The Madras Agricultural Journal

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Editorial

The Budget provision for Agriculture in the Madras State for 1951–'52 amounts to Rs. 621·5 lakhs as against Rs. 446 lakhs in 1950–'51. As the Hon'ble Minister for Agriculture Sri A. B. Shetty poiuted out, while moving this demand during the last budget session of the Madras Asstmbly, the problem of feeding our growing population at an adequate level of nutrition overshadows all the other problems facing the country today. The recent census figures reveal an almost alarming rate of increase in the population, which is in striking contrast to the static and even dwindling nature of our food resources.

Though the Grow More Food Campaign has now been in existence for nearly eight years, it cannot be claimed, not even by an optimist, that it has succeeded to the extent desired. A large measure of this failure is to be atributed to the fact that people have gone in more for the cultivation of commercial crops like cotton, sugarcane, groundnut and tobacco than for the food crops so badly needed by the country. As the Hon'ble Minister pointed out "during the last twenty years there has been a slight decrease in the area under food crops, while the area under non-food crops has increased, mainly due to the relatively more atractive prices that they are able to secure". As a natural corollary there is now a wide disparity in the prosperity of food-grain growers and the grower of commercial crops. Those who cultivate food crops have also been hit hard by a succession of monsoon failures. The cultivator of commercial crops, on the other hand has prospered very definitely, on account of the highly remunerative prices he gets for crops like sugarcane, groundnut and tobacco and the fact that there is no price control over commercial crops, except in the case of cotton and sugarcane.

This difference in the prosperity of the two groups of cultivators is bound to have, in years to come, even more serious repercussions on the progress of the Grow More Food Campaign,

unless the Government takes up a more comprehensive policy of price control, to build up an equitable price structure for all agricultural produce, food crops as well as commercial crops. The regulation of agricultural prices should be correlated to a rational system of crop-planning to maintain a proper adjustment of productive resources as between food crops and commercial crops.

In this context it is pertinent to emphasise that in the final count, it is the people who decide the success or failure of any programme or policy that is drawn up by the Government, as the best-laid plan and programme for increasing food production is bound to fail, unless the common man and cultivator realise that controls and quotas, rules and regulations are meant to be respected and obeyed for the sake of the common good, rather than evaded or circumvented, for the sake of personal gains.

OBITUARY

Madras is distinctly poorer by the death, last month, of one of her most brilliant sons, Dr. C. R. Reddy, Vice-Chancellor of the Andhra University.

A distinguished educationist and one of the few real orators in the whole of India, it is a matter of pride for the Madras Agricultural Students' Union to recall that it had the rare privilege of having Dr. Reddy as the President of the College Day and Conference in July, 1941.

Rice in other Countries

By

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The scarcity of rice in this country is an eye-opener, but a similar scarcity prevails over the whole world. Modern civilization has abridged space and time so much that it is quite easy for anyone to fall in with the One-World ideology. Rice has therefore to be studied as a One-World crop.

A study of this crop in other countries might also help to adapt the practices in those countries to suit the needs of our conditions, not only in the present crisis, but also in the future designs of our crop-planning policies. The general status of the rice crop in the world is presented in Table I.

TABLE I.

Country	Area in Million acres	Production million ton (Rice)	Yield per acre (Rice)	Prewar Imports million ton (Rice)	Prewar Exports million ton (Rice)
1. (a) Indian Union	47·2	18·1	860	1·6	...
(b) Pakistan	22·5	7 4	730	...	...
2. China	45·0	37·6	1750	0·5	1·10
3. Japan	9.8	9·3	2350	1·8	...
4. Indonesia (Java)	9·0	5·9	1000	0·3	...
5. Burma	12·6	5·0	960	...	2.80
6. Indo-China	13 4	4·5	700	...	1.30
7. Siam	6·9	3·1	1030	...	1·40
8. Korea	4·1	2·8	1340	...	1·10
9. Philippines	4 7	1·6	750	...	...
10. Formosa	1·6	1·2	1550	...	...
11. Malaya	0 8	0·4	1100	0·6	...
12. U·S.A.	1·1	0·8	2000	...	0·07
13. Brazil	2·2	0·8	900	...	0·08
14. Italy	0·3	0 5	2000	...	0·15
15. Spain	0·1	0·1	3920	...	0·40
16. Egypt	0·3	0·3	2200	...	0·10
				4·8	8·50

Quantitatively rice is the largest food crop of the world, followed very closely by wheat. It is the staple food for more than half the people of the world. The total world production of nearly 100 million tons of rice over 200 million acres give about 100 lb. only of the milled rice per head of the rice-eating population. This ration is far below the standard for adequate nutrition and health. Considering its importance

The Maharajah of Travancore Curzon Lecture, 1950.

to India, it is evident that there is no other field in which well-expended effort will add so much to human welfare as rice culture. It is the cereal which permits the most intensive fertilisation and at the same time ensures good yields under both drought and floods. It is the crop which permits people to utilise not only all the rain falling on the fields, but also enormous volumes of run-off water from adjacent uncultivated areas. Under good husbandry and favourable conditions rice can be produced more easily than any other cereal. Rice is four times as useful as potatoes, weight for weight. Rice protein, though quantitatively less than in wheat, is considered to possess a better biological value. The wealth of material available in this crop is unrivalled; there being more than 3,500 varieties grown in the countries of South-East Asia alone. Credit should go to the Madras workers for having nearly 2,500 types in their collections which are maintained ***in vivo*** at the Paddy Breeding Station, Coimbatore.

The variations that exist in every part of this crop, its range of adaptability and its response to good husbandry, do not exist in any other cereal or for that matter in any other crop. Its ecotypes have a cosmopolitan range of geographical distribution in respect of latitudes as well as altitudes.

Rice is also a safe crop. Where rice is the exported crop, the market may slump as it will, without any serious repercussions on the grower in the country, whereas other crops such as rubber, tobacco, coffee, tea or copra can only furnish the money to buy rice to feed the people, and hunger steps in promptly when they cannot be sold or sold well. Thus a cultural system which sacrifices some food for probable money would be an unsound policy.

The exportable surplus of this cereal at present is only a quarter of the prewar average exports; while in 1935—'39, the internal trade amounted to 7·0 million tons, the export surpluses at present are estimated at only 3·0 million tons, creating thus a gap of 4·0 million tons. Asia's importing countries need more rice than its exporting countries can provide in the near future. Thus the task of increasing the total store of rice is urgent and it is more so in Eastern countries, where rice is the largest crop.

Although rice ranks as the first amongst the grain crops of the world, there is no denying that the organisation of its study stands in need of everything. No doubt very good work is being done in individual countries. But there is no reviewing periodical that gives even an approximate idea of all that is written on rice. Recently there is a publication named the 'Rice Journal' but it deals more with the economics of rice cultivation than other important aspects, on this

crop. There has been, unfortunately, no collaboration between the investigators on this crop, though recently the FAO has a Rice Study Group as one of its branches, a good augury for the Eastern countries.

Much of the information on the cultivation practices of rice in countries other than India relates to prewar years. Nevertheless many of them hold good even today and their main principles are accepted.

Spain: The cultivation of rice in Spain has been brought to a higher pitch of perfection than anywhere else in the world. It is recorded that the highest acre yields in the world are obtained in this country with an average of 5,200 lb. of paddy (3,600 lbs. of rice), over an area of 1·2 lakhs of acres. The extent is more or less equal to that of the Tambraparni basin in South India and the area is confined to the deltas of two rivers.

The rainfall is only 17", with a humidity of 64 per cent throughout the growing season, the highest temperature being 105° and the lowest 38°. The high yields are in part due to the season the rice is grown in i. e. from May to October when there is plenty of sunshine and also to the very good husbandry. The outstanding features that distinguish the cultivation of rice in this country are first, a thorough cold weather cultivation, the stubbles being burnt immediately after the crop is harvested. The fields are watered in January and harrowed, under puddle. In the lower lands a special harrow called 'Rallaora' which can be run even when the land is still wet, is worked. The discs are about a foot in diameter and set about a foot apart. When just dry it is again harrowed and later ploughed with a double mouldboard plough, drawn by horses. In recent years the breed of horses suitable for this work has been improved. The land is again puddled in May under water with a harrow.

The second feature is intensive manuring. Green manures are grown in most of the high levels areas. The use of artificials at 240 lb. ammonium sulphate, 300 lb. of super-phosphate and 50 lb. of potassium sulphate is a normal routine.

Thirdly, clean cultivation and aeration of the soil, when necessary, followed by copious but graduated irrigations, provide the conditions for a good stand of the crop.

Short-growing stiff varieties and constant replenishing of the stock offers itself as the fourth point of success in rice growing.

And lastly, most of the operations are carried out by human and animal labour with thoroughness except threshing which, of late, is done by machinery. Polishing is seldom done and this keeps the workers in

good health with all the food value of rice preserved intact. The spacing adopted for planting in most areas is 8″×10″ and 3 to 5 seedlings are planted per hole.

Italy: The next important European country recording a high yield is Italy where, it is learnt, only 3 to 3½ lakhs of acres are under rice. Rice is the staple crop in the Po valley. Land rather than labour is the limiting factor of agricultural production in this country, influencing every aspect, from agricultural research to land utilization. The elimination of physical or chemical obstacles to agricultural production has been the main aim of all agronomic investigations. It was the rice crop that made possible the reclamation of large areas in this country. Draining of marshes, protection of countryside against floods, attempts to check soil erosion, long-term financial assistance to develop land as an organic unit with the idea of ruralising have also been the aims of land development in Italy. The sand dunes of Po valley were brought on a par with the most progressive countries of Northern Europe after the fine irrigation systems that were developed. Through such intensive cultivation, an average acre yield of 2,600 lb. of rice (shelled grain) or 4,000 lb. of paddy is obtained. How are these acre yields achieved when we are told that the soils are neither inherently rich nor does the river Po get much silt material? The high yields per acre must necessarily be due more to the methods of culture in vogue, than to the natural fertility of the soil.

The rice area here consists of very level fields not less than 20 acres in area so that it is possible to use some sort of machinery. Multiple ploughs drawn by horses are freely used for dry ploughing and even for puddling. Most of the area it is reported, is broadcast or drilled but the Italians have fully understood the beneficial effects of transplanting and are reported to have evolved a successful paddy transplanter.

The owner cultivators are 59% and the intensity of farming is evinced by the very many peculiar practices of farm enterprise. A few peculiarities in the paddy cultivation of this country may be mentioned:

(i) Weeding very thoroughly by manual labour.

(ii) Economic use of water. Farmers' associations are in charge of distribution of water and other irrigation sources are kept in perfect conditions by the farmers themselves.

(iii) The fields are dried 20 days after sowing and again after the final weeding.

(iv) Wheat and pasture for two years and then rice one year is the rotation practised. Fish culture is also carried on in rice fields.

(v) Over 10 tons of farmyard manure is used per acre and artificials at 1 cwt. ammonium sulphate, 3 to 4 cwts. superphosphate and 2 cwts potassium sulphate serve to enrich the crop while aiming to keep the soil in good heart.

(vi) Short-stalked rices with heavy panicles and good tillering are grown. Hybridisation methods are commonly used for improvement of rice crop in this country.

(vii) Electrically operated threshers and artificial desiccators for drying grain if weather is bad.

(viii) Crop insurance against damage at 6 to 9 per cent of the gross value.

(ix) Husking done in small mills usually attached to the farms or a group of them, thus helping to retain the bye-products with the cultivator himself.

(x) It is said that the Italian varieties are richer in proteins and fats. This is yet to be verified.

(xi) On the part of the Government, there used to be instituted huge prizes to promote competition for best yields. Two to four lakhs of rupees per year were given personally by Mussolini in the presence of a number of high Government officials. Formation of societies for production of good seed was encouraged, the State paying half the expenses of their formation The Press was also helping by devoting front-page articles on matters of agricultural importance.

China: Coming nearer home, to the countries of the Far East where 90 per cent of the rice production is concentrated, some basic facts have to be borne in mind, namely:

(1) A large percentage of production never enters trade channels and statistics are therefore, liable to be incorrect.

(2) Rice consumers in these countries obtain 70 to 85 per cent of their calories only from this cereal.

(3) Carry-over of rice into the next crop is always never more than two months' supply and no terminal storage facilities as warehouses and elevators, as exist in the West, are available.

(4) Most of the rice exports are Government-controlled.

Countries like China, Japan and Korea form a group in themselves so far as agriculture is concerned. F. H. King records that "In selecting rice as their staple crop, in developing and maintaining their systems of combined irrigation and drainage, notwithstanding they have a large summer rainfall, in their systems of multiple-cropping; in their extensive and persistent use of legumes in their rotation for green manures to

maintain the humus of their soils and composting and the almost religious fidelity with which they have returned to their fields every form of waste which can replace plant food reqnired by the crops, these nations have demonstrated a grasp of essentials and fundamental principles which may cause any nation to pause and reflect. Every part of land is made to contribute towards food, fuel or fibre".

The high esteem which rice enjoys with the Chinese may be gauged from the fact that the Emperor used to sow on an auspicious day (corresponding to the best day from the agricultural point of view also,) rice seed in seed-beds and the lesser nobles other cereals. Because the Chinse are rooted to the soil by their rice, they have outbred and outlived their conquerors. The population in China and Japan is twenty times more dense than most other countries, such as the U. S. A., but the Chinese are such a hard-working race that their 500 million are being maintained upon products from an area smaller than the improved lands of all U. S. A. put together. This they have been able to do by their resourcefulness and utilisation of all possibilities which science and invention have taught other nations.

The rice area of China is 45 million acres, confined to Central and Southern China with an annual rainfall of about 60", of which nearly 20" falls in July-August. 95% of this rice area is transplanted and the average acre yields of the transplants is recorded at 3000 lbs. of paddy. In areas favoured with longer seasons two or three crops are grown. It is said that the cultivator here is an industrial biologist. A few interesting points may be worthy of mention.

(i) The average size of the fields in China is only 10 cents More than 75 per cent of the same land matures at least one other crop the same year and much of this may be wheat or barley, both consumed as human food.

(ii) Industrious labour, displayed from day to day in persistent, never-ending endeavours in keeping their land and themselves ever busy in producing something useful, is something surprising; and quite admirable. For them, as Emerson might put it, the natural is the supernatural, the real is the spiritual.

(iii) Fields that had matured two crops of rice during the long summer are thrown into strong ridges for vegetables. Centuries of toiling millions have excavated works of almost incalculable magnitude, building bunds, digging canals, carrying deposits of silt and organic growth and reclamation of lowlands. King truly believes that "if the Chinese had spread and developed in North America, the world would have seen a bigger production of all commodities. There might have been a grand canal, Rio Grande to the mouth of the Ohio river and from the Mississippi

to Chesapeeke Bay preventing the run-off and saving millions of acres of soil erosion". One unique feature of China and Japan is the paucity of work cattle. Though beasts are very important to agriculture, it is undoubtedly a luxury in these countries. The human population is already too heavy, for any wealth of bovine species to compete with man in the struggle for existence.

(iv) The foremost consideration in these countries is the maintenance of soil fertility at all costs and the remarkable feature is that China has been able to maintain her soil fertility in spite of 4000 years and more of cultivation. This is due to the scrupulous attention to make everything possible to serve as fertilizer for soil and food for crops. The unique feature of this country as well as of Japan is the scrupulous thoroughness of the utilization of human excreta for fertilising their rice crops. About 20 per cent of the total nutrients are derived from night soil. It must be recorded to the credit of the Chinese that no dung is burnt. Special shrubs are grown (matting rushes) in the vacant sites and canal bunds to be used specially for fuel purposes. Liquid manure is plentifully applied to the fields from time to time.

(v) Another remarkable feature in Chinese agriculture, which incidentally should mean rice culture, is the extent of canalisation with an aggregate mileage more than the roads in the U. S. A. There are two lakhs of miles of canals with a sea wall of 300 miles length as dykes. By impounding water in reservoirs large areas of swamps are reclaimed. By raising the low-lying fields, drainage is improved and soil fertility maintained. Water lifts consist of a long wooden frame with paddels, worked by three men who irrigate 2.5 acres in ten hours, with a lift of 3 to 4 feat.

(vi) Not only does the Chinese cultivator look to the irrigation of his crops but attends also to perfect drainage facilities, so that water melons, egg plants and other vegetables can be grown in rotation on the small paddy fields and sometimes even among the paddy fields.

Japan: The land of the 'Rising Sun' is also the land of bounteous rice crops. It is a country with too many people and too little land. But there are few countries in the world in which crop yields per acre are so high as in Japan or in which they have increased more within recent historical times. Moreover there are few countries in which research has played a more important role in promoting greater production. As in most other countries, Japan has increased her rice yields by a number of factors, including specially improved cultural methods, extensive use of commercial fertilizers, better control of insect pests and plant diseases and better varieties improved by hybridisation. It has about 10 million acres of rice with an acre yield of 4000 lbs. paddy, equivalent to 2400 lbs. of rice. The whole of Japanese rice culture is comparable with scientific horticulture or market gardening. Seven-ninths of the population lives in villages

with not more than 2,000 population. The rice land is divided amongst many small owners, with ¼ acre per head of population. Fifty-three per cent of the irrigated rice land is less than ⅛ of an acre. When the country is not level, the slopes are finely graded into horizontal terraces varying in size with each terrace. There are more than 11,000 square miles of fields thus graded, each provided with bunds, with water supply and drainage channels, all carefully kept in the best repair. They have also the dry-lands terraced, but there are no irrigation systems developed.

In spite of the well-distributed rainfall of about 50 to 60 inches, per cent of the area is irrigated from some source or other. Large and costly irrigation works are established. Except in certain limited areas, cattle and horses are scarce and the great mass of labour is human. The largest and best crop possible rather than less trouble and labour determine the practices.

Active and enthusiastic, happy and efficient, very intelligent, the Japanese have a marvellous sense of assimilation and adaptation to scientific processes. They are the best farmers in the world, both at home or elsewhere. The average extent of a farm is only 2.7 acres but the best use is made of the available area. Tillage is deep and thorough and no slovenly corner is to be found in any field. In April and May, the moist, stubbly soil is inverted in deep blocks by long forks. Recently small-sized tractors 'Kataba' and 'O. K.' are coming into use. Extensive as is the acreage, every cent of paddy land is transplanted and 4 or 5 persons plant an acre. Women pull seedings sitting on low bamboo stools. Transplanting is done in perfect rows. A cord is stretched every 6' apart in the field 4 to 5 seedlings planted in rows one foot apart with a spacing of 8" or 9" in the rows. Sometimes a rake is used to mark the rows. A week after planting, spading is done in the rows with a 4-tyned hoe, for loosening the soil and a man again passes along to set the lines in position. Recently there are revolving cultivators worked by hand for this operation. Weeding is done three of four times during the crop growth.

Manuring: The chemical analysis of the rice soils of Japan discloses that they are not rich, but are made very fertile for producing crops by the strenuous and intelligent work of the farmers. No crop is planted without its dose of manure. Fertilization receives the greatest attention everywhere. The pink clover (*Astragalus* species) is extensively grown after rice in the autumn giving 18.20 tons which is spread over 3 to 4 acres. If one is not able to grow green manure it is gathered from the hills and mountains or even cut from the channels. Wastes from every available source, wastes of body, of fuel and of fabric are gathered, taken back to the field, housed against weather and used in the most economical and sensible manner to serve as food for the crop and manure for the soil. In one year it is officially reported that 24 million tons of human manure and

23 million tons of compost were used in the country. Recently artificials are being used. When the world consumption of commercial fertilizers is considered, Japan ranks third for nitrogenous fertilizers, sixth for phosphatic and potassic fertilizers though that country ranks only as the 19th in the world distribution of arable land. Manure is applied in part doses, 3 or even 4 times, which is economical, prudent and sensible. The following is the usual routine application per acre.

110 lbs. of Nitrogen (N)
60 lbs. of Phosphoric acid (P_2O_5) } 40 per cent from chemical fertilizers, rest from farm sources.

60 lbs. of Potash (K_2O) - 75 per cent from farm supplies, rest chemical.

It was found from experiments that manganese when applied as carbonate increased yields of rice. A word about application of ammonium sulphate. The Japanese apply ammoniun sulphate at a depth of 3″ of soil to prevent its loss. This is in accordance with the latest findings of research that ammonium sulphate oxidises more rapidly into soluble salts in the upper layers. The Japanese apply 2/3 of the ammonium sulphate before the rice is transplanted and the rest in two part doses, one and two months after transplanting. One-third of the area is double or multiple-cropped. A variety of crops is grown in rotation to provide a well-balanced diet as also some money for the family, vegetables, wheat or barley even after two crops of rice are taken. This shows the very hard work the Japanese farmer is capable of.

There is a very old Imperial edict in Japan as well as in China, which enjoins the selection of big-sized, well-filled seeds for sowing. The rice seed is put in brine or sea water and all grains which float are removed while the seeds which sink are washed and sown in the nurseries. This method has not given any marked results in Madras. It is, however, a safeguard in eliminating weak and unfilled seed. Most nurseries are raised by the wet method and are very small and narrow; silt with mixture or organic manures and ash are applied tothe nursery when the seedlings are one inch old.

Reaping is done by hand and the sheaves are removed and hung on racks or frames, after which they are beaten and the grain separated.

Almost 80 per cent of the total area is devoted to rice varieties improved by breeding, of which 50 per cent is by hybridization. The work of breeding 'better varieties' has spread to such an extent that Salmon has pointed out that due to the evolution of varieties resistant to blast, early maturing varieties that could stand the stem borer, paddy varieties that tolerate or resist low summer temperatures, crop failures which occurred before quite often in many parts of the country, have now practically disappeared. In some prefectures all seed is improved seed

and in certain prefectures the use of uncertified seed is punishable by law. There are 595 Imperial, prefectural, private, main and branch Experimental Stations, of which 150 Stations work on rice. The set-up must be considered lavish considering the area it serves. The enthusiasm of the cultivators is so great that they erected a monument at Akita to commemorate the evolution of a blast resistant variety Rikuu 132 by the Agricultural Department.

There is a keen sense of co-operation amongst the farmers. The Better Farming Societies of Japan are entrusted with (1) Modernisation of farm operations and improvement of agricultural methods by experimentation, (2) publishing pamphlets for augmenting crop yields, (3) arranging yearly competitions and (4) seed production and distribution activities. These are farmers' own independent organisations. There are warehouses in Japan which may be called 'Rice Banks' whose members are mostly farmers and whose business consists in the care of the rice deposited, making advances, establishing exhibitions, diffusing knowledge in the use of machinery, manures etc. Profit is not the object. In one godown the transaction involved about one million tons of rice.

It has been recoguised that the agricultural economy and the industrial economy of a nation are always interlinked. In Japan we have an example of how agriculture is made to flourish by developing cottage industries closely connected with farming which provide spare-time work for the families. There is a Japanese slogan 'my home is my factory'. 54 per cent of the industries are one-man workshops and 40 per cent small plants have less than five workers, sometimes one family only. The following figures speak for themselves:—

1945

	Percentage of population employed	National income
Agriculture	43	18
Industry	29	33
Commerce	7	22
Rest	21	27

This revolution was brought about by a well-organized plan of co-operation between agriculture and industry. There is no illiteracy in the country. Patient, hard working and highly trained mechanics and skilled labourers are at the back of this success of industrial organisation.

In one prefecture with 2.5 lakhs acres of farm land, in addition to rice and barley in the same year the following were produced from straw; 9 million slippers valued at 20 million rupees. This was in 1930. Ten hours of work and no holiday on Sundays are the rule.

When we talk of the Japanese people as industrially bent, there may be a misapprehension that the Japanese might have mechanised rice culture completely. But it is not so. Most of the operations from planting to harvesting are done by manual labour and no need was felt for replacement of manual labour by power. Recently handworked cutting and motor-threshing machines which are community owned, are being used. Electric motors and gasoline engines are used for processing agricultural products, but not for raising crops. The machines are all of low H. P. only. The average H. P. for a gasoline engine is 2.9 and of an electric motor is 1.5 while there is a large percentage of 0. 25 H. P. electric motors in use.

Nicholson has truly said "it is neither capital, nor agricultural education nor government aid, nor imported food supplies or fertilisers that keep up Japan but the utilization of those substances and forces which are or may be available in greater or less degree to every farmer in any country. Utilization of all wastes, both in matter, space and time and persistent, dogged and strenuous labour are the secrets of agricultural success in this country." The following figures show the progress in yield per acre.

Year	Area (Million acres)	Yield per acre (rice) pounds
1900	6.2	1,900
1920	6.9	2,400
1930	7.3	2,500
1940	7.8	2,600

Human excreta as manure: As manuring with human excreta is the most esteemed fertilizer in the rice culture of China and Japan, some further details on the methods of collection and application in these countries may prove to be valuable. One analysis gives fresh night soil as containing 6 per cent Nitrogen (N), 3.5 per cent Phosphoric acid (P_2O_5) and 5 per cent Potash (K_2O) giving for one lakh of population about 2 tons of nitrogen, 1 ton of Phosphoric acid P_2O_5, and $1\frac{1}{4}$ ton of potash. In one of the most popular rice-growing tracts of Szechvan it is reported that 25 million tons of night soil, consisting of $1\frac{1}{4}$ lakhs of tons of Nitrogen, are used. The Chinese agriculturist has no sentiment against handling this material. Probably the Budhist religion is responsible for this in not only rendering innocuous an apparently filthy product but making it highly efficacious in enhancing the productivity of the soil. China cannot afford to lose this valuable material. No doubt a certain amount of improvement in the handling of it to make it more sanitary and aseptic may be called for to mitigate the probable dangers arising from its use as a fertiliser. The greatest danger it is said, is the contamination and infection by the eggs of the parasitic worm *Ascaris.* But one great natural precaution which the Chinese have taken against such dangers is that all food is taken hot (even

the things sold in the street are hot) and very few vegetables are eaten raw. Hot drinks, consisting mostly of 'green tea' are always used and this to a great extent acts as a safeguard against the danger arising from the use of night soil as fertilizer. And for transport, covered buckets are used. It has also been found that by composting the manure for 2 to 3 weeks all the *ascaris* eggs are killed in the 60° to 70° temparature that is developed. But it has been found that compost value of the night soil is less than the same amount of night soil used for the compost. Again composts are more costly because of the preparation and distribution costs.

Human excreta are collected from house to house, transported in big bins or carts and collected in pits lined with brick and lime. In the compost pits superphosphate is applied to conserve the ammonia liberated.

Japan is the most modern country in Asia. Yet she faithfully clings to the old practice of preserving the night soil in houses. Every home is provided with a disinfectant which is used twice daily to deodorise and the night soil is preserved in a deep pit until the sweeper comes on his round with clean wooden containers (all covered) and these are loaded on carts. Even notice boards on roadside invite passers by to profit the owners of fields on their way, where they are to ease themselves.

Indonesia (Java etc.) The Republic is predominantly a sugar-producing one, but it must be stated that rice was the earliest crop to be studied scientifically in this country. In their efforts to improve the hereditary qualities and yield, Java has led the world. First, extensive work in line selection and hybridization were done here. The rice irrigation in this country is highly developed. The soils are rich and rice is also rotated with dry crops such as maize, groundnut and tobacco. Yields are about 2,000 lb. of rice per acre but here as in India, the poverty of the cultivator is a draw-back for higher production. An interesting industry in relation to rice growing in this country is 'fish culture'. Spawn of gold fish is actually planted in rice fields and this industry provides a cheap and easy source of proteins in the dietary of the country. It was found that soils have responded to phosphatic manure applications very well.

The Government have been helping the rice industry of the country by a unique system of rural finance which keeps prices constant while a combination of warehouses and banks provide the Government with accurate and reliable information regarding stocks etc. There about 10,000 rice banks in the country. Copeland in his book on 'Rice' gives detailed information on the subject, which is well worth perusal by everyone concerned with rice improvement work.

Burma: India's long association with this country makes it her kin. As a matter of fact rice cultivation in Burma was in the hands of emigrants from this country, and except in one or two points there are not many

peculiar features that merit any special consideration. Since rice is the barometer which measures the prosperity of the country, every encouragement was given by the State to rice industry.

In Lower Burma the construction of a large number of 'canals and embankments', the former to serve as drainage and communications and the latter to prevent inundation, is a special feature. Yet another feature is in the preparatory cultivation practised in Burma. The plough is not so common as the '*Settun*' which combines the functions of a cutter of the soil, a trampler of weeds and a puddler, preparing the soil for planting. The preliminary cultivation is thus rendered easier and is done also quicker.

A third important feature of rice culture in Burma is the well-developed seed organisation in the country. The nucleus seed produced on the Government Rice Stations is multiplied on Government-owned tenant-cultivated seed farm areas which may be called the major seed farm areas and from these, the seed required for the minor seed farm areas owned by the cultivators, is sown. The Department buys a certain portion of this produce and allows the rest of the produce to be distributed by the cultivators themselves, who maintain a register of the persons to whom they distribute the seeds. The Government helps the minor seed farm ryots by special concessions.

Siam: There was an interesting order in 1865 that rice should not be sent out of the country. This would show how the country was stricken with famine for rice and also that the area under the crop was very small. But now this is one of the three great exporting countries that supply the rest of the world with rice.

There are three divisions of the country (i) the flat alluvial plains, (ii) a forest-covered mountain tract and (iii) a small bit of undulating country. On the first type of land rice is the most important crop. About 90 per cent of the area is under rice in this country and this is so because much of the land is flooded and no other crop is suitable to these conditions without expensive and special attention on the land. Again it is a very sure crop with flood irrigation and grows best during the rainy summer and autumn. Finally, labour is cheap and skilled enough for raising a successful rice crop.

In this country, there is also a large area of swampy tracts where the soils are very acid with the pH varying from 3·5 to 6·25. A good many varieties of rices have been developed to suit this area. Broadcasting and transplanting are both in vogue. The broadcast fields are furrowed every 5′ to 6′ with drainage channels 9″ to 12″ depth to serve as drains in case of heavy rainfall.

Use of harrows drawn by animal labour and also motor power appear to be common. No large-scale manuring is practised. But it was definitely established that deficiency of lime required immediate attention and that repeated use of ammonium sulphate without addition of lime was responsible for reduced yields. No great differences in other practices are noticed except that the harvested sheaves are kept on the fields for 3 to 4 days to cure and threshed only afterwards.

Only one crop of paddy is grown per year. There are no great irrigation works. Still the Siamese produce some of the best rices for the exporting market. The development of the varieties was designed to suit the millers' profits, the characteristics of good milling aimed at being large size of grain with a cylindrical shape, small embryo, thin husk and a translucent inner structure. Local varieties were improved by selection to reach these standards.

More recent developments in rice improvement appear in the introduction of oil-driven tractor engines of 15 H. P. for cultivation purposes and the use of glutinous rice for distillation of alcohol.

Agricultural Science had been the orphan child of the country until the advent of the Japanese, whose influence has been felt in the improvement of yields by introduction of snperior pedigree rices and better methods of manuring and cultivation. However, one factor worth remembering here is that the Government controls and owns all the rice exports through the Thai Rice Company. Recently irrigation projects are said to have been in progress, bringing about 40 per cent of the area under irrigation so that one of the uncertain factors of production will have been eliminated to some extent. Siam exports about 1·6 million tons of rice.

Indo-China: This is an important rice-exporting country and has a larger area than Japan but the production is not even half of that of Japan. The diverse conditions under which rice is grown, with varieties from 90 days to 10 months' duration, poor soils with some degree of acidity and their flooded condition are to a great extent responsible for this state. Like India, Indo-China has a very high birth rate and also large areas owned by temples and the priestly classes.

The main season for rice begins in February and the methods in vogue in rice culture do not vary very much from those of India. As most of the rice is grown for export, the number of well-defined good quality rices is small. For internal consumption only coarse kinds which give higher yields are grown.

Philippines: Possessing an area of little more than a third of the acreage in Madras, the Philippines records of yields are very poor, due to the very imperfect cultivation methods and high incidence of weeds.

It is not a staple industry of the country. The heavy rainfall up to 160" (between June to October) is also partly responsible for the poor yields. Though there is nothing peculiar in the cultivation practices of the country, the method known as the '*Dapog*' system of raising nurseries, appear interesting.

The '*Dapog*' system make it possible to plant the seedlings at a much earlier stage than in the ordinary method and without injury to the seedlings. A plot near the irrigation ditch is harrowed, puddled and levelled. A thick seed rate (20 lb. to the cent) is used in the nursery plots laid with banana leaves in the mud at a depth of 1" below the surface. The entire bed gives the appearance of a carpet of seedlings. After 15 days the leaves are stripped into convenient sizes and carried to the field of planting.

The use of machinery is on a very limited scale, as most of the area is in the hands of small farmers who are poor, so that not much of 'mechanisation' is feasible in this country. Most of the area is cultivated on rentals which vary from 1/3 to 2/3 the gross yield. A certain amount of irrigation has to be done by pumps, in spite of the heavy rainfall, especially in broadcast areas.

Another notable feature of rice culture here is the "terraced" area called the '*Igorots*'. Copeland records that nowhere in the world has it reached quite the perfection of development, either in the extravagance of hand labour or in the completeness of water utilisation as it has among the '*Igorots*'.

The Philippines have only a few varieties of rice under cultivation. This country has a well-established Rice Research Section.

The United States of America: Mechanisation of rice production has so much stirred the imagination of some enthusiasts that it becomes necessary to devote our attention to the prospects offered by such cultivation in India, after examining the results in the countries where it is most popular. Australia in the Eastern Hemisphere and the U.S.A, in the Western Hemisphere may be taken up for such studies.

From an importing country of rice up to 1900, the U. S. A. has become an exporting country by 1915, the exports rising to 700 million pounds in 1920. From 600 million pounds of 'rough rice' in 1915, the production has increased to four times before World War II and in 1949 it produced 4000 million pounds. In this country the production of rice differs from the production of most other crops, in that rice is seldom grown as a minor enterprise. It is generally raised on specialised farms where it has first claim on all production facilities. Rice ranks second as a source of cash income for some of the States. Cultivation of rice in this country has to serve a two-fold purpose, one for utilising land hitherto not used for any crop but left for scanty pasture or on which grain-growing had been declining and another of providing a means of utilising the waters of irrigation systems. The Japanese, Chinese and Indian settlers were attracted to these valleys, the biggest of which is Sacramento Valley. The present area of rice in this country is 1·1 million acres.

The climate of the Sacramento Valley has a maximum temperature varying from 105° to 115° between June and August with an annual rainfall of 22". The soil is clay to clay adobes and rice cultivation in these States is really an example of cultivation with the aid of machinery, as a substitute for human labour which is both scarce and costly. Almost all the rice land is ploughed up with large tractors under dry conditions to gain time. The usual practice is to plough, double disc, to get a rough seed bed and make drill lines visible for drilling when in condition. The fields are then irrigated from large canals supplying plentiful water.

The average rice holding is 200 acres, with at least one tractor, a set of 3 ploughs, 11 discs, one seed drill and a thresher.

Seedlings are usually done in April-May by grain drills and 'Endgate' seeders and harvested in autumn. Recently in California, rice is seeded by airplane in water and 400 acres are covered in a day. When the land is very foul with weeds, of which the Barnyard grass and Cyperus are very prominent, the land is given a rest, as there is no other way to clear off the weeds except by ploughing and bare-fallowing to destroy the weeds. Incidentally this also improves the fertility of the soil.

Manuring with artificials is extensively practised, though till 1933, rice never got any artificials. Dressing the field with superphosphate is also practised. Most of the commercial fertilizers used is applied by hired planes between the first and second watering.

Rice is cut with binders and it is found that the losses vary from 10 to 15 per cent in the process. The cut bundles are usually 'shocked' to dry the grain as the crop is usually cut before it is fully ripe. Recently a 'combine' is used which cuts, binds, threshes and separates the grain also. This 'combine' is worked by power or may be even horse-drawn. When only the thresher is used, the 'shocks' are taken to the thresher commonly called the 'separator' on bundle wagons. The sacks from the separators are moved by 'bundling out wagons' to warehouses and elevators where about 2 to 3 million bushels (1 bushel=50 lb.) may be stored and the produce well-dried and kept ready to go to the mills. The latest average yield is estimated at 2,500 lb. of grain rice per acre.

Another feature of rice culture in the U.S.A. is the very lavish use of water, working out to a duty of only 50. There are large wells irrigating 100 to 125 acres from a depth of 25 to 35 feet run by private enterprise and large pumps are installed from the rivers, all organised by private companies.

But in spite of ruthless competition in costs, the American grower, fortified by selection of seed varieties, large-scale production technique and his superior mechanical skill is able to secure not only the domestic market but also certain foreign markets. He is able to sell rice as cheaply as any "rice grower in the Orient, where labour is cheap. The American rice grower has increased his *per capita* production to such a large figure that he is successfully meeting the Orient in the world market, sells at the same price, and yet enjoys as large an income as the producer of any other crop."

Australia: The rice culture in this country shows the utilisation of this crop as a means of reclaiming land and it is said that the area under this crop is on the increase.

Australian rice industry is also highly mechanised, due to paucity of population; and naturally on the soils used for rice growing, wet weather creates many problems. Sinking in the bogs is a common feature and sometimes two powerful tractors are necessary to pull the binders and treaders through the crop.

Since machinery has to be used, only the short, stiff-straw varieties from America are used, one of which called *Calorco* came originally from Japan.

A recent Agricultural News Letter says – "The yield in Australia is higher because there are no diseases and there is plenty of irrigational supplies. Rotational cropping with wheat and oats is also practised. The cost of production is estimated at Rs. 170/- a ton including rental, depreciation and marketing."

A recent investigation gives hope of extension of rice crops in the Northern Territory and the river districts in the north of Western Australia. Agricultural Experts consider that Australia has a bountiful new rice-growing land in that zone.

Africa: The next important amongst the other countries of the world producing rice is Africa. The rice area in this country, occupies 3 lakhs of acres and is concentrated in Egypt and portions of Tanganyika. The varieties in rices of this country are numerous and all of them are said to belong to *O.glaberrima*, a very close and allied species of O.sativa. The Egyptian rice is of excellent quality – i.e. hard and its acre yields are high. There are model farms of one acre size established in in different parts of the country to serve to extend the area of rice and also demonstrate improvements in cultivation. The seed is changed by the cultivator after every 5-year period. The excellent system of irrigation, depositing good silt and the heavy manuring that is also practised, are responsible for these high acre yields.

British Guiana: Rice is second in importance in this country The East Indians took rice from India with its knowledge as well as tradition early in the 18th century Nearly 40 per cent of the population are Hindus and they took great trouble to introduce and develop this industry in this country. A number of strains from India, the smaller-grained *Krishnakatukulu*, short duration *Garikasannavari*, G. E. B. 24 etc., were taken from here and used for hybridisation work to improve the local races which were more prolific. It was found that it was not profitable to manure those rice fields which yield 3,000 lb. of rice and more.

Recently tractor implements weighing 2 tons with 3 disc ploughs were found useful even on wet ground on the big farms which are owned by settlers. This may be of interest to us in this country where large tracts of waste land and plenty of irrigation are available. Seed distribution is one of the most important activities of the Agricultural Department in this country.

U. S. S. R. Not much information from this country is available but it is said it has 4 to 5 laks of acres under rice, concentrated in Turkestan and Transcaucasia. Rice in this country competes with cotton which is irrigated and it has been found that a crop of rice after cotton gave very high yields.

Other Countries: In recent years rice culture is extending in other countries. In Cuba, during the last four years, the area of 130 acres went up to 1·3 lakhs and yielded rice from 2,000 to 4,000 lbs. per acre. The well-distributed rainfall and rich soils are responsible for this.

Ecuador, which was exporting only 11 tons in 1915 has increased it to 230 tons, by 1944. In Costa Rica a similar increase is visible. In this country even on large farms, manual labour is still used.

Rice was introduced in Bulgaria in 1882. In 1934 it became a State affair and the area is being increased by the State providing the best facilities. An interesting feature in this country is the use of hand-pounded rice produced by the wooden country mill 'the Dinki' – (corrupt name from the North Indian 'Denkhi') a long-levered implement worked by legs.

A word about the inter-relationship of the rices grown in the different countries may not be out of place. The varieties grown in all the countries except those of Africa may be grouped into two broad divisions. The *Indica* group, represented by the rices grown in India, South-Eastern China, and Burma, the Philippines, Indo-China. Siam etc., and the *Japonica* group cultivated in Japan, Northern China and Korea and the European and American rices, the rice varieties went to these areas from Japan. A very large amount of sterility results by the crossing of these two groups: *Indica* and *Japonica*. There are the forms which are intermediate between these two groups such as the varieties grown in Turkey, Egypt, Iraq etc.

The African varieties are classed into a separate species – *O.glaberrima*, but it is doubtful whether they are so distinct as to be given the status of a distinct species.

It is seen from the above that in many countries the acre yields are very high and sometimes they are thrice as high as in Madras. There is a complaint from the Press and platform that our yields are very low and the blame is often put on the Agricultural department.

The major cause of this difference is the total climatic and ecological factors that differentiate countries like Spain, Italy and even Japan from India during the rice-growing period. In these countries, rice is more or less a summer crop with copious irrigation and heavy manuring, favourable for good root development and production of a large amount of dry matter. In India, most of the rice is grown in the monsoon months, when not enough sunshine is available and when only large quantities water required for rice are available. The high humidity promotes vegetation at the expense of grain formation. The plant also cannot make full use of the manures as in the subtropical countries. Rice crops grown in the autumn months in Madras (June—October) have also given acreage yields of 4,000 lb, over extensive areas as in the Thambraparni valley, Swarnavari crops in North Arcot, South Arcot and Chingleput and the Kuruvai of Tanjore. Our cultivator is in no way inferior to his counterpart in any part of the world. But he is poor and illiterate and therefore not able to follow recent scientific developments, and hence not able to give adequate attention to his land. There is no incentive to manuring due to so many causes. We have good strains in many of the local varieties suitable to different tracts and have evolved suitable manuring formulas. This does not mean that the present low yields should continue. It is possible to increase the yields by at least 40 to 50 per cent, i.e., we could reach at least the yields of the Chinese rice grower. The following suggestions emerge from a review of the conditions existing in the other countries. There may be nothing new about them but their repetition may be excused, because they are so vital to our country.

(1) *Human element:* The first is the human element. As an economist has put it, "The wealth of a nation lies not in the material resources but in the energy, the initiative and the moral fibre of the

people. Without these attributes no country can become permanently prosperous; with them, no unfavourable circumstances can prove an insuperable obstacle".

The economic condition of the Indian cultivator has to be taken into consideration in any scheme of improvement of the crop without whose active co-operation, schemes for increased rice production no matter how sound they may be, will prove ineffective.

To secure success therefore, his lot may have to be made more attractive through improved education and means must be found to improve his financial stability. There must also be closer contact through extension services of the departments concerned between him and the technical experts, to ensure that the results of research are applied to his problems and to the great masses of people to whom rice is indeed the staff of life.

(2) *Maintenance of soil fertility*: At levels which sustain yields and ensure adequate returns for labour spent, it is estimated that to effect a 20 per cent increase in Indian rice production, over 3 million tons of oil cake, 33 million tons of farmyard manure and compost, 22 million tons of green leaf manure, 8 lakhs tons of ammonium sulphate and 3 million tons of phosphate are required. It will take a good deal of time for us to supply the artificials but certainly it is in us to secure the rest. It is reckoned that the 300 million human souls may produce 1½ million tons of nitrogen sufficient to fertilise 100 million acres. This must be secured through ways which are not repugnant to sentiment and health. All farm wastes must be converted into composts and *applied*. Husks, ash etc., are also useful.

(3) *Improvement of irrigational facilities:* Unlike in some foreign countries where rainfall is received almost throughout the year, in this country it is limited to certain periods of the year and that too is uncertain. Of the two monsoons it has been the experience that the North-East Monsoon is the more fickle and all suitable measures are therefore essential to conserve as much water as possible of the South-West Monsoon by storage and partly by development of all water resources to reduce the dependence of rice on rainfall and occasional droughts. "Rice pays for larger and assured irrigations (i) by larger crops, (ii) by uniformly good crops and (iii) by making two crops a year possible and more safe where one is growing". This will also help the farmer to secure steady employment throughout the year by growing cover and catch crops, providing more grazing for animals.

(4) It should be possible to carry to transform rice-growing from being an occupation and a mode of living into a business proposition for the benefit of the cultivating classes. In this direction, Japan offers us

the best example. Developing small-scale industries from waste products of rice, and other raw materials, introducing suitable small machinery to direct the excess agricultural labour on to the above, have to be taken up.

(5) Greater and closer attention to seed production and distribution methods. Here again Japan should be the model.

(6) Safeguarding production, costs and prices of produce.

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Agricultural College and Research Institute, Coimbatore

LIST OF ADDITIONS TO LIBRARY FOR FEBRUARY, 1951.

1.	...	Report of the Ministry of Agriculture for Canada for the year ending 31st March 1950.
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4.	MASEFIELD (G. B.)	Short History of Agriculture in British Colonies 1950.
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12.	LOWE and COLDIE:	Students hand book to Milk and Milk Products 1948.
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22.	HINE (H. J.)	Tractors on the Farm 1950.
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29.	TROMP (L. A.)	Machinery and equipment of Cane Sugar Factory.
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36.	...	SOCIETY OF CHEMICAL INDUSTRY: Annual Report on the Progress of applied Chemistry. 1949.
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50.	...	FARM IMPLEMENT AND MACHINERY REVIEW: Farm Implement Buyers Guide.
51.	...	MADRAS AGRICULTURAL DEPARTMENT: Report on Marketing of Castor seed in Madras Presidency 1948.
52.	...	INDIAN COUNCIL OF AGRICULTURAL RESEARCH: Report on Salvage of Milch cattle for Bombay City 1950

Weather Review — For January 1951

RAINFALL DATA

Division	Station	Total for the month in inches	Departure from normal in inches	Total since January 1st in inches	Division	Station	Total for the month in inches	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars.	Gopalpur	0·0	—0·3	0·0	Central—*Contd.*	Coimbatore (C. B. S.)*	0·0 tr.	—0·6	0·0
	Calingapatnam	0·0	—0·2	0·0		Coimbatore	0·0 tr.	—0·6	0·0
	Vishakhapatnam	0·0	—0·4	0·0		Tiruchirapalli	0·1	—0·8	0·1
	Anakapalle*	0·0	—0·2	0·0	South.	Nagapattinam	1·4	—1·3	1·4
	Samalkot*	0·0	-0·0 £	0·0		Adduturai*	0·6	—1·4	0·6
	Kakinada	0·1	—0·3	0·1		Pattukottai*	1·2	—0·4	1·2
	Maruteru*	0·0	—0·1	0·0		Madhurai	0·5	—0·3	0·5
	Masulipatnam	0·0	—0·2	0·0		Pamban	3·8	—1·2	3·8
	Guntur*	0·0	—0·0	0·0		Koilpatti*	0·9	—0·1	0·9
	Agrl. College, Bapatla*	0·0	-0·0 £	0·0		Palayamcottai	2·4	—0·7	2·4
	Rentachintala	0·0	-0·0 £	0·0		Ambasamudram*	4·0	—1·1	4·0
Ceded Dists.	Kurnool	0·0	—0·2	0·0	West Coast.	Trivandrum	0·7	—0·1	0·7
	Nandyal*	0·0	—0·0	0·0		Fort Cochin	0·0 tr.	—0·9	0·0
	Hagari*	0·0	—0·1	0·0		Pattambi*	0·0	—0·3	0·0
	Siruguppa*	0·0	—0·0	0·0		Kozhikode	0·0	—0·2	0·0
	Bellary	0·0	—0·1	0·0		Taliparamba*	0·0	—0·1	0·0
	Cuddapah	0·0	—0·4	0·0		Nileshwar*	0·0	—0·3	0·0
	Kodur*	0·0	—0·8	0·0		Pilicode*	0·0	—0·4	0·0
						Mangalore	0·0	—0 3	0·0
						Kankanady*	0·0	—0·3	0·0
Carnatic.	Nellore	0·3	—1·0	0·3	Mysore & Coorg.	Chitaldrug	0·0	—0·3	0·0
	Buchireddipalem*	0·0	—0·3	0·0		Bangalore	0·0	—0·2	0·0
	Madras (Meenambakkam)	0·1	—1·3	0·1		Mysore	0·0	—0·1	0·0
						Mercara	0·1	—0 1	0·1
	Tirurkuppam*	0·0	—2·2	0·0	Hills.	Kodaikanal	1·6	—1·6	1·6
	Palur*	0·6	—2·0	0·6		Coonoor*	2·9	—1·9	2·9
	Tindivanam*	0·1	—1·6	0·1		Ootacamund*	0·4	—1·1	0·4
	Cuddalore	1·0	—1·4	1·0		Nanjanad*	0·6	—0·1	0·6
Central.	Vellore	0·0	—1·5	0·0					
	Gudiyatham*	0·0	—0·7	0·0					
	Salem	0·0 tr.	—0·3	0·0					
	Coimbatore (A. C. R. I.)*	0·0 tr.	—0·6	0·0					

Note:—

(1) * Meteorological Stations of the Madras Agricultural Department.

(2) Average of ten years data is taken as the normal.

(3) @ Average of eight years data for Tirurkuppam and nine years data for Pilicode is given as normal.

(4) Taluk office normal is 0·07″ and rainfall is Nil.

(5) £ Rainfall upto 4 cents.

(6) tr. Traces.

Weather Review for January 1951.

Dry weather prevailed generally over the State except in the extreme South of Tamilnad. Rainfall occurred at a number of stations in Tamilnad on 9—1—1951, owing to the strengthening of the North-east Monsoon over the extreme South of the Peninsula on 8—1—1951. A low pressure wave moved westwards across Ceylon on 11—1—1951 and weakened on 13—1—1951. The North-east Monsoon temporarily strengthened in the extreme South of the Peninsula on 16—1—1951 causing fairly widespread rains in Travancore-Cochin, and local showers in South Tamilnad. Another low pressure wave was moving westwards over the South Bay of Bengal on 22—1—1951 and became unimportant by the next day. Yet another low pressure wave from the Andaman Sea moved over the South-East Bay of Bengal on 26—1—1951 and became feeble and unimportant after two days.

There had been nine western disturbances during the month, passing in succession over Baluchistan and the Punjab.

Night temperatures were below normal in Coastal Andhradesa except during the period 16—1—1951 to 25—1—1951. Ootacamund recorded a minimum temperature of 33°F on 7—1—1951, which was 10°F below normal.

Particulars about the noteworthy falls during the month are furnished below :—

S. No.	Date	Place	Rainfall in inches for past 24 hours.
1.	15—1—1951	Pamban	1·2″
2.	16—1—2951	Palayamcottai	2·1″
3.	16—1—1951	Alleppey	1·5″
4.	16—1—1951	Ambasamudram	2·85″

ZONAL RAINFALL

S. No.	Name of Zone	Zonal Precipitation
1.	Orissa & Circars	Below Normal
2.	Ceded Districts	Below Normal
3.	Carnatic	Below Normal
4.	Central	Below Normal
5.	South	Normal
6.	West Coast	Below Normal
7.	Mysore & Coorg	Below Normal
8.	Hills	Below Normal

Summary of Seasonal Conditions of 1950.

Considering the year 1950 as a whole it may be recorded that rainfall in almost all the districts except Bellary, Nellore, South Kanara and Malabar was much less than the normal. Apart from the quantity of rain received, its distribution was definitely bad in twelve districts, mostly in Tamilnad.

Districts like Cuddapah and Guntur recorded, as usual, very high maximum temperatures in April.

Ootacamund recorded the lowest minimum of 36°F. on 26—11—1950.

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore,
Dated, 16—2—1951.

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

Weather Review — For February 1951

RAINFALL DATA

Division	Station	Total rainfall for the month	Departure from normal in inches	Total since January 1st in inches	Division	Station	Total rainfall the the month	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars.	Gopalpur.	0·0	−0·9	0·0	Central Contd.	Coimbatore	0 0 tr.	−0·4	0·0 tr.
	Calingapatnam	0·0	−0·6	0·0		Tiruchirapalli	0·0	−0·3	0·1
	Visakhapatnam	0 0	−0 9	0·0	South	Nagapattinam	0·0	−0 8	1 4
	Anakapalle*	0 0	−0·5	0·0		Adutuari*	0.0	−0 6	0 6
	Samalkot*	0 0	−0·8	0 0		Pattukottai*	0·0	−0 8	1·2
	Kakinada	0 0	−0·3	0·1		Madhurai	0.0	−0·5	0·5
	Maruteru*	0 0	−0·1	0 0		Pamban	1·2	−0·3	5·0
	Masulipatnam	0 0	−0·5	0 0		Koilpatti*	0 0	−0·1	0 9
	Guntur*	0 0	−0 0 §	0 0		Palayamcottai	0·3	−0·9	2 7
	Agrl. College, Bapatla*	0·0	−0 5	0·0		Ambasamudram*	0 0	−1·8	4 0
	Agrl. Farm Bapatla*	0·0	− §	0 0					
	Rentachintala	0 0	−0 5	0·0	West Coast	Trivandrum	0 0	−0 8	0 7
						Fort Cochin	0 1	−0·7	0 1
Ceded Dists.	Kurnool	0 0	−0·3	0 0		Pattambi*	0·0	−0·5	0 4
	Nandyal*	0 0	−0 2	0 0		Kozhikode	0·4	−0·3	0 0
	Hagari*	0 0	−0 0 §	0·0		Taliparamba*	0 0	−0·1	0·0
	Siruguppa*	0·0	−0·1 (a)	0 0		Nileshwar*	0 0	−0·1	0 0
	Bellary	0 0	−0·2	0 0		Pilicode*	0·0	−0 1 @	0·0
	Cuddapah	0 0	−0·1	0 0		Mangalore	0·0	−0·2	0·0
	Kodur*	0 0	−0·2	0 0		Kankanady*	0·0	−0·1	0 0
Carnatic	Nellore	0 0	−0 2	0 3	Mysore & Coorg	Chitaldrug	0 0	−0·1	0·0
	Buchireddipalem*	0 0	−0·2	0 0		Bangalore	0·0	−0·3	0·0
						Mysore	0·0	−0·2	0 0
	Madras (Meenambakkam)	0 0	−0·4	0 1		Mercara	0 0	−0 2	0 1
	Tirurkuppam*	0 0	−0·6 @	0·0	Hills	Kodaikanal	0·2	1·8	1·8
	Palur*	0·0	−0 4	0·6		Coonoor*	0 1	3·0	3 0
	Tindivanam*	0 0	−0·2	0·1		Ootacamund*	0 0	0 4	0·4
	Cuddalore	0 0	−0 9	1·0		Nanjanad*	0·2	0·7	0·7
Central	Vellore	0 0	−0·3	0·0					
	Gudiyatham*	0 0	−0·2	0 0					
	Salem	0 0 tr	−0 3	0 0 tr.					
	Coimbatore A. M. O.*	0·1	−0 2 ×	0·1					

Note :—

1. *Meteorological stations of the Madras Agricultural Department.
2. Average of ten years' data is taken as normal.
3. @ Average of eight years' data for Tirurkuppam and nine years' data for Pilicode is given as normal.
4. Taluk office normal is (a) O. 28″ and rainfall is nil.
5. § Actual departure from normal is 0·01″.
6. Tr = Rainfall from 0 01″ to 0·04″.
7. × = The normal of Agricultural College and Research Institute is given. The collection of rainfall data was commenced in the new observatory area from 1—2—1951. So the normal figure with reference to the present locality will be available only from 1—3—1960.
8. § Actual departure from normal is −0 03″.
9. § Farm was started only in 1950.

Weather Review for February 1951.

The month began with a very cold weather particularly in Rajasthan, where temperatures below freezing point were recorded at a number of stations.

A well-marked "low" was noted on 5—2—1951 over west Madhya Pradesh and Madhya Bharat. Under its influence widespread thunder-showers occurred in East Uttar Pradesh and Vindhya Pradesh and local thundershowers in West Madhya Pradesh. This became unimportant the next day.

The western disturbance over Baluchistan continued to be marked till 8—2—1951.

Local showers were received in South Tamilnad on 9—2—1951. Again a few showers were received on 11—2—1951 in Tamilnad, Malabar-South Kanara and the hills of the Punjab and of West Uttar Pradesh.

In the rest of the month a number of disturbances were noted and they became feeble the next day. The weather continued to be dry. Night temperatures were appreciably below normal over the entire country. From 24—2—1951 onwards day temperatures tended to be above normal practically throughout the country.

In Madras State weather was practically dry. There is no worth-mentioning rainfall in the State, except perhaps the rainfall of 1·1″ recorded at Pamban on 9—2—1951. Night temperatures were appreciably below normal.

It is to be mentioned that practically all zones in the Madras State received no rains. Very few places like Pamban and Kozikode received very mild showers, the former, to the tune 1·2″.

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore.
Dated, 8—3—1951.

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

Departmental Notifications

GAZETTED SERVICE—POSTINGS AND TRANSFERS

Name of officers	From	To
Sri Achutharama Raju,	Supdtt. College Farm, Bapatla,	Secretary E. Godavari Coconut and Tobacco Market Committee.
,, Bagirathipadi, P.	D. A. O., Anakapalli,	D. A. O., Srikakulam.
,, Hanumantha Rao, C.	Addl. D. A. O., Elluru,	Supdtt. Agricultural College Farm, Bapatla.
,, Kalyanasundaram, N.V.	On leave,	D. A. O. Mathurai.
,, Krishna Rao, D.V.,	Asst. Agrl. Chemist, Coimbatore,	Deputation to U.K. & Palastine for one year.
,, Muhammad Ali, A.M.,	Asst. Marketing Officer, Trichy,	Regional Dy. D. A., Mathurai.
,, Rama Rao, V.	D.A.O., Anantapur,	D.A.O., Anakapalle.
,, Rathnam, G.V.	Addl. D.A.O., Kakinada,	Sugarcane Inspector Vuyyuru
,, Sirinivasa Rao, N.	Teaching Asst. in Agrl. Coimbatore,	Asst. Marketing Officer, Trichy.

Subordinate Service

Name of Officers	From	To
Sri Antony, J.S.C.,	A.D. Kallakurchi,	Seed Development Asst. (Paddy) Sattur.
,, Achuthan Nair, E.,	A.D. Kozhikode,	A. D. Badagara.
,, Asirvadham, N.K.S.,	Cotton Asst., A.R.S., Nandyal,	F.M., A.R.S., Nandyal.
,, Anjanayulu, G. V.,	P.P.A. (Mycology) Guddapah,	P.P.A. (Mycology) Vijayavada.
,, Achanna Sastri M.,	On leave,	A.D. Yellamanchilli.
,, Ananthachari, P.S.,	A.D. Trichy,	Seed Development Asst. Millets, Koilpatti.
,, Abraham, E.V.,	P.P.A. (Entomology) Tanjore,	Asst., in Entomology Tanjore.
,, Balasubramaniam, P.,	A.D. Dhone,	A.D. Kurnool.
,, Butcheswara Rao, A.,	Asst. in Meteorology, A.R.S. Hagari,	Addl. A.D., Hospet.
,, Dinakar Rao, K.,	Paddy Asst. Seed Development Scheme, Mangalore,	Addl. A.D., Kasaragode.
,, Gopalakrishnan,	P. A. to D.A.O. Tinnevelly,	A.D., Tenkasi.
,, Ibrahim Ali, P.,	Asst., A.R.S., Bellary,	A.D. Proddathur.
,, Kameswara Sarma, V.,	Fruit Asst. A.R.S. Anakapalli,	A.A.D., Mannargudi.
,, Jagannatha Rao, V.V.,	P. A. to D.A.O., Anakapalli,	P.A. to D.A.O., Srikakulam.
,, Jayaseelan, D.S,,	Seed Development Asst., Paddy, Sathur,	A.D., Kalakurichi.
,, Kannan Nambiar, P..	Ginger Asst., Pattambi,	A.D., Kozhikode.
,, Krishnamurthi Rao, S.,	P.P.A. (Mycology) Bellary,	P.P.A. (Mycology) Cuddapah
,, Krishnamurthi, P.A,,	A.D., Cuddalore,	A.A.D., Cuddalore.
,, Lakshiminarayana, E.,	Cotton Asst., A.R.S., Hagar,	A. D., Bellary.
,, Muthukrishnan, K.S.,	P.P.A. (Mycology) Guindy,	A.D., Athur.
,, Nalla Gounder,	A.D., Athur,	F.M., C.F., Coimbatore.
,, Naganna, N. Ch.,	P.P.A. (Mycology) Bellary,	Millet Asst., Hagari.
,, Narasimha Rao, R.,	Asst. in cotton Narasaraopet,	Asst., Tuber crop Scheme, Bapatla.

Name of Officers	From	To
Sri Nargunam, W.R.,	A.D., Devakottai,	Special A.D., Tirumangalam.
,, Nanjappa Maniyakar, V.,	on leave,	Fruit Asst., Mettupalayam.
,, Narasimha Rao, G.,	on leave,	A.D., Ramachandrapuram.
,, Nambiar, P.K.,	A.D., Cannanore,	A.M., A.R.S., Taliparamba.
,, Pappa Rao, P.,	A.D., Yellamanchilli,	A.A.D., Yellamanchilli.
,, Radhakrishna Menon K.,	A.A.D., Pattambi,	A.D., Cannanore.
,, Ramanathan, G.,	A.D., Udamalpet,	P.P.A. (Entomology) Tanjore
,, Rebello, N.S.P.,	A.A.D., Kasaragode,	Paddy Asst., Seed Development Scheme, Managalore.
,, Radhakrishnan, K. S.,	Addl. A.D., Hospet,	Asst. Meteorology, A.R.S., Hagari.
,, Rajagopalan, D.S.,	Special A.D., Cotton Scheme, Koilpatti,	Cotton Asst., A.R.S., Koilpatti.
,, Raghava Panicker, A.,	A. D., Mannantody,	F.M., Wynad Colonization Scheme.
,, Raghava Rao, N.,	on leave	Asst., in Entomology, Coimbatore.
,, Satyanarayana, K.,	A.D., Kandukur,	A.D., Pulivendla.
,, Sankarasubramaniam, T.K.,	P.A. to D.A.O., Ramnad,	Fruit Asst., Metupalayam.
,, Suryanarayanamurthi, C.V.,	A.D., Proddathur,	A.D., Masulipatam.
,, Syed Mahboob Ali,	F.M., A.R.S., Nandyal,	Cotton Asst., Nandyal.
,, Sivagnanam, L.,	Cotton Asst., A.R.S. Koilpatti,	Cotton Scheme, Koilpatti.
,, Subbayya, J.,	Asst. in Entomology,	P.P.A. (Mycology) Bellary.
,, Subramaniam, T.V.	on leave,	P.P.A. (Mycology) Guindy.
,, Srinivasa Rao,	on leave,	Asst. in chillies, A.R.S, Lam Guntur.
,, Sridhara Sastri, J.,		A.D., Dhone.
,, Sankaram, A.,	on leave	Asst., in Chemistry, Bapatla.
,, Seshagiri Rao, T.	Teaching Asst. in Chemistry Agrl. College, Bapatla.	Asst. in Chemistry, Coimbatore.
,, Srinivasan, K.,	A.D., Gingee,	A.D., Cuddalore.
,, Somayajulu, P.,	P.A. to D.A.O. Srikakulam,	P. A. to D.A.O. Anakapalle.
,, Srinivasan, V.	Seed Development Asst. in Millet, Koilpatti,	A.D., Paramakudi.
,, Subbiah Pillai, R.,	Special A.D., Tirumangalam,	A.D., Devakottai.
,, Venkatakrishnan, C.,	P.A. to D.A.O., Ramnad,	P.A. to D.A.O. Tinnevelly.
,, Vasudeva Rao, S.,	Cotton Asst. Narasaraopet,	A.D., Repalli.

The following postings and transfers of the Special Agricultural Demonstrators working in the scheme of districution of manures in the East and West Godavari districts are ordered :—

East Godavari :	Post to which transfered :
Sri Chintamani, P. O.	A. D. Tuni.
,, Dakshinamurthy, V.	A. A. D. Razole.
,, Rajarathnam, J.	A. D. Badhrachalem.
,, Sithapathi Rao, S.	A. D. Ramachandrapuram.
,, Venkatachalem, C.	A. D. Rajahmundry.

West Godavari:	Post to which transferred:
Sri Appa Rao, K.	A. D. Marakapur.
,, Appa Rao, V.	A. D. Manjeri.
,, Appa Rao, S.	A. D. Yeleswaram.
,, Annaswami Ayyar, A. K.	Teaching Asst. in Agriculture, Coimbatore.
,, George Vasanta Rao, M.	Ginger Asst. A. R. S., Pattambi.
,, Narasimha Rao, G.	A. D. Amalapuram.
,, Mallkarjuna Rao, Y.	A. D. Udumalpet.
,, Patnaick, V. J.	A. D. Tiruchirapalli.
,, Pappiah, B. P.	A. A. D. Chintalapudi.
,, Ramachandran, S. V.	Special A. D. Cotton Scheme, Srivilliputhur.
,, Rama Rao, B. V.	A. D. Manantody.
,, Srinivasa Rao, M.	Teaching Asst. in Agrl. Bapatla.
,, Sithapati Rao, S.	F. M., A. R. S., Nanjanad.
,, Surya Rao, N. V.	A. D. Gudalur.
,, Venkateswara Rao, S.	A. D. Nugur.
,, Venkateswara Rao, M.	A. D. Cannanore.

NEW B.Sc. (Ag.) AGRICULTURAL APPOINTMENTS

Agricultural Section.

K. Sudhakara Rao, A. D., Siruguppa, B. Kamojee, A.D., Proddatur, M. Venkateswara Rao, A. D., Chintalapudi. G. R. Raghavalu, A. D., Podili. Paul William, Spl. A.D., Sugarcane, Udumalpet. M. George Vasantha Rao, Spl., A. D., Manures, Eluru. I. Gnanavaram, P. P. Asst., Entomology, Pattukottai. John Knight, A.D., Wandiwash. J. Balraj Joseph, A. D., Tiruvannamalai, M- V Jeyaraj, A.D., Palani. C.I. Chacko, A.D., Alatur. L. S. Jeyaseelan, A.A.D , Srivilliputhur. J.F. George, A.A.D., Polur. M. Sundara Singh, Soil Conservation Assistant, Bellary. P. K Philip, Journal Assistant, (Malayalam) Madras. V. J. Patnaick. A. D., Bhadrachalam, P. F. George, A.D., Uthamapalyam. M.K.S. Asirvadham, F.M., A R.S., Nandyal. A. Jagannadham, A.D., Tekkali. B. K. Rama Rao, Spl.' A. D. Firka Development Scheme. Kumbla. K. Perumal, P. P. Asst. Entomology, Madhurai. N. Pinagapany, P.P. Asst., Entomology, Cuddalore. M. Malakondiah, A.A.D., Kovur. I. Balasundram, A. D., Dharmapuri. C. Krishnamoorthy, A.D., Chingleput. G. Mutharasan, A.D., Kodavasal, B. Krishnamurthy. A.D., Gooty, H.S.M. Chandrabasaiah, A. D., Rajampet, R. Jayaraja, P. P. Asst., Entomology. Tanjore. C. Lakshmiah, A.D , Banganapalli. E. N. Varadarajan, A. D., Tirupattur. T. M. Vittal, A.D., Villipuram. S. Subramanyam. F.M., Central Farm, Coimbatore. B. Solaiyappan, Spl. A. D., Sugarcane, Vellore. R. Alagariswamy, A.D. undergoing training in Agrl. Engineering, Coimbatore. V. G. Venkataswami, A.D., Tadpatri. B. Vasudeva Singh, P. P. Asst., Entomology, Vellore. A. Venkata Rao, A. A. D., Nellore. K. K. Ananthanarayanan, A. D., Cotton Scheme, Sulur. L. B. Vamsavardhanam, A.A.D., Avanigadda. R- Narasimha Rao, Spl. A.D., Tuber Crop Scheme, Bapatla. A. Yeswanath, F. M., A.R.S , Nileswar. L. Ramachandran, A.D., Madakasira. G. Selvarangaraju, Seed Development Asst. Millet, Udumalpet, N. Natarajaratnam, A.D., Gingee. A.S. Perumal, A.D., Mayuram. B. Venkataraman, A. D., Vilathikulam. A. Venkataraman, A.A.D., Nilakottai, V. Veeraraghavan, A.A.D., Kancheepuram. S. S. Parthasarathy, A.A.D., Kumbakonam. M. Sankaraiah, A.D., Dindigul. L. Sivagnanam, Spl. A.D.K. 2. Cotton Scheme Koilpatti- K. Satyanarayana Rao. A.D., Kandukur. K. Satyanarayana, A.D., Chirala. G. Purushothaman, A.A.D., Chidambaram. B. C. Narasimha Reddy, A.D.. Badvel. Y. Sadhashiva Shetty, A.D., Coondapur. S. Siva Reddy, A.A.D.,

Chilanathur, M. M. Sankaran Kutty, F. M., A.R.S., Pattambi. G. Rajagopalan, Upper Subordinate, Cardamom Scheme Kalladaikurichi. T. Ramachandra Rao, A.D., Hindupur. K. Radhakrishna Alwa, F. M., A.R.S., Nanjanad. S. Kasiviswanathan, A.A.D., Chingleput. N. Yuvaraj, A. A. D., Guidyattam. T. V. Janardana Rao, F.M., A.R.S., Siruguppa. G. Satyanarayana Raju, A.A.D., Tiudivanam. K. K. Kanakaprasada Rao, F. M., Sugarcane Research Station, Anakapalli. A. Butcheswara Rao, (Age exempted by Govt.,) Spl. A.D., Manures, Razole. E. G. S. Shanmukham, A.D., Kudligi. V. Muthiah, A. D., Koilpatti. N. Raghava Rao, A.A.D., Kurnool. P. Suryanarayan, A.D., Rayachoti. K. Radhakrishna Menon, A.A.D., Pattambi. K. Jagannathan, Spl. A. D., Cotton Scheme, Tirupur. S. V. Pandurangan, Loan of services to the Thirukattupalli High School, Tanjore Dt. from date of commencement of probation under correspondence with Government. S. Vasudeva Rao, A.A.D., Repalle. I Muthuswamy, A.D., Nannilam. K. Raghu Shetty, A.A.D., Udipi. P. Bharathan, A.A.D., Namakkal, S. Vinayagam, A.D., Chengam, T. K. Thanickachalam, A.A.D., Vellore. C. Narayanan, F.M., Wynaad. A.R. Bhaskaran, A.A.D., Tiruvellore. E. L. Narayana, (Age exempted by Govt.) A.D., Bellary. N. Subramanian, A.D., Sivaganga. P.K. Vijayan, F.M., Taliparamba. C. Shanmugam, A.D. Tenkasi. A.P. Vijayaragavan, A.A.D., Cannanoor. V.Parthasarathy Reddy. Spl. A.D., Sugarcane, Chittoor. K. Sethumadhava Menon, A. A. D., Chowghat, Ponnani. V. Satyanarayana Raju, A.A.D., Atmakur. M. Nageswara Rao, (Under suspension from 17—10—50 AN) Ranking shown here is subject to orders that may be passed on the disciplinary case pending against him.) R. Krishna Rao, A:A.D., Pathapatnam. D. Sitaramaiah, A. D., Kanigiri. B. Ranga Reddy, A.A.D., Tenali. M. Satyanarayanamoorthy, A.A.D, Peddapuram. G. Sadasiva Reddy, A. D., Sidhout. K. Radhakrishnamurthy, F. M., A. R. S., Samalkot. M. Chokalingam, A.D., undergoing training in Agricultural Engineering at Coimbatore. A. Venkateswara Rao, A.A.D., Bhimavaram G. Karuppannan, A.D., Avanashi. I. Veerareddy. A.D., Vinukonda. T. Madhava Rao, A.A.D,. Gudivada. M. Hanumantha Rao, A. A. D, Ongole. B. Dharma Rao, A, A. D., Samalkot. P, S. Purushothaman, Spl. A.D, Co4 Cotton Scheme, Srivilliputhur. K. Raghava Panikkar, F.M., Wynaad. S. Sivasankaran, A.A.D., Musiri. G.R. Koteswara Rao, O.D., Koilkuntala. S. C. Nalla Gounder, Farm Manager, Central Farm, Coimbatore. C. Ramanujam, A.D., Tiruppattur. K. Lingannan, A.D., on other duty as Agricultural Engineering Supervisor, Vellore. R. Vaidyanathan, F.M., A. R. S., Palur. Y. Suryanarayanan, A.D., Udayagiri, R. Rama Doss, A D., Tiruvarur. Y. Mallikarjuna Rao, Spl. A,D. Manures, Tanuku. G. R. Prabhuswamy, A. D., Kollegal. C.D, Vedachalam, A.D., Harur. S. Venkataswami, A. D., Arupukottai. S. Chandrasekaran, A.D., Ponneri. V. Gopalakrishnan, A.D., Arni. K. V. Raghava Rao, A.A.D., Nandigama. P. Kunhan Raja, F.M., Wynaad. M.V. Surya Rao. Spl. A.D., Manures, Bhimavaram. N. Subramanian, A. D., Mettupalayam. K. Sivaramakrishniah, A.A.D,, Wallajah. R. Doraiswami, A.D., Pollachi. K. V. Gopalakrishnan A.D., Darsi. T. Narayana Kutty Nair, A.A.D., Manjeri. A. Jayaraman, A.A.D., Srikakulam. S. Balagurunathan, A.D., Atmakur. G. Ravendra Rao, A.D, Repalli. S. Sitapathi Rao, A.D., Venkatapuram. P. V. Ranga Reddy, A.A.D., Sulurpet. K. K. Koteswara Rao, A.D., Alur. I. Rajaratnam, Spl. Ag. Amalapuram. C. Varada Reddy, A.A.D., Chittoor, S. Rangaswami Reddiar, A. D., Srivilliputhur. K. Nagabhushanam, F.M., A.R.S. Siruguppa. V.G. Palaniandy, F. M., Palur, S. Balasubramaniam, A.D., Tiruchendur. R. Subramanya Shetty. A. A. D., Erode. P. Chandrasekharan, Seed Development Asst. (Paddy cum Millet,) Palghat,

Paddy Section.

N.S.P. Rebello, Paddy cum Millet. Asst. Seed Development Scheme Mangalore S. J. Mathias, Paddy Asst., Paddy Section, Mangalore. N. Venkataraghavaralu, Paddy Asst. Seed Development Scheme, Kakinada. K. Srinivasalu, Paddy Asst. A.R.S., Tirurkuppam, T. Kalyani, Paddy Asst. A.R.S., Pattambi. K.R. Ramswamy Paddy Asst., Meteorological Section Coimbatore, Ch. Hanumantha Rao, Paddy Asst. Rice Station, Buchireddipalem. C. Bhaskara Rao, Paddy Asst. A.R.S., Maruteru.

Cotton Section

Sargunam Davis Peter, Cotton Asst., Coimbatore. K.I. James, Cotton Asst. Coimbatore. C. Sanyasi Rao, Cotton Asst,, Hagari. B. Venkatachari, Cotton Asst. Hagari. M. Rama Rao, Cotton Asst. A.R.S., Nandyal. V. Sethuraman, Cotton Asst. A.R.S. Palur. K. Ramachandran, Cotton Asst. Coimbatore. V. D. Guruswami Raju, Cotton Asst., Kovilpatti, R.S. Annappan, Cotton Asst., Srivilliputhur.

M. Dharma Rao, Cotton Asst., Siruguppa. S. Iyemperumal, Cotton Asst. Koilpatti. P. V. Marappan, Cotton Asst, Coimbatore. P.S. Chandramathi, Cotton Asst., Coimbatore. H. Bhoominathan, Cotton Asst., Srivilliputhur.

Millet Section

G. P. Prasada Rao, Millet Asst., Narasapatam. K. Mahudeswaran, Millet Asst., Coimbatore. V. Durai Raj, Millet Asst. Coimbatore. C. Sree Ramulu, Millet Asst. Nandyal. M. Sivaramakrishniah, Millet Asst. Guntur.

Oil Seeds Section

N. Gopalan, Oil Seeds Asst. Tindivanam. V. Subbiah, Oil Seeds Asst., Tindivanam, C. Ramakrishnan Nambiar, Oil Seeds Asst., Nileshwar.

Pulses Section

C. K, Rajagopalan, Pulses Asst. Coimbatore.

Botany Section

V. Ramakrishnan, Botany Asst, Coimbatore.

Sugarcane Section

G. Pushpaveni, Sugarcane Asst. Anakapalli. C. Prabakara Rao, Sugarcane Asst. Sugarcane Development Scheme, Hospet.

Chemistry Section

R. Thyagarajan, Chemistry Asst. Coimbatore, K. Shivaram Shetty, Chemistry Asst. Coimbatore. M. Damodara Nambiar. Chemistry Asst., Coimbatore. N.M. Thyagarajan, Chemistry Asst., Coimbatore. T. Radhakrishnan, Chemistry Asst,, Coimbatore. A. N. Ramaswami, Chemistry Asst., Coimbatore. D. Anji Reddy, Chemistry Asst., Sugarcane Scheme, Anakapalli. C. Dharma Rao, Chemistry Asst., Coimbatore.

Entomology Section

K. Raman, (Declined appointment – Name removed in M. P. S. C. No. 7875.GL/50. dated 29—1—1951. K. V. Sekharan, Entomology Asst., Coimbatore. K. Lakshminarayana, Entomology appointment, M.P.S.C., addressed for removal of name.)

Mycology Section

B. Gopalaraju, Mycology Asst., Coimbatore. K. M. Vijayan, Mycology Asst. Coimbatore. T. C. Venkata Reddy, Mycology Asst., Coimbatore. P. Appalanarasayya, Mycology Asst., Sugarcane Scheme, Anakapalli. J. Subbayya, Mycology Asst. P. P. Scheme, Bellary. C. Appavu Naidu, Mycology Asst. Ootacamund.

Physiology

S. Lakshmanan, Physiology Asst., Coimbatore. K.P. Leela Menon, Lady Demonstrator, Fruit Products Development Scheme, Madras, without prejudice to her selection as Assistant in Physiology ; Concurrence of Commission applied for.

Cytogenetic Section

P. Chandrasekaran, Cytogenetics Assistant, Coimbatore.