,,	Lemon yellow	,,	,,	Lemon Yellow	Pale whitish yellow
18	Amaranthus tricolor, L. ..	Amarantaceae	Amaranth purple	,;	,,	Not retained	Not retained
19	Antigonon leptopus, Hk. & A.	Antignaceae	Rose colour	,,	,,	Brown	Brown
20	Verbena borariensis, L. ..	Verbinaceae	Violet purple	,,	,,	Violet purple	Violet purple
21	Petunia, (single) Juss. ..	Solanaceae	Light mallow purple	,,	,,	Light mallow purple	White
Leaves : .							
22	Coleus rehneltianus, Hp. ..	Labiateae	Carbon brown coloured leaf with light elm green margin	,,	,,	Light elm green	Light elm green
23	Iresine celosiodes, L. ..	Amarantaceae	Dark maroon purple leaf with rosolane purple coloured along they	,,	,,	Retained	Dark cress green colour
24	Poinsettia pulcherinma, R. ..	Euphorbiaceae	Carmine	,,	,,	,,	Dark purplish vinaceous
25	Manihot utilissima, Pohl. (Ornamental) ..	,,	Dark cress green with green deep sea-ioam patch	,,	,,	,,	Rinnsmann's green with light buff patches

A Review of the Rural Economic Conditions of the Coimbatore District as Revealed in the Eeconomic Surveys of Some Villages in the District

By

S. V. DURAISWAMI, B. A., B. SC., Ag.
Lecturer in Agricultural Economics

and

V. S. NARASIMHAN, B. A.,
(Asst. in Economics)

Introduction: The subject of Agricultural Economics has been given a status equal to other subjects like Agriculture, Chemistry or Botany for the B. SC., (Ag.) examination at the Agricultural College from the year 1946—1947. On the practical side the subject includes Rural Economic studies to be undertaken by the students independently as well as directly under the guidance of the Lecturer. Every student is expected to do one survey of a village and submit the same at the University examination, for valuation. It has been decided to publish a brief review of the more interesting aspects of rural economic conditions as revealed in selected surveys done by students, pertaining to the district of Coimbatore.

The Surveys of villages selected for the purpose of this review are as follows:

No.	Name of the village	Taluk	Name of the student who presented the survey	Year of survey	No. of Hamlets included
1.	Thudiyalur	Coimbatore	Chandramohan J.	1950–1951	3
2.	Chettipalayam	do.	Ramakrishnan S.	do.	1
3.	Chinna Thadagam	do.	Nallagounder	1948–1949	2
4.	Kannamanaickanur	Udamalpet	Ramaswamy K. R.	1949–1950	9
5.	Velampalayam	Palladam	Thiruvenkata-swamy K.	1950–1951	7
6.	Kalampalayam	Avanashi	Kaliappan R.	1950–1951	7
7.	Pachapalayam	Bhavani	Karuppanan G.	1948–1949	11

Out of 31 villages so far surveyed by students in this district, seven have been selected as given above since the surveys of these villages may be considered to be best among them. They also represent in a fair measure, the conditions existing in this district in general.

2. **Location and Physical Features:** Of the seven villages taken up for this review the two villages viz., Tudialur and Chettipalayam have railway stations, the former 6 miles and the latter 10 miles from Coimbatore Town. The third village Thadagam is 13 miles from Coimbatore town situated on the border of Thadagam reserve forest and is surrounded by hills. There is a regular bus service to this village from Coimbatore town. All these villages are in Coimbatore taluk. The fourth village Kannamanaickanur is in Udamelpet taluk and is 4 miles from Udamalpet town. The fifth village Velampalayam in Palladam taluk is 4 miles from Tiruppur town. Kalampalayam village is in Avanashi taluk and is 7 miles from Karamadai railway station on the west in the interior and there is no bus service for this village. The last village Pachapalayam is in Bhavani taluk and is situated 20 miles from Erode and is on Bhavani Andiyur road on which there is a regular bus service.

3. **Population:** The population statistics of the villages are given in Statement No. I. The trend is for an increase in all the villages. The village Velampalayam has recorded an increase of 58% in 40 years (1911 to 1951). The average rate of increase for all the villages during 40 years period has been 35%.

4. **Area and Classification of land:** Statement No. II gives the areas of the villages and the cultivated area of wet, garden and dry lands and the proportion of garden area to the total.

The figures are of interest because the area under garden in any village really gives an indication of the economic prosperity of that village. Judged from this stand point the maximum area under garden viz., 1428 acres in Kannamanaickanur village is only 22% of the total cultivated area and therefore may not be considered more prosperous compared to Kalampalayam which has over 1,000 acres under garden out of a total of 2,899 acres which is 40% to the cultivated area. The area under wet lands is negligible compared to the total area. Except Thadagam and Kalampalayam all the other villages are far away from the influence of forests or hills. There is no area under orchards in any of the villages, but there is here and there a small area under mango trees. The trend is for increase of area under garden lands in many of these villages by sinking new wells, or by deepening old wells. But there had been a set back for this due to the successive failure of the monsoons in the last few years.

5. **Holdings:** Statement No. III shows the distribution of holdings according to size in each village. Out of the total number of 3,314 pattas for all the seven villages the number of holdings of different sizes are as follows:

Under one acre	359	10 to 15 acre	315
1 to 3 acres	532	15 to 25 acres	193
3 to 5 acres	1,076	25 to 50 acres	114
5 to 10 acres	666	over 50 acres	59
	2,633	Grand Total	3,314

It is evident from the data that as these villages are mostly dry, majority of the holdings are uneconomic as more than 79% of the holdings in these villages are below 10 acres. So these small cultivators, besides cultivating their lands have also to work as labourers in the fields of bigger cultivators having garden lands to supplement their income. Garden lands offer employment more or less throughout the year as several crops are raised in the year and as such an area of 3 to 4 acres may give full employment for the family and also an adequate return. Another avenue open to these small farmers for employment in some villages, is the wet land area situated within a radius of 5 miles during transplantation and harvesting periods. Of course in fragmented holdings cultivators have to spend more of their time in transporting implements, cattle and the harvested produce to the farm-yard. Another great difficulty is that there is no incentive to sink a well and convert portion of the dry lands into gardens as the areas held are small, and adequate capital will not be available. In spite of these difficulties cultivators are seldom willing to consolidate by exchange of plots. A great deal of propaganda and persuation are necessary to bring about a change in their outlook or attitude. One redeeming feature however is that in spite of fragmentation disputes are very few and rarely plots of land are left uncultivated. The following statement gives the growing density of population in relation to cultivated area:

Cultivated area per head:

Village	1911 Acres	1951 Acres
1. Tudialur	1·1	0·73
2. Chettipalayam	1·40	1·25
3. Thadagam	0·86	0·58
4. Kannamanaickanur	1·70	1·23
5. Velampalayam	0·97	0·62
6. Kalampalayam	0·80	0·64
7. Pachapalayam	0·74	0·56

Though the area cultivated per head has decreased on account of increase in population, production has increased on account of more lands brought under irrigation and intensive cultivation.

6. **Crops and Cropping:** The areas under different crops in the villages are given in statement number IV. Taking all the villages together we find 89% of the area is under cultivation. Out of the total cultivated area of 25,440 acres in these villages, garden lands (area irrigated by wells) form 5,275 acres or 20%. But this area is liable to change depending upon the supply of water from the wells. The main crops grown are Cholam, Ragi, Cumbu, Pulses and minor millets among food crops and groundnut, cotton, and tobacco among commercial crops. Paddy is grown in small areas in Tudialur Kalampalayam under wells, particularly by well-to-do ryots, for their own consumption.

As regards the economic effect of *rotation practices* we have to make a distinction between those in garden land and those in dry lands. In the first case cholam and Cambodia cotton take the prominent place since the first supplies food and fodder and the second the required cash return. Ragi and Cumbu form other food crops in rotation. The well balanced normal rotation generally practised is summer cholam and ragi followed by Cambodia cotton. Variations are observed to occur depending upon seasonal rains and water supply in the wells. The scope for proper rotation in dry lands is very limited owing to the fact that assured rains are not received every year. In most of the villages cholam is grown mixed with pulses like lab-lab, year after year, since in a favourable year a good crop of cholam will give adequate food for man and fodder for animals. If rains are late instead of cholam, horse gram, Tenai or Samai may be sown. In Chettipalayam and Pachapalayam instead of cholam, groundnut occupies a considerable area grown year after year.

Regarding *pest and diseases on cr ps* they are a commen curse of all crops and are taken as inevitable by the ryots. The damage from these pests and diseases varies from 10% to even 50% during some years. Thus in Thadagam where Cholam is the main crop the damage by pests was said to be more than 60%, the total loss in terms of quantity of grain being 4,000 'salagais' of 60 M. M. each, in the year 1947—1948. So also castor plants were completely eaten away by caterpillars in that year. Plant Protection section of the Agricultural Department is seldom approached. This is due to partly the ignorance of the cultivators of its existence and lack of confidence in insecticides. Only in Tudialur one or two of the bigger educated farmers have availed of the services of the plant protection staff to ward off pests on ragi and cotton. In one case an enlightened farmer has sprayed DDT in the fields before ploughing and sowing cotton.

7. **Irrigation:** The main source of irrigation in all the villages are the wells. The number of wells in each village and the number and nature of water-lifts are given in statement No. V. There are 1141 wells in all the villages put together. Pachapalayam in Bhavani taluk has got the largest number of wells viz. 288, while Thadagam has got only one well for irrigation purposes and that too sunk very recently i. e. in 1950. The depth of the wells in most of the villages goes below 35 feet and upto 70 feet. The wells in Tudialur are deep and rocky commanding larger area per well i. e. 6 to 10 acres (27 acres in one case) while wells in Kalampalayam are shallow with 15 to 20 feet depth commanding 4 to 6 acres per well. Wells in Kannamanaickanur in Udamelpet taluk vary from 40 to 60 feet in depth and command only 2 to 3 acres. In Thadagam village the sub-strata upto 60 feet is soft or sandy and well sinking is risky. The sides of the wells have to be protected from the bottom with masonary structure to prevent the loose soil slipping into the well and this means high cost of construction which may go upto Rs. 5,000/-. Regarding supply of water in these wells, it is dependent on springs which are affected by seasonal rains. If there are regular rains supply is normal. Most of them except in Kalampalayam are either having precarious supply or have dried up completely. In Chettipalayam even drinking water is not available. In Kalampalayam water supply in the wells is said to be fair in spite of the drought conditions, which is a peculiarity of the tract. Because of the scarcity of water, wells in all the villages in general have been deepened and the process is going on. This effort for increasing the supply of water is more pronounced in villages like Tudialur, Velampalayam and Pachapalayam because there are more well-to-do and enterprising farmers living in these villages. Cost of sinking wells varies from Rs. 1,000 to 1,500 in Kalampalayam where the water table is high (15 to 25 feet) and Rs. 4,000 to 5,000 in Tudialur where it is deepest. There are wells in Tudialur costing Rs. 10,000/- and more which are fairly big sized with at least one bore-hole in them. Well sinking has become very costly in this district as the wages are high and wells have to be dug deep. 54 new wells have been sunk recently in all the seven villages.

Coming to the study of lifts used in these wells only four villages, Tudialur, Chettipalayam, Velampalayam and Pachapalayam are having electricity. Out of 93 electric motors used for irrigation Tudialur has the distinction of having 71 wells out of its 84 wells fitted with electric motor and pumpsets for lift irrigation. On account of this advantage of electric power, cultivation is more intensive in Tudialur and farmers are also more prosperous than those of other villages. How electricity can revolutionise agriculture can very well be seen in this district and more so in particular in Tudialur village. In 1920 there were only 17 wells for irrigation purposes. Within the course of 30 years 67 wells have been sunk in this village. There are 16 oil engines in use to lift water from wells in all the other villages. The rest of the wells are fitted with either single or double mhotes to lift water which is a costly and slow process compared to power lifting. The cost of installation of an electric motor and pumpset varies from 1,500 to 2,000 and that of an oil engine from 2,000 to 3,000 depending on horse power and make. The average cost of erecting a mhote comes to about Rs. 130 to 150.

Cost of irrigating an acre by the various lifts are as follows:

By a single mhote Rs. 12 to 14, By an oil Engine Rs. 5—10—0 to Rs. 8—7—0, By an Electric Motor Rs. 2—8—0 to Rs. 3—0—0. Cost of irrigation by electric motor is considerably lower than by irrigating with a mhote and it can also command a larger area if adequate water supply is available in the wells.

8. **Implements and methods of cultivation**: Among the tillage implements country plough is the favourite implement in all the villages. Even when iron ploughs are used as for example in farms in Tudialur, the country plough has its

own place and is frequently used. Inspite of departmental propaganda improved implements like iron ploughs bund formers, ridge plough, junior hoe, etc., are not purchased and used, by the farmers in all the villages except in Tudialur, on a large scale. The main reason is that the majority of the cultivators are small holders. Tractor ploughing is popular in Thadagam and Tudialur villages. They are hired from the department during the ploughing season. In Thadagam, farmers appreciate tractor ploughing of dry lands as they say one tractor ploughing saves four ploughings by their cattle. The rate of hire for a pair of cattle with a plough and a man varies from Rs. 3 to 5 depending upon nature of land and duration of ploughing.

9. **Use of Manures and Seeds :** As is to be expected, the application of farmyard manure and tank silt is a common feature in all the villages, garden lands receiving the bulk of the available manures. In fact dry lands are seldom manured regularly every year, by all the farmers. Chemical fertilizers are obtained from the Stanes & Co., at the nearby factory. Owing to its situation, Tudialur has got many advantages in respect of availability of different kinds of manures. As the village is very near to the city of Coimbatore the farmers take advantage freely of the large quantity of town rubbish, compost and pouderette manure available at the Municipal depot within a few miles of the village. In all the other villages the quantity of manure applied depends upon the quantity available with the ryots, as there is no extra source of supply other than the village itself. The average cost of farm yard manure is Rs. 3—4—0 to Rs. 4/- per cartload. Sheep-penning is a regular feature in Thadagam and Pachapalayam villages.

As regards seeds, in Tudialur alone improved seeds of Cotton, Ragi, Cholam and Cumbu are in demand. In the matter of seed-rate generally, the rates are fairly high particularly for the millets. If improved seeds are used the rates will be considerably lower. The rates vary naturally depending upon the kind of soil, time of sowing and the purity of the seeds used.

Taking the total availability of typical cattle manure (Statement V) and the minimum or normal rate of application that would be necessary for garden and dry lands in the case of all villages, it would be worth while to judge the manure position with reference to the basic requirement of organic manures. Calculating on the basis of 5 cart loads per adult stock and 2½ for young stock the total quantity available in all villages will be about 53,000 cart loads per annum. The basic requirement of cattle manure is estimated at 20 cart loads per acre per annum for garden and 2½ cart loads per acre for dry lands (though dry land is not manured every year) to keep up normal fertility level of the soil. On this assumption the total essential requirement by way of cattle manure can be put down at about one lakh of cart loads for garden areas and 50,000 for dry lands per annum. There is a deficit of nearly a lakh of cart loads in all the villages. This is really a serious position which will tell upon productive capacity of the soil now and in the future years. The deficit is partly made up by resorting to sheep penning which may be estimated, to be available in terms of cart-loads, at about 4,000 per annum for all the villages. There is still a big gap to be filled up which is being done again partly by application of other organic manures like town refuse, composts, cakes and tank silt.

10. **Live Stock :** For all agricultural operations mostly work cattle of local breeds are used. Here and there we find typical Kangeyams and Alambadi types owned by well-to-do farmers. The efficiency of work turned out is certainly better in the case of pure types. The introduction of the power lifts for irrigation has saved cattle labour by about 30% in Tudialur and the cattle released for other

operations like carting of tank silt and manure. Most of the farmers maintain dairy stock of a few cows or buffalos besides young stock for breeding. They are also benefitted by the extra manure got from these animals. In villages like Tudialur, Kannamanaickanur and Velampalayam, situated near towns, the cultivators dispose of the surplus milk got from their dairy animals and thus earn an additional income which is not insignificant. As regards sheep population it is largest in Kannamanaickanur and Velampalayam. Statement No. V gives the cattle census in the village surveyed.

11. **Agricultural Labour:** In Statement No. III in the last column is given number of labourers available. Generally in all villages there is self sufficiency of labour in the matter of labour required for all crops and operations on the basis of requirements calculated for the villages. During sowing or harvesting period in a few of the villages there is an inflow of labour from adjacent villages. In Kannamanaickanur of the Udamalpet taluk families of labour migrate to Pollachi taluk for harvest of groundnuts. Petty cultivators work as labourers in other fields in all the villages. As regards wages, they are said to be adequate. They are paid in kind as well as cash depending upon operations. Harvesting operations are as a rule taken up on kind basis, while field operations like digging, weeding etc., may be paid in cash. Labour can be classified as permanent and casual, the former being dependent upon the prosperity of the land lords. Such permanent servants called 'Padiyal' or 'Pannayal' are maintained only by garden land farmers, and at the rate of one for every pair of cattle maintained. The wages paid in cash for casual labour is almost the same in all the villages, men getting from Re. 1 to 1—8—0 and women As. 10.

12. **Tenant cultivators:** In the statement No. III the number of cultivating tenants in the different villages is also given. The average number of such tenants works out to 17% to the total pattadars for all the villages, the percentages varying from 8 in Tudialur to 25 in Chettipalayam. The rest are owner cultivators. The low percentages of the tenants indicate that absentee landlordism is not a serious problem as one would imagine to be the case now. Many of the bigger land owners have in fact given part of their lands on lease to tenants, the rest being cultivated by them. As regards the nature of the leases there are two kinds of leases prevalent. One is the fixed lease of either in cash or kind and the other 'varam' the produce being shared by the tenant and the land-lord. The fixed type of lease is more popular and widely adopted as it is difficult to fix up the quantum of share for each, when various kinds of crops are grown in garden lands. The owners as well as cultivating tenants prefer cash rent instead of varam since the land owners are in constant need of cash for their expenses which have increased due to high cost of living. This is also advantageous to the tenants since they adjust their cropping to give them the best benefit. Unless the tenancy is felt secure he will not have the incentive to improve the fertility of the soil for increased production year by year. The leases for the dry lands in all the villages are mostly in kind. The rate of lease for garden lands varies from Rs. 150/- to 250/- per acre and Rs. 15/- to 50 per acre if paid in cash or 2 to 4 salagais of grains if in kind for dry lands. The rate of lease for dry lands in Chettipalayam and Pachapalayam villages are higher because of the growing of groundnut crop which gives better return compared to cereals. Lands are taken up on lease by the tenants, both on oral understanding as well as by written deeds. Garden land leases are generally for 3 to 5 years.

13. **Co-operation and Rural Credit:** Only in three villages Co-operative Credit Societies are said to be working. It is however a redeeming feature to note that in Chettipalayam the credit society is functioning as a multipurpose one

and has been awarded prizes for its efficient working. Besides credit, it hires out implements like bund-former, ridge plough, guntaka and junior hoe. A ration shop attached to this society has earned a profit of more than Rs. 15,000/-. In Tudialur and Kannamanaickanur the credit societies are working satisfactorily. There is scope for organising co-operative societies in all the other villages provided the local leaders are enthusiastic and helpful. A review of the rural indebtedness would be appropriate at this stage. The activities of the money lending class has not been noticed to any alarming extent in any of the villages, though they were responsible for much of the indebtedness noticed in some of the villages. The interest rates vary from 12 to 20 per cent, the maximum recorded in Chettipalayam and Velampalayam. The total indebtedness of all the villages is estimated to come to 8 lakhs of rupees. A certain correlation seems to exist in some of the villages between the land values and indebtedness position. In villages where land values are greater the indebtedness has also accumulated to a greater extent as in the case of Chettipalayam Kalampalayam and Kannamanaickanur. Loans have been obtained from Land Mortgage Banks in Kannamanaickanur, Velampalayam Chettipalayam and Kalapalayam, out of which Chettipalayam is said to have obtained to an extent of 2 lakhs in the last 15 years.

14. **Conclusion and suggestions for improvement of the economic Conditions:** (i) About 80% of the holdings are below 10 acres and these include mostly dry areas with insufficient rainfall. Hence the necessity for enlargement and consolidation to bring about a reduction in small holdings, is obvious and suitable action has to be taken in this connection on a planned basis. It is seen that in these seven villages, 1967 holdings out of 3,314 are below 5 acres and are not economic to cultivate. 891 holdings are below 3 acres and with such sub-economic size of holdings the cultivator cannot support himself and his family. So there is a great need to check by some means of legislation further reduction of the sizes of holdings and steps are to be taken to enlarge the smaller sized holdings at least to economic sizes. Especially in dry land areas there is no incentive to dig wells and improve the lands in other ways.

(2) The average per capita area cultivated is just one acre and this shows that too many people are dependent on agriculture. New lines of rural industries and trades have to be started and encouraged to wean out some percentage of the population away from agriculture.

(3) Villages having more area under garden lands are naturally more prosperous and therefore more wells should be sunk and more area should be brought under irrigation for intensive cropping. Garden areas give better facilities for employment of agricultural labour through out the year.

(4) Irrigation (from wells) is the main stay of Coimbatore agriculture. In respect of the number of wells in this district it ranks as second in this State with more than a lakh of wells, the first being North Arcot. But in respect of area irrigated by wells, this district surpasses all other districts with more than 4 lakhs of acres covered by wells. This brings the importance of well irrigation in this district in general and in particular for the villages surveyed.

(5) Cost of cultivation is reduced by about 30% if electric motor is used with pumpset for irrigation. Already this district is noted for having largest number of electric motors for pumping water. But still it has touched only the fringe of the problem of lift irrigation. Hence utmost distribution of electricity to

all the villages for lifting water must be arranged as the farmers are only too ready to take advantage of such facilities, since the present mhote lifts are a great strain to the bullocks and is also a slow process.

(6) Introduction of improved implements like bund former, Junior hoe, light iron ploughs and mechanical seed drill has to be taken up intensively in all the villages except Tudialur since these implements are popular and largely used in Tudialur and therefore there is no reason why these should not be used in the other villages also. The tractor should be made available to a much larger extent in all the villages of the district once in two or three years for effective ploughing of dry lands, new areas and garden areas wherever necessary.

(7) In all the villages steps should be taken to supply improved seeds of millets like Cholam, Ragi, Cumbu, and Tenai and also groundnut and pulses.

(8) There is a great insufficiency of bulky organic manure, particularly farm yard manure and therefore propaganda should be effectively undertaken to encourage the growing and use of green manure. Preparation of composts and use of suitable cakes and chemical manures and these have to be made available in adequate quantities at the time needed for application to crops in the different villages. Supply of improved seeds, manures, small implements and Tractor could very well be undertaken by co-operative agencies.

(9) Supply and maintenance of breeding bulls will improve the quality of livestock which is generally of the local type and so poor in efficiency of work. Pure bred Kangeyams turn out better work and give more manure and in the long run will bring down cost of production.

(10) Agricultural labour requires special help in housing and employment during slack periods. Increasing the area under garden, by sinking new wells will help these labourers in solving their off season unemployment problem to some extent.

(11) The average percentage of tenants to pattadars is only 17 in these villages and so major area is under owner cultivators. However tenants have to be made to feel secure in their lease holds to take interest in improving production.

(12) It is observed that there are co-operative credit societies formed and working only in three villages of which two are dealing with credit side only. All the villages should have such co-operative societies and they may all try to emulate the example of Chettipalayam by developing the societies into multipurpose ones. There is good scope for co-operation to play its role to help the metal workers in Velampalayam if one is formed.

(13) All villages except Tudialur and Chettipalayam lack panchayat boards. Even in these two villages the panchayats have not done much work, though in Tudialur they have accumulated a fund of Rs. 12,000/-. It may be expected under the new Act panchayat boards will be duly constituted in all the villages and such boards will be guided and encouraged to work for improving the villages in all directions. Introduction of proper lighting, improvement of sanitation and road communications, provision of more schools in proper buildings and dispensaries are the more important amenities that should be provided through these panchayats in all these villages at the earliest possible time.

STATEMENT No. I.
Population Details.

S. No.	Name of the Village	1911	1921	1931	1941	1951	% of increase from 1911 to 1951 over 40 years
1.	Tudialur	1799	1566	2080	1863	2758 (Ration Register figure)	54
2.	Chettipalayam	3961	..	4148	3964	4400	11
3.	Thadagam	2420	2487	2693	2974	3534	46
4.	Kannamanaickanur	3742	4103	4401	4529	4947	32
5.	Velampalayam	4381	4942	5575	6240	6900	58
6.	Kalampalayam	3135	3252	3312	3544	3895	24
7.	Pachapalayam	..	3999	3686	4304	4800	20 (in thirty years)

STATEMENT No. II.
Total Area — Cultivated Area.

S. No.	Name of the Village	Total area	Cultivated area			Total cultivated area	Poramboke	% of garden area to total cultivated area
			Wet.	Garden	Dry			
1.	Tudialur	2137	..	580	1406	1986	150	30
2.	Chettipalayam	5951	..	642	4858	5500	451	12
3.	Thadagam	2549	..	6	2090	2096	N. A.	Nil
4.	Kannamanaickanur	7672	27	1428	4912	6367	594	22
5.	Velampalayam	4268	..	888	3370	4268	N. A.	21
6.	Kalampalayam	2899	..	1100	1532	2632	300	40
7.	Pachapalayam	3000	424	523	1771	2718	292	19
		Total	451	5177	19939	25567		

N. A = not available

STATEMENT No. III.

Statistics regarding size of Holdings, Tenancy and Agricultural Labourers.

S. No.	Name of the Village	Under one acre	1—3	3—5	5 to 10	10—15	15—25	25—50	Over 50	Total No. of Patta-dars	Tenants leasing other lands	% of lessees to total Patta-dars	No. of Agrl. Labou-rers
1.	Tudialur	..	27	448	64	19	3	7	9	577	43	8	237
2.	Chettipalayam	30	60	58	142	92	55	35	9	481	120	25	470
3.	Thadagam	12	36	78	23	12	7	5	5	178	25	14	650
4.	Kannamanaickanur	6	132	175	148	76	42	36	29	644	151	23	375
5.	Velampalayam	92	54	60	165	65	48	15	3	502	19	4	400
6.	Kalampalayam	13	38	70	95	34	29	14	4	297	49	16	412
7.	Pachapalayam	206	185	187	29	17	9	2	..	635	115	18	700
	Total	359	532	1076	666	315	193	114	59	3314	522	17 Average	

STATEMENT No. IV.

Area under crops.

S. No.	Name of the Village	Paddy	Cholam	Ragi	Cumbu	Tenai	Other millets	Sugar cane	Cotton	Tobacco	Groundnut	Plantain	Cocoanut	Fruits & Vegitables	Pulses	Flowers	Coriamder	Turmeric	Gingeely	Total
1.	Tudialur	82	1137	30	18	34	..	3	246	..	..	32	33	11	190	35	..	..	..	1851
2.	Chettipalayam	11	802	130	84	65	83	15	105	45	565	..	24	15	1936	..	10	2	22	3914
3.	Thadagam		2000 with pulses																	2000
4.	Kannamanaickanur	..	346	597	..	..	372	..	283	13	..	..	..	12	503	..	151	..	..	2277
5.	Velampalayam	12	380	84	42	8	..	..	101	19	..	2	9	5	590	..	..	..	17	1269
6.	Kalampalayam	102	1126	332	176	3	24	..	152	180	274	..	..	..	213	..	..	..	..	2582
7.	Pachapalayam	3	385	170	780	..	5	78	116	55	770	120	7	..	36	..	..	24	..	2549
	Total	210	6176	1343	1100	110	484	96	1003	312	1609	154	73	43	3468	35	161	26	39	16442

Food Crops — 13345 acres. Commercial Corps — 3097 acres.

STATEMENT No. V.

Statistics of wells, lifts, Livestock and Manure Production.

S. No.	Name of the villages	No. of wells	Nature of lifts			Milk cattle			Youngstock of cows & Buffalos	Sheep & goats	Total manur obtained in cart of ½ ton
			Electric Motor	Oil Engine	Mhotes	Bullock	Cows	Buffalows			
1.	Tudialur	84	71	Nil	13	355	370	218	777	143	6895
2.	Chettipalayam	117	14	3	98	407	271	62	851	753	6580
3.	Thadagam	1	Nil	1	Nil	767	452	251	568	354	9124
4.	Kannamanaickanur	205	Nil	3	200	1147	478	193	733	3333	14256
5.	Velampalayam	237	3	Nil	234	663	380	132	728	1820	9515
6.	Kalampalayam	209	Nil	9	200	806	574	129	368	516	8981
7.	Pachapalayam	288	5	Nil	283	630	183	92	140	668	5211

College Notes and News

The Madras Agricultural College, Coimbatore, took part in the Inter-Collegiate Dramatic Competition, conducted by the Government College of Technology Students' Union on 25th and 26th October 1952. The Students' Club staged "Birds of a feather" in 3 Acts and got the Rolling Cup given for the best performance. It is also noteworthy to say that Messrs. James Redrigues and Selvaraj Carvallo got the individual cups for the first and second prizes respectively.

The students took part in the Inter-Collegiate debates organised by the Madras University. The following students represented the College:

Messsrs.	William Odango A. N. Sivappa	English at Vellore
,,	G. A. Sivaraman R. M. Alagappan	Tamil at Coimbatore
,,	Muddappa Karunakara Shetty	Kannada at Mangalore
,,	Parameshwaran Namboodri	Malayalam at Thevara

Messrs. William Odango and Ramachandran represented the College for the Inter-Collegiate Debate in English for the Rolling Cup donated by the Rotary Club on 20th November and they got the 6th and 7th places respectively.

This College is taking part in the Madras University Inter-Collegiate Tournaments of the Coimbatore Division. The students also took part in the University Divisional Inter-Collegiate Sports conducted in Salem on 14th and 15th November and in the C. I. A. A. Sports conducted in the Madras Forest College grounds on the 18th and 19th November.

Gleanings

International Union for the Protection of Nature

Man's responsibility for the progressive formation, first of semi-arid regions, then of arid regions and finally of deserts being what it is, it is a pleasure to welcome the formation of an international Union for the Protection of Nature. We hope and trust that facilities will be made available to the Union in generous measure to enable it to fulfil the aims and objects set out in No. 2, Vol. I of its Official Bulletin, viz., to examine critically the multifarious dangers with which nature is confronted consequent upon the constantly heavier pressure exerted by technicians upon biological cycles, to devise protective measures against wastage on the countryside, and to consider ways and means of extending the same over the widest area possible.

(Current Science, June 1952)

Golden Jubilee Colebrations of the Agricultural Research Station, Samalkot

The Golden Jubilee Celebrations of the Agricultural Research Station, Samalkot were inaugurated by Dr. R. Nagan Gowda, Minister for Agriculture, on the 30th October 1952. Mr. M. S. Sivaraman, Director of Agriculture, presided over the function on the first day.

Inaugurating the Celebrations Dr. R. Nagan Gowda laid stress on the necessity for sincere work towards solving the food problem. The Agricultural Research Station, Samalkot in its existence for the past 50 years, the Minister added, has rendered very valuable service to the ryots of the locality.

Mr. M. S. Sivaraman, I. C. S., Director of Agriculture, Madras, stated that the Agricultural Research Station, Smalkot is the second oldest in the State, and was opened in 1902, a year after the Agricultural Research Station, Koilpatti, was started. The farm during its existence has released eighteen high yielding paddy strains and contributed to an increase of the income of the farmers of the district by about 30 lakhs. Still, with a constant area, and the increase in the population, the Director stated, the problem was to find out ways and means to meet the food deficit. As a solution he suggested intensive cultivation and application of green manure to crops. Regarding the former he gave some practical suggestions. Concluding the Director stated that the Department was also engaged in making every bit of land self-sufficient.

Earlier Mr. M. Satyanarayana, Deputy Diretor of Agriculture, Eluru presented a report on the work done on the Station during the past 50 years, with

special reference to eradication of "Red Rot" in Sugarcane and development of the paddy crop by release of eighteen paddy strains, suitable to different conditions in the locality.

Mr. J. V. B. Ramars, Chairman of the "Golden Jubilee" reception Committee welcomed the gathering and stressed on the valuable service rendered by the Station to the ryots of the East Godavary District.

The Farmer's Day was observed on the second day i.e. on the 31st October. Sri N. Satyanarayana, M. L. C. spoke on "Co-operative Agriculture" and exhorted the ryots to develop Agriculture on a co-operative basis.

Sri M. Lakshminarayana, Nuzvid, spoke on the reclamation of the waste lands.

The third and the last day's proceedings–1st November 1952–were presided over by Sri M. B. V. Narasinga Rao, Paddy Specialist. Sri T. Lakshmipathy Rao, Agricultural Officer, Andhra Sugar Mills spoke on "White Sugar Industry". The Paddy Specialist advised the gathering on the improvement of the yields of paddy by the application of manures.

The following papers were read on 1—11—1952:

(1)	Suitability of the Strains released from the Agricultural Research Station, Samalkot and Maruteru.	Janab Syed Ibrahim, Superintendent
(2)	Cultural practices in the Cultivation of rice.	Sri P. Lakshmana Babu, Assistant in Meterology.
(3)	Manuring of paddy	Sri K. Radhakrishnamurty, Farm Manager.
(4)	Banana Cultivation	Sri A. Jayaram, Farm Manager.
(5)	Coconut Cultivation	Sri T. Narasimha Dass, Coconut Nursery Assistant.

An Agricultural Exhibition was arranged in the Station premises. Prizes were distributed to the owners of the deserving exhibits by Mr. N. S. Mani, I. C. S., District Collector, East Godavary,

Janab Syed Ibrahim, Superintendent, Agricultural Research Station, Samalkot and Sri K. Veerabhadra Rao, District Agricultural Officer, Kakinada, proposed vote of thanks.

Weather Review — For October 1952

RAINFALL DATA

Division	Station	Total rainfall for the month	Departure fromnormal in inches	Total since 1st January in inches	Division	Station	Total rainfall for the month	Departure fromnormal in inches	Total since 1st January in inches
Orissa & Circars	Gopalpur	15·3	+6·7	41·1	Central Contd.	Vellore	5·0	— 1·8	17·6
	Calingapatnam	9·9	+2·0	38·2		Gudiyatham*	3·8	— 2·1	14·7
	Visakhapatnam	12·5	+4·7	30·4		Salem	8·5	+ 2·1	32·4
	Arakuvalley*	6·3	—1·7@	45·4		Coimbatore (A. M. O.)*	4·2	— 1·9	9·6
	Anakapalle*	9·8	+2·0	37·4		Coimbatore	1·9	— 4·4	7·4
	Samalkot*	11·7	+3·4	32·7		Tiruchirappalli	4·4	— 1·9	14·5
	Kakinada	18·6	+10·1	43·6					
	Maruteru*	7·7	+0·5	32·1	South	Nagapattinam	6·3	— 4·3	19·3
	Masulipatnam	8·9	+0·3	28·6		Aduturai*	3·8	— 2·1	19·6
	Guntur*	3·3	—0·9	19·2		Pattukottai*	4·0	— 1·7	22·3
	Agrl. College, Bapatla*	6·1	+0·3	28·5		Mathurai	3·0	— 4·4	17·0
						Pamban	0·4	— 8·1	11·8
						Koilpatti*	2·7	— 3·7	9·9
	Agrl. College, Farm, Bapatla*	6·8	X	25·3		Palayamcottai	1·6	— 5·5	8·6
	Rentachintala	6·5	+1·5	21·0		Ambasamudram*	3·8	— 2·6	15·9
Ceded Districts	Kurnool	2·3	—0·9	31·3	West Coast	Trivandrum	13·3	+ 2·6	50·5
	Nandyal*	4·7	+2·0	31·4		Fort Cochin	11·3	— 2·0	91·7
	Hagari*	4·5	+1·3	15.1		Kozhikode	15·8	+ 4·7	89·6
	Siruguppa*	4·8	+0·3	19·9		Pattambi*	12·1	+ 3·0	66·5
	Bellary	4·2	0·0	11·1		Taliparamba*	12·6	+ 5·3	108·6
	Cuddapah	3·9	—1·0	21·5		Wynaad	9·3	+ 1·3	53·6
	Kodur*	4·5	—2·0	26·1		Nileshwar*	18·5	+13·4	132·0
	Anantapur	3·7	—0·2	12·3		Pillicode*	16·4	+11·5	113·4
						Mangalore	12·2	+ 4·9	110·1
Carnatic	Nellore	4·7	—4·9	25·1		Kankanady*	14·6	+ 8·1	114·5
	Buchireddipalem*	1·6	—7·1	19·4	Mysore & Coorg	Chitaldrug	7·9	+ 3·1	19·8
	Madras (Meenambakkum)	4·9	—7·1	28·9		Bangalore	6·9	+ 1·0	28·8
						Mysore	7·8	+ 1·9	24·6
						Mercara	11·4	+ 3·1	109·4
	Tirurkuppam*	5·7	—3·1@	27·8	Hills	Kodaikanal	4·1	— 6·1	32·6
	Palur*	5·1	—2·2	17·5		Coonoor*	3·5	— 5·7	27·1
	Tindivanam*	8·0	+1·9	18·7		Ootacamund*	6·0	— 1·9	22·7
	Cuddalore	8·1	—3·4	21·7		Nanjanad*	4·2	— 3·4	26·8
Central	Arogyravaram (Chittoor dt.)	7·0	—1·1	18·1					

Note:—

1. * Meteorological Stations of the Madras Agricultural Department.
2. @ Average of nine years data for Tirurkuppam and seven years data for Arakavalley is given as normal.
3. Average of ten years' data is taken as normal.
4. X The Farm was started only last year.

Weather Review for October, 1952

The unsettled conditions which prevailed in the north-west Bay of Bengal and neighbourhood on the last day of September, 1952 passed inland across Orissa – Circars Coast as a low pressure wave on 1—10—1952, and became unimportant. On the same day markedly unsettled conditions were seen in the Andaman Sea and the adjoining south-west Bay of Bengal but they became unimportant on the very next day. On 3—10—1952 a trough of low lay over the south-east Bay of Bengal and the adjoining Andaman Sea and another shallow trough appeard in the east Arabian Sea of Kanara – Konkan coast. The former concentrated into a depression with its centre within a degree of latitude 11° N., longitude 87° E., on 5—10—1952, moved north-westwards, weakened on 8—10—1952 of the north Circars coast, passed inland and got filled up over Orissa and the Gangetic West Bengal on 11—10—1952. Under its influence North-East Monsoon conditions set in over Tamil Nad. Widespread rains occurred over the Madras Region with locally heavy falls in coastal Andhradesa. The trough of low in the Arabian Sea persisted causing widespread with locally heavy rainfall along the West Coast and became unimportant on 9—10—1952. On 12—10—1952, a feeble low pressure wave moved westwards across the north Andaman Sea and on the following day a trough of low existed in the West central and the adjoining south Bay of Bengal. This concentrated into a depression on 14—10—1952, centred near latitude 14° N., and longitude 88° E. moved towards west, crossed the coast near Masulipatnam on the evening of 16—10—1952 and lay as a diffused low over coastal Andhradesa which became unimportant on 18—10—1952. This caused fairly widespread rain over coastal Andhradesa on (16 and 17—10—1952.) Meanwhile, on 16—10—1952 a low pressure wave from the east moved into the Andaman Sea causing unsettled conditions which concentrated into a depression with its centre near 1 at. 13½ N. long. 94 E., move north-westwards and crossed the Sunderbans coast on 22—10—1952. On the same day a low pressure wave across Tennasserim coast into the north Andaman Sea, causing a deep depression on 23—10—1952, centred within one degree of 1 at.15 N. and long. 95 E. The deep depression further intensified on the succeeding day into a cyclonic storm and crossed the coast near Akyab. On 25—10—1952 a well marked seasonal trough of low lay over the central Bay of Bengal and neighbourhood and the conditions were becoming favourable for the onset of the North-East Monsoon on 26—10—1952. On the same day a feeble low pressure wave was approaching north Andaman Sea from the east. The seasonal trough of low persisted over the central and adjoining Bay of Bengal upto the end of the month.

Day temperatures generally above normal over the Region from 22—10—1952 upto the end of the month.

The noteworthy rainfalls during the month and the zonal rainfall have been furnished hereunder :—

Noteworthy rainfalls during the month

S. No.	Date	Place	Rainfall for the past 24 hours.
1.	3—10—1952	Minicoy	3·1″
2.	4—10—1952	Madras (Nungambakkam)	2·2″
3.	do.	Kozhikode	3·0″

S. No.	Date	Place.	Rainfall for the past 24 hours
4.	do.	Trivandrum	4·6″
5.	do.	Alleppey	3·2″
6.	7—10—1952	Kakinada	7·5″
7.	do.	Vizag	3·9″
8.	do.	Calingapatnam	3·6″
9.	do.	Arogyavaram	3·6″
10.	18—10—1952	Cuddalore	3·6″
11.	22—10—1952	Salem	4·1″

ZONAL RAINFALL

	Name of the zone.	Average for the month	Daparture from normal	Remarks.
1.	Orissa and Circars	9·50″	+ 2·22	Above normal
2.	Ceded Districts	4·08″	— 0·06	Just normal
3.	Carnatic	5·44″	— 3·70	Far below normal
4.	Central	4·97″	— 1·59	Below normal
5.	South	3·20″	— 4·05	Far below normal
6.	West Coast	13·61″	+ 5·28	Far above normal
7.	Mysore and Coorg	8·50″	+ 2·28	Above normal
8.	Hills	4·45″	— 4·28	For below normal

Agricultural Meteorology Section,
Lawley Road P. O., Coimbatore,
Dated 12—11—1952.

M. B. V. N., C. B. M., & M. V. J.

Departmental Notifications

GAZETTED SERVICE
POSTINGS AND TRANSFERS

Name of Officers	From	To
Sri Ananthapadmanabhan Pillai, R.	Agronomist, Siruguppa (on leave)	Dist. Agrl. Officer, Mangalore.
,, Bhujang Rao, C.	Superintendent, Fruit Res. Station, Kodur.	Superintendent, Wynaad Colonisation Scheme.
,, Krishnaswami, P.	Asst. in Millets	Asst. Millet Specialist Coimbatore.
,, Krishnaswami, V.	Asst. Millet Specialist, Coimbatore.	Seed Dev. Officer, (Paddy) Tanjore.
,, Kannian, K.	Asst. Cotton Extension Officer, Guntur.	Gazetted Asst. (Assistant Cotton Specialist) to the Certification Officer, Rajapalayaam.
,, Padaki, G. R.	Asst. Cotton Specialist, Tirupur.	Asst. Cotton Extension Officer.
,, Raghavan, A.	Asst. Cotton Specialist, Siruguppa.	Asst. Cotton Specialist, Tirupur.
,, Ramana Rai, K. S.	Dist. Agrl. Officer, Managalore.	On leave.
,, Raghunatha Reddi, K.	Addl. D. A. O., Manures Scheme, Eluru,	Secretary, Krishna District Tobacco and Groundnut Market Committee.

(Leave)

Name of Officers	Designation	Leave
Janab Muhammad Basheer	Asst. Ento. (Sugarcane Scheme) Coimbatore,	Granted earned leave for 18 days from 31—10—'52 to 17—11—1952.
Sri K. S. Ramana Rai	D. A. O., Mangalore,	Leave on average Pay for 1½ months.

SUBORDINATE SERVICE
POSTINGS AND TRANSFERS

Name of Officers	From	To
Sri Y. Anthoni Reddy	Soil Conservation Assistant, Contour Bunding scheme, Guntakal	Fruit Assistant Model orchard cum Nursery, Modampalle Village, Kurnool.
,, Ananthachari, P. S.	A. D., Trichy	Seed Dev. Asst. (Paddy) Vellore.

Name of Officers	From	To
Sri Balasubramaniam, N.	Seed Dev. Asst. (Paddy) Vellore	Storage Assistant, Civil Supplies Department
,, Basaviah, V.	Spl. A. D., Manures, Tenali.	Addl. A. D., Bellary.
,, Dattatroyalu, M.	Spl. A. D., Manures, Bapatla.	A. D., Markapur.
,, Ganga Rao, G.	Spl. A. D., Manures, Tenali.	Farm Manager, Nandyal.
,, Gopalakrishna Reddy, M.	Spl. A. D., Manures, Guntur.	Addl. A. D. Gudivada.
,, George, A.	Spl. A. D., Manures, Ambasamudram.	Addl. A. D., Mannargudi.
,, Gopinath, K. V.,	P. P. A. (Ento) Tellicherry	A. D. Cannanore.
,, Hanumantha Rao, P.	Asst. in Mycology, Coimbatore.	Asst. in Plant Physiology, Anakapallo.
,, Kannan Nambiar, P.	A. D., Cannanore.	P. A. To D. A. O., Tellicherry.
,, Kumaraswamy, A.	A. D. Avanashi.	Addl. A. D. Avanashi.
,, Karupannan, P. N.	Addl. A. D., Avanashi,	A. D., Avanashi.
,, Krishna Kutty, K. S.	Spl. A. D., Manures, Nanguneri,	A. D., Ponnani.
,, Kameswara Rao, G.	Spl. A. D., (Sugarcane) Ramachandrapur,	Addl. A. D., Anakapalle.
Janab Mahammad Azimuddin	Farm Manager, Sugarcane, Research Station, Anakapalle,	Addl. A. D., Rajahmundry.
Sri Muthuswamy, R.	Spl. A. D, Manures, Karur,	Ousted from service from 15—11—1952 F. N.
,, Murthy Raju, K.	A. D., Kandukur (On leave),	A. D., Cuddapah.
,, Murahari Rao, G.	Spl. A. D., Manures, Bapatla,	Millet Asst., Narasapatnam
,, Narayana Reddi, M. L.	A. D., Markapur,	A. D., Parvathipuram.
,, Narasimha Rao, G.	Asst. in Plant Physiology, Anakapalle,	Farm Manager, Sugarcane Research Station, Anakapalle.
,, Obli Chetty, V.	Spl. A. D., Manures, Lalgudi,	Millet Asst. Coimbatore.
,, Prasada Rao, D. M. V.	Spl. A. D., Manures, Repalle,	Teaching Asst. in Botany Agrl. College, Bapatla
,, Palaniswamy, K. M.	A. D., Kollegal,	A. D., Gobi.
,, Ramu, S.	A. D., Gobi,	A. D., Kollegal.
,, Rama Rao, M. V.	Asst. in Plant Physiology, Anakapalle,	To continue in his present post.
,, Ramachandran, K. V.	P. A. to D. A. O., Tellicherry,	P. P. A. (Ento.) Tellicherry,

Name of Officers	From	To
Sri Subramaniam, V.	Spl. A. D., Manures, Tiruchendur, Tirunelveli.	Addl. A. D., Tinnevely.
,, Sreemannarayana,	Spl. A. D., Manures Repalli,	Addl. A. D., Kurnool.
,, Venugopala Rao, A.	Addl. A. D., Rajamundry,	Spl. A. D., Amalapuram.
,, Venktatappayya Sastry, K.	Spl. A. D., Manures, Repalle,	Addl. A. D., Chodavaram.

(Leave)

Name of Officers	Designation	Leave
Sri A. Annaswamy Iyer,	Seed Development Asst. (Paddy) Mathurai,	Extension of leave on average pay for one month.
,, S. V. Kuppuswamy,	Asst. in Chemistry,	Granted leave on average pay for 3 months.
,, Karuppannan, G.	Asst. A. D., Coimbatore,	Granted leave on Medical Certificate for 4 months.
,, Kunhirama Menon, P.	Asst. in Chemistry,	Extension of leave on average pay for 3 months.
,, Lakshmanan, S.	Asst. in Plant Physiology Coimbatore,	Granted Leave on Medical Certificate for 62 days.
,, Rajaratnam, C. S.	Journal Asst. (Tamil),	Extension of leave on average pay on Medical Certificate for 2 months.
,, Ramalingam, A. N.	Seed Dev. Asst. (Millets)	Granted earned leave for 30 days.
,, Seshagiri Iyer, C. S.	Farm Manager, Central Farm, Coimbatore,	Leave on Medical Certificate for 4 months.
,, Subramaniam, C. L.	Asst. in Mycology, Coimbatore	Granted earned leave for 45 days on Medical Certificate.
,, Venkata Naidu, C.	Teaching Asst. in Chemistry,	Granted earned leave for 27 days from 3—11—1952 to 30—11—1952.
,, Vasudeva Menon, K.	Asst. in Chemistry,	Earned leave 27 days from 20—10—'52 to 15—11—'52.