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Report on the work of the Imperial Council of Agricultural Research in applying Science to Crop Production in India.

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SUMMARY AND RECOMMENDATIONS

The Imperial Council of Agricultural Research has admirably discharged its primary duty of co-ordinating and promoting agricultural research in India, at any rate in regard to crop production, with which alone this report is concerned. The Council has been able to arrange that all the factors affecting the production of each of the more important crops should be studied by one group of workers; the results can now be brought together and put into a form in which they can be used by the agricultural officers. A vast amount of pioneering work extending over a wide range has been accomplished.

A stage is now reached where a reorientation of the Council's activities should be considered.

It may be laid down as a broad principle that the investigations fostered by the Council should be for the express purpose of improving agriculture, the great need now is for fuller use of existing knowledge, rather than the accumulation of more knowledge, for work on the cultivators' fields rather than in the laboratory.

The Council's programme should, in my view, be lightened by handing over to the Universities all investigations of a scientific or non-technical nature and setting aside a certain fraction of the grant for this purpose. The grants made by the Council to Universities should be primarily for the purpose of fostering research in subjects allied or basic to agricultural science and practice and for training graduates in research methods, but the investigations should not be required to have an agricultural bearing. So far as research is concerned, it is the teacher and not the subject that counts, and the Council should be empowered to make grants to University Departments where good work is being done so as to provide one or more additional assistants who could subsequently, if needed, be attracted into the agricultural service.

Much of the research in agricultural science done in India is not as widely known as it deserves to be and I recommend the preparation of a series of monographs by competent persons setting forth the results obtained by Indian workers and pointing out how they differ from those obtained elsewhere.

Agriculture in India is not merely an industry but the mode of life of a large part of the population. The scope of the Council's work must therefore be much wider than if the subject were purely a branch of technology.

It is not sufficient for the results of the research work simply to be published in the Council Journal : the Council should have powers to undertake the much more difficult task of arranging for them to be put into practice. The Council should also act as a Development Commission, stimulating extension work by the Departments and commercial exploitation of useful discoveries. This would involve additional staff to take over various duties so as to leave the senior staff free to plan ahead and to think out the problems involved. This extension of the Council's activities would involve additional expenditure necessitating an increase in its grants.

On the other hand Provincial Departments should contribute substantially to investigations made at their Stations on subjects of importance to them.

By far the largest part of the land of India is used for producing food crops intended for home consumption. Investigations on these crops should be made in conjunction with the human nutrition experts who should advise how far existing dietaries are deficient and what supplementary crops, vegetables, fruits etc., should be grown in order to make up the deficiencies in the various regions. The Council's investigations should be directed to increasing the output per acre of foodcrops with a view both of ensuring full supplies and of liberating land for the growth of the supplementary crops and of fodder crops for the production of milk.

This increased productiveness is the main problem to which all others should be subordinated.

Investigations on quality of food crops should be made only at the request and under the close supervision of the nutrition experts except where specific marketing problems arise.

Certain problems relating to various crops should receive early attention.

Wheat:—In view of the fact that the export trade has fallen considerably and the home consumption increased, a decision should be reached as to the future policy. If the recapture of the export trade is proposed then vigorous steps must be taken to increase largely the area under those varieties acceptable to the modern English

market. If, on the other hand, the home market is to be the chief consideration then the varieties should be tasted for their suitability to the local mills and the making of *chapatis*, actual cooking tests being used.

Barley—Recent developments in the United States suggest that Californian 6-rowed barley may not be available on the English market in such large quantities as hitherto, and this may create a good opening for Indian barleys. The varieties placed high on the list by the Institute of Brewing should be grown on a sufficiently large scale to ensure adequate supplies for the development of a permanent export trade. The export of cheap barley, however, should not be encouraged owing to its high content of protein which has considerable value in India.

Vegetables: Every effort should be made to extend the cultivation of potatoes and other vegetables, particularly of the more hardy kinds, the list to be drawn up in conjunction with the nutrition experts.

Fruit. The hill regions offer considerable scope for the ordinary English and Mediterranean fruits, and the plains and the Peninsular for tropical and subtropical fruits—mangoes, citrus, bananas and others. The cultivation of fruit should be extended where possible and distinction could be made both in experimental work and in action between production for the village and production for the market. Much confusion in regard to varieties needs straightening out; methods of propagation have to be developed, and above all supplies of young trees true to type must be worked up for distribution.

Along with fruit growing for the market go various subsidiary industries, especially fruit preservation and the making of containers, besides minor activities such as bee keeping and poultry keeping, both of which go well with fruit growing.

Transport is however, a usual limiting factor and this should be improved wherever possible.

Grass and Fodder Crops; 1. *Grass.* The reports on nutrition lay great stress on the need for augmenting the milk supply and this resolves itself finally into an increase in the amount of grass and fodder crops available. Some 10 per cent of the livestock population have to depend on forest grazings. Various difficult problems of administration, soil erosion and deterioration of herbage are involved, and I recommend that the Council call for a report by a forester, an animal husbandry expert, and a soil expert making recommendations for improving and developing these grazings and that the council should urge upon the proper authorities the need for taking active steps to carry out these recommendations.

The other grazings, which provide for some 90 per cent. of the stock, should form the subject of a second report on which action

should be taken. They include a very wide range varying from fairly good grassland down to virtual waste land. Improvement may be possible by reseeding, selecting for this purpose varieties and strains of indigenous grasses, and introducing drought resistant varieties from Africa such as the Woolly Finger grasses, *Digitaria seriata* and *D. Pentzii*. More experiments on management are also needed : on rotational grazing, the effect of period of the year and of manuring : these all require that the land should be enclosed. Experimental work on this subject should as far as possible be done on actual grazing land.

2. *Fodder Crops*. Where water is available fodder crops can be grown and they not only provide food for the animals but indirectly increase soil fertility. Berseem is particularly useful and steps should be taken to increase the seed supply : the North-west Frontier Province appears to be a suitable source. Napier grass has done well and other fodder crops deserve investigation. The possiblity of silage making should be further examined. The more intimate fusion of agriculture and livestock husbandry is one of the most hopeful ways of improving Indian agriculture.

The improvement of farm implements, and particularly of the bullock cart would reduce the need for the present large animal population and so enable the remaining animals to be better fed.

Cash Crops. The investigations on cash crops should be done in close association with expert users and buyers of the crops. Good example of close co-ordination are afforded by the Tea Research Institute, Tocklai, and the Cotton Research Laboratory, Matunga. Malting barley is also adequately dealt with. On the other hand the arrangements for wheat and rice are less satisfactory ; in neither case is the purpose of the work sufficiently definite. It is necessary to decide on the market for which the experimenters are to cater, and then to associate competent market representatives with the enquiry.

The investigations on sugarcane are on sound lines : most of this crop is used for making gur in the villages, and the experiments on the improvement of the mills and evaporating plant (including the furnace) should be pushed forward with the aid of competent engineers. Experiments on factory technique are carried out at the Harcourt-Butler Technological Institute, Cawnpore.

Broadly speaking it seems undesirable for the Council to undertake technological investigations and the new Sugar Committe could quite properly carry on this work.

Some way should be found out of the present difficulty of putting into factory practice the results obtained in the various technological investigations at the Sugar Research Institute, at Dehra Dun on forest products, and elsewhere. The difficulty in India is not so much to discover or to invent, as to exploit.

Other Crops. The possibility of extending cultivation of cinchona and insecticidal plants should be discussed with the scientific officers of the tea and coffee plantations, especially as the former are limiting their areas under tea as a result of trade agreements.

Methods of increasing the output from the land. 1. *Improved varieties.* The finding of new varieties by selection and breeding is in general very well done: it is indeed some of the best agricultural work in India. It is necessarily localised because the varieties best suited to one place may not be best suited to another: and it is continuing work because no selection can ever be final. It has now in the main passed beyond the research stage and become essentially a combination of routine operations more suited to the Provincial Departments than to the Council. Nevertheless the Council will always have an important part to play. It is the only body with full knowledge of all the material available for work on breeding or selection of crops; and it is in a position to arrange for exchange of material and to decide what work in a provincial Department should continue to be carried on if some financial stringency threatened to endanger a useful investigation.

More work is needed on the millets, the pulses, and the oil seeds.

The work would be put on to a less mechanical and more definitely scientific basis if it could be associated with a first class geneticist, good enough to command the respect of the men now engaged in the work, and to be accepted by them as a leader. Unfortunately no man of this type is at present in sight.

Improved varieties have not been widely taken up, except of sugarcane and jute partly because of the difficulty of obtaining seed. I recommend that the Council enquire into the methods of distribution adopted in the various Provinces and States, and consider the desirability of finding means for speeding it up.

2. *Better control of pests and diseases.* In general each of the more important groups of crops should have its own staff of entomologists and plant pathologists: cotton, sugarcane, the food crops, each presents special features and no one man is likely to succeed with all. Surveys should be made to ascertain which pests are increasing and which are decreasing and to collect material for ascertaining the effect of conditions on the intensity of attack. When these are known it becomes possible to see how far changes in conditions or methods will obviate the attack. Direct control by chemical means is sometimes the only possible method, and the work on vegetable insecticides should be continued with some modification of programme. Biological control presents various difficulties, but should be studied.

In view of the importance of insect pests in India, and the need for finding means of control, I recommend that a visiting expert of

high standing be called in to advise as to the most suitable types of measures to be taken.

The search for resistant varieties must always continue, it is more useful for fungus diseases than for insect pests and in any case it is not final: so called "resistance" often means only that another variety growing close by is preferred; and even actual resistance may break down.

It is very important, however that some central authority should have power to deal administratively with plant diseases and pests for the whole of India. With increased speed of transport it is almost impossible to keep out disease organisms from other countries but it is far easier to deal with an invader at an early stage than to wait until it has spread into every Province.

The Council, however should not be concerned with the executive control of diseases and pests: its duties should be to arrange for research and advice into the most suitable means of dealing with them.

3. *Improvement of the water supply for crops.* This is one of the most important of all agricultural problems in India and perhaps the most difficult. It is too big to form part of a programme, and I recommend the establishment of a Central Irrigation Station for all-India where the agricultural problems can be worked out. At this station the relations of soils, water and growing crops would be studied, also the interaction between salt water and soil, the reclamation of salted and alkaline land, the movements of subsoil water, and the agricultural effects of various sequences of crops.

Provision should also be made for more complete co-ordination of the investigations on dry farming and for linking it up with the work of the proposed Irrigation Research Station.

4. *The Conservating of Soil Fertility.* (a) *The prevention of erosion.* While further research on soil erosion should continue, the chief need now is for action rather than for more research. Protection against erosion should be State responsibility and each erosion area should be dealt with as a whole. An Erosion Conference should be held annually at which forestry, animal husbandry and soil experts meet the agricultural officers and advise as to what measures should be taken; the appropriate Minister should then have power to carry out these measures and to distribute the cost over the lands protected.

(b) *Manuring.* More systematic schemes of manurial trails are necessary in order to test the relative values of nitrogen in artificial ferilizers, farm yard manure and composts, and the values of phosphate and potash. Simplified schemes should be carried out on cultivators' ground so as to discover what new factors, if any, come

into play there and to find also how far the stations results hold generally.

Green manuring should be more systematically studied.

A report on the manurial trials fostered by the Council should be drawn up by the Statistician, with recommendations for a more systematic treatment. If they can be obtained, the results of the extensive trials carried out recently by the large fertilizer organisations (Imperial Chemical Industries : the Potash Syndicate) should be included in the survey.

Next to an improved water supply an increased supply of farmyard manure should probably do more than anything else to augment the output from the land. Additional supplies of fodder crops would add to the amount of farmyard manure, but the surest way of doing this is to reduce the necessity for burning it by providing alternative sources of fuel. The Forest Department should be consulted as to suitable ways of planting tree belts that could provide shelter, fodder and fuel, and protection against erosion and dust storms.

The Special Difficulties of Indian Agriculture. One of the most serious defects of Indian village life is the absence of an educated middle class actually engaged in farming. Students from Agricultural colleges, who might be expected to form this class, do not take to farming, but strong efforts should be made to induce them to do so. The experiment of establishing Colony villages in the canal areas of the United Provinces seems to offer one method of solving the problem. Generally speaking specialised farming such as cotton growing, fruit farming, seed production, etc., afford better prospects for a trained man than ordinary farming.

The Co-operative movement can hardly be expected to achieve as good results as in Denmark owing to the wide difference in conditions. The experience of Bombay and the Punjab is, however, that something can be achieved if there is firm guidance from outside, and probably suitable modifications in this direction can be devised.

The consolidation of scattered and fragmented holdings is so important that officers found to be successful in arranging it should be encouraged to remain at the work and should not be under the necessity of seeking advancement in other directions.

Owing to the importance of fruit and vegetable growing in the villages, and the desirability of planting more trees, school teachers should be encouraged to take up gardening and to undertake some of this planting with the children. Where possible, a school garden should be established.

The insufficiency of subsidiary industries is a well recognised weakness of Indian village life : the cultivator has long slack periods during which, if he had the opportunity, he might be increasing his

income. An expansion of the cropping scheme should be arranged to utilise some of this time. Poultry keeping offers some possibility of success over a wide area as shown by the results of Mr. A. E. Slater in the United Provinces and of Dr. Hatch at Martandam in Travancore ; beekeeping is possible in the hill regions. The ideal occupation would be cottage industries but apart from weaving and a few localised industries, these are hampered by the very difficult problems of marketing.

Bridging the Gap between the Experiment Station and the Cultivator. By far the most important and most difficult task before the agricultural officers in India is to bridge the great gulf separating the agricultural experiment stations and the few large scale farmers from the peasants who cultivate by far the largest proportion of the land. It is not new science so much as fuller use of existing science that is needed, and the Council should order an enquiry to discover how best this could be done and to urge upon the proper authorities the need for taking all steps possible to this end. The extension officer should be recognised as a very important member of the staff and really competent men should be encouraged to continue at the work and be under no necessity to seek promotion out of it. The possibilities of broadcasting should be tested and means should be devised for the rapid answering of enquiries that have come in as a result of the talks. It should be impressed upon the staffs at the experiment Stations that they have a responsibility to the cultivator ; that they must not shelter themselves within the walls of the laboratory in the hope that somehow their work may find practical application; they must make the field and the crop their centres, and as early as possible set out experiments on cultivators' land so as to widen the scope of their enquiry.

Demonstrations should be made by means of holdings taken as a whole in addition to those on individual plots, and the staffs of the experiment stations should be expected to carry out simplified forms of their experiments on cultivators' land unless there was good reason to the contrary.

The Imperial Agricultural Research Institute, Delhi. The Institute both because of its tradition and in virtue of its equipment should take a leading part in agricultural research in India. It can best accomplish this by working in close collaboration with the Imperial Council of Agricultural Research which, as the actual agent for the co-ordination of agricultural research in India, should be in a position to require the inclusion of specified items in its programme of work. Among other important subjects which could be handed over to the Institute are the devising of statistically sound methods of sampling soils and crops for approximate and accurate investigations

respectively ; the collection and collation of the results of the numerous local soil surveys that have been made ; surveys of insect and fungus pests and of physiological and other diseases. In carrying out its own programme the Institute should carefully avoid the common faults of keeping the work too much in the laboratory ; it should centre its investigations on the field and it should study a few problems thoroughly rather than a larger number superficially.

The Staff. Suggestions are made in regard to training and qualifications of staff, and the difficulty of finding good leaders is emphasised. Good officers who excel in either research, extension work, or in persuading cultivators to consolidate their holdings, should be kept at their work and should not be compelled to seek promotion outside of the sphere in which they have proved their capacity for success. Although the Council's schemes are by their nature temporary the research staff should after a probationary period be given certain advantages of permanence ; in particular a provident fund scheme should be set up for them, a register of competent workers should be maintained so as to help the men to find other posts, and a permanent cadre of selected workers of proved merit should be formed for the purposes of carrying out investigations wherever this might be necessary.

The Improvement of the Village. The efforts to improve agriculture are likely to be unavailing unless the villages are improved and made fit for good cultivators to live in. This work has a deep personal side and could never be accomplished without enthusiasm and the missionary spirit ; but it needs a solid foundation of accurately determined knowledge, and careful impartial consideration of the probable effects of proposed measures. The Council could probably better than any other body arrange for this to be done by organising surveys or other enquiries.

It should also arrange for a Report on methods of effecting consolidation of holdings and of cropping, and consider what steps could be taken to hasten these changes.

General Recommendations. (The detailed recommendations relating to the research schemes are given under each section).

1. The success of the Council's efforts shows that its general organisation and research programme are both sound and that it is a very effective agent for the improvement of Indian Agriculture. My proposals are for an extension of its activities but always with the same purpose ; increased production from the soil of India.

2. An organised research scheme implies a definite plan for agricultural improvement and means of ensuring that the results of the research work are put into practice. I recommend therefore that the powers of the Council be widened to comprise developmental activities as well as research activities.

3. The work on crops sold in the open market (cash crops) should be done in association with the expert buyers or users of the crop. As a crop becomes of sufficient importance it should have its own committee and specialist staff as now happens for cotton and jute and will soon be the case for sugar.

4. The work on crops mainly retained for food (food crops) should be done in association with the nutrition experts, who should advise as to the most suitable means of making up deficiencies in diet. The Council on its Developmental side should arrange for the recommendations to be put into practicable form. A survey showing broadly the quantities of food produced in the various provinces should be made so as to provide a basis for joint action by agriculturists and nutrition experts in improving the schemes of food production in the villages. The newly appointed laison officer between the Agricultural and the Health (nutritional) departments could be of a material assistance in this work.

Fodder and grazing committee should be set up for each Province so as to examine the possibility of increasing the food supply for animals.

5. Part of the Council's funds should be used for promoting scientific research at the Universities on subjects basic to the science and practice of Agriculture. This financial aid however should be essentially personal, it should be given only to enable an investigator of proved capacity to develop further his own main line of research. No question of possible practical value should be raised; in training for research it is the man and not the subject that matters.

6. On its developmental side the Council should have resources:-

(1) to put into practical form the dietetic recommendations of the nutrition experts;

(2) to stimulate activities directed to the bridging of the gap between the experiment station and the cultivator;

(3) to plan extensions of dairy husbandry, fruit and vegetable growing, poultry keeping and other specialised branches of agricultural production in relation to transport and marketing facilities and to co-operate with the Departments in putting them into practice;

(4) to arrange for the setting up of organisations for the multiplication and distribution of approved stocks of seed, sets and fruit trees;

(5) to advise the Government in regard to other action that could usefully be taken for the improvement of agriculture or the avoidance of some impending loss of soil, crop or market;

(6) to arrange for the exploitation of results of commercial interest obtained at the research stations, e. g. the conserving of fruit and vegetables.

7. The Council should set up a Soil Conservation Committee whose functions would be :—

(1) to arrange for the collection and collation of results of manurial trials and for the putting into practice of suitable results ; the co-operation of the experimental staff of the large fertilizer organisations being if possible secured for this purpose ;

(2) to watch closely regions liable to erosion calling periodical conferences of the Departments concerned, with a view to working out schemes based on the physical rather than the political boundaries ;

(3) to arrange for the collection of results of soil analyses and the accumulation of material for a soil map of India;

(4) to help Departments where necessary in making surveys in irrigated regions or wherever salt or alkali may cause trouble so as to ascertain whether or not it is spreading; to arrange also for reclamation of deteriorated soils;

(5) to examine the cultivable waste lands and report how far they can be better utilized.

8. The Council should call for a report by an agrostologist, a forester, an animal husbandry expert and a soil expert, under the chairmanship of the Agricultural Expert to the Council, on the grazings available in each Province and on the methods of improving them; it should then encourage appropriate action.

9. The Council should set up a Crop production Committee whose function should be :—

(1) the consideration of the cropping schemes, much on the lines adopted by the Crop Planning Conference, with a view to advising about desirable extensions or curtailments of areas under particular crops, improved sequences or rotations, fodder crops, etc;

(2) the general oversight of the programme of research work on crops and examination of the results ; the framing of schemes for putting accepted results into practice:

(3) the organisation of watching services to report on the incidence of insect and fungus pests, noxious weeds or other threats to crop production and to arrange for the working out of control measures with the help of some visiting expert if necessary. The Council would then advise the Government as to any steps that should be taken.

10. In view of the supreme importance of water to the growing crops I recommend the establishment of a separate Research Institute for the study of irrigation and water relationships to soils and crops; also of more unified direction of the work on dry farming.

11. None of these proposals can attain much success unless the standard of country life is raised and this necessitates the settlement of more educated men and women on the land. An enquiry should be made as to the working of the various colonisation and settlements experiments in the Punjab, the United Provinces, and elsewhere and steps taken to institute large scale trials of promising methods. The influence of a colony of good cultivators on the surrounding district would be out of all proportion to their number.

12. The machinery at the disposal of the Council for carrying out this work should consist of :—

(a) the Imperial Agricultural Research Institute, Delhi which should work in close co-operation with the Council, and whose programme would largely be determined by the problems confronting the Council :

(b) A Marketing branch;

(c) a cadre of proved investigators, selected gradually from among the temporary staff now engaged on the Council's schemes; these men would be sent to various stations to deal with difficult problems for which the local resources were inadequate;

(d) a staff of temporary investigators as at present. I recommend, however, that their status be improved by setting up a Provident Fund and by establishing a register of approved persons which should be available to Departments, organisations or private employers wanting scientific workers.

13. These recommendations if carried into effect will necessitate an increase in the grant made to the Council. I see, however, no alternative to the acceptance of this situation. The Council is the co-ordinating agency which provides invaluable assistance to the Provincial Agricultural Departments and will afford still greater help if it is given the wider developmental powers that will enable it to bring to fruition investigations which at present stop at the experimental stage. These departments between them spend over 200 lakhs of rupees annually, a large sum and yet it amounts to little more than one anna per acre sown. The Council's regular grant of 5 lakhs is augmented for various purposes but its income is in my view inadequate for this its important duties and the need for additions to its resources should be recognised at any rate for the next few years, if progress is to be made as rapidly as desired.

A SIMPLE METHOD FOR PREPARING CUBE JAGGERRY FROM LOW QUALITY SUGARCANE JUICES

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It will be within the experience of almost all the cane growers in the district of Coimbatore and round about that low quality juices from badly lodged, diseased or insufficiently irrigated canes often fail to form into the usual cube-shaped jaggery that is so popular in these markets. It is usual in such cases to make the jaggery into big lumps weighing about 2 mds. each. These lump jaggeries are, however, held at a discount in the markets of Coimbatore, Madura, Malabar, and Tinnevelly as they are usually associated with low quality. It is, therefore, the aim of every cane grower in these districts to convert his whole crop into cube jaggery, if he can possibly manage it. The development of a simple process for arriving at this result should accordingly be a matter of some importance to the cane growing ryots of these areas.

Difficulty in making cube jaggery is encountered ordinarily when the juice is of about a purity of 80% or thereabouts. To prepare cube jaggery in such cases, it is the usual practice to add a large excess of lime to the juice both before and during boiling. The result is often successful ; but the colour of this product is dark and unattractive. When the lime is added in moderate quantities, cubes do not form.

In trying to devise a process for overcoming the above difficulty, it is essential to examine critically the local method of jaggery making with a view to remedy any apparent defects found therein.

In the preparation of cube jaggery, the syrup is usually concentrated to such a consistency that a sample of it when dropped into cold water solidifies to a brittle mass. The pan is removed from the fire and the contents stirred slowly and steadily till sugar crystals begin to appear. The crystallised mass is then transferred to the proper mould board and after cooling, the solid cubes are thrown out by striking hard on the top of the inverted mould board.

When the original juice is of high quality having a purity of about 90%, the crystal formation takes place within 5 minutes after removal from the fire. With juices of moderate purity viz., about 85% it takes about 10 to 15 minutes for the crystals to make their appearance. When the juices are of much lower purity say about 80%, the crystallisation does not occur even after half an hour by which time, however, the mass becomes cooled and so viscous that it is no longer fit for charging into the usual mould.

The problem, therefore, seems to resolve itself into one of devising a simple method to make the thick syrup crystallise in time. As is well known, crystallisation of sugar from a supersaturated sugar solution is, apart from its purity, largely dependent upon the temperature and the viscosity of the syrup. The greater the temperature and the lower the viscosity, the more rapid is the formation of crystals.

It has also been found that the greater the temperature to which the sugar solution has been heated in the preparation of the syrup, the greater is the time required for the subsequent formation of crystals.

On a consideration of the above facts, it would appear that the local practice suffers from the following two drawbacks.

(1) The juice is concentrated to too high a consistency.

(2) The thick syrup is cooled down rather at too rapid a rate.

These two factors apparently operate together in delaying the formation of crystals from the concentrated syrup and it was felt that suitable modifications regarding the two operations mentioned above would solve to a certain extent the difficulty in question.

A series of experiments were accordingly tried with low purity juices on the laboratory scale, varying the striking temperature from 118° to 124°C and altering the process of cooling in various ways. It was found for juices of low quality that a temperature of about 122°C was the optimum to which they may be heated for preparing cube jaggery. Crystallisation from the thickened syrup was found to be considerably hastened when the rate of cooling was slowed down. This was carried out as follows.

The pan with its contents on removal from the furnace is placed in hot water kept at a temperature of 80°—90°C and the contents stirred gently from time to time. In about 20 to 30 minutes crystals begin to appear when the crystallised mass may be transferred into the mould and cube jaggery obtained in the usual way.

The modified method has been invariably found a success whenever cube jaggery could not be obtained by the usual process.

Recommendations. (1) The juice should not be concentrated to too high a consistency. The pan may be removed from the furnace when the temperature rises to about 122°C. This roughly corresponds to the consistency required for making lump jaggeries ; (in vernacular, to the உருண்டைப்பதம் of the local jaggery boilers).

(2) The rate of cooling of the thick syrup may be slowed down by placing the pan in hot water kept at 80°—90°C and stirring the contents gently from time to time.

(3) On the appearance of crystals, the mass may be transferred to the mould board and proceeded with in the usual way.

In this connection, it will not be inappropriate to make a mention of the great usuefulness and convenience of the new mould board that has recently come into use in this district. It is, no doubt, a great improvement on the ordinary mould and differs from the latter in having the conical cavities open at both ends. The lower ends of these are, however, closed with movable wooden pegs, of suitable size and these pegs are prevented from falling out of the cavities by small nails driven into them crosswise. On charging the mould with the crystallised syrup and on turning it over after a few minutes, a slight pressure on the pegs causes the whole of the solidified jaggery to drop down in perfect condition.

When using the new board there is no need for the hard and severe hammering that is required to throw out the jaggery cubes from the old mould board and there is, therefore, no doubt that the improved mould board should last considerably longer than the ordinary one.

A NOTE ON THE INDIAN JUTE INDUSTRY

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Among the textile fibre crops of the world jute comes next to cotton and flax in commercial importance. The English word 'Jute' probably derived from Sanskrit '*jhat*' or '*jhout*' meaning "to be entangled" seems to have been in use since the middle of the eighteenth century but its mention for the first time in customs list was about the year 1828.

Jute is cultivated in Bengal from comparatively remote periods for its fibre from which coarse cloth for wear and cordage used to be made. The possibilities of this crop in international trade either being not well understood or more possibly an organised endeavour for its development on a commercial scale not obtaining, jute cultivation and jute manufactures remained in a primitive condition until in the first quarter of the last century, when, with the development of export trade of food grains, the need for a general packing material was keenly felt and jute bags were found handy enough to meet the situation. From that time onwards jute fibre came into the market and began to be exported to Europe and in particular to the Dundee mills in Scotland, chiefly through the efforts of the East India Co. Thus with the opening up of foreign market and the subsequent increased application of the fibre, the jute industry of Bengal came into prominence and grew to phenomenal proportions by the end of last century. Since then, and side by side with the increase in cultivated area, several jute manufacturing and exporting concerns were also established on the banks of the Hooghly.

To the Bengal ryot jute cultivation continued to be so attractive and remunerative that he freely put paddy fields under jute and by the year 1928 there were nearly a million cultivators with an area between $3\frac{1}{2}$ to 4 million acres in Bengal and in parts of the adjoining provinces of Assam, Bihar and Orissa, capable of a moderate fibre outturn of 12 million bales of standard weight of 400 lbs each. The relative export value of jute, raw and manufactured, is nearly one-tenth of the total exports of all the other Indian commodities.

The following additional points make the history of the Indian jute industry more complete, cogent and interesting. The unique place of Bengal as the world's chief jute producing centre is too well known to need emphasis. The significance of this industry as an integral part in India's national economy in general cannot be more emphatically described than in the words of Sir T. V. Acharya:— "How many people outside Bengal are aware of the vast importance of the jute crop in the Indian national economy? What percentage of the readers of 'The Hindu' realise that in 1934 jute and jute products were the second largest item of India's exports, and that in 1935 they were the largest, even cotton and cotton goods coming down to the second place? Think of what it meant for India in a year of depression to get for her jute a sum of nearly thirtyseven crores of rupees from foreign countries.

"To the poverty-stricken cultivator of Bengal, jute, ever since the Crimean War when the world was cut off from Russia's flax supplies, has been a veritable silver shower from the skies. In bumper years, before the catastrophic fall in agricultural prices that dates from the autumn of 1928, jute has brought as much as 70 crores to the ryot, a sum which if distributed among the population of Bengal would give a dividend of Rs. 15 — to every man, woman and child." Such is the proud privilege of Bengal which produces 90 per cent of India's raw jute and over 80 per cent of world production. But this position was not attained so easily as one would imagine. For the pioneers of this industry had to surmount a good deal of initial difficulties to introduce and popularise jute yarns in the West where prior to 1835 jute was " looked upon with suspicion by users of linen goods," which bore the guarantee seal " warranted from Indian jute". Thus the early history of this industry was one of dire competition with the other well known and copiously used textile fibres like flax and hemp which were gradually suppressed almost to extinction.

From the first inception of a power loom jute factory of 192 looms in 1859 on the banks of the Hugli, the Calcutta Jute Mill industry steadily progressed in three quarters of a century until in 1933 over 60,000 looms were under operation in the whole of Bengal. A little more than 50 years ago the managing agents of the various mills constituted themselves into a body now known as the Indian

Jute Mills Association (which is virtually a jute fraternity) with a view to protect and promote the interest of all those engaged in this industry.

Although Bengal grows practically the whole of the jute supply of the world and the jute export trade is a significant source of revenue to India, the world wide economic collapse since 1930, coupled with over-production naturally created great anxiety in those concerned in this gigantic enterprise. The slump compelled the associated mills to reduce working time by about a third, sealing down 15 per cent of the total looms and the universal adoption of a single shift working with a consequent slow retrenchment of 21 per cent of the workers, a half of which were women employees—all this calculated to bring supply into line with demand. " The effect of the fall in jute prices on the economic life of Bengal has been of tremendous severity and the result has been described.....as something approaching financial paralysis in the province."

The Department of Agriculture was not slow to take cognisance of the situation and to launch schemes of propaganda among the cultivators to restrict the area under jute cultivation and to advocate alternative crops like sugarcane, tobacco, groundnut, linseed and the like. Such intense propaganda together with voluntary restriction resulted in the reduction of the total jute area by about one-half before 1934 and the position is but hesitatingly improving since 1935 as would be seen from the final forecast figures of the jute crop for 1936, viz, 2,180,800 acres with an estimated yield of 7,774,500 bales for Bengal and 364,800 acres with an yield estimate of 961,300 bales for Assam, Bihar and Orissa together.

The price of jute fibre is subject to wide fluctuations due to " forward speculation ". In 1936 the price per bale of " Firsts " was on an average Rs. 32 which is slightly less than a third of the highest price realised in 1926. During the years 1927—'30 the price ranged from Rs. 85 to Rs. 65 per bale. The present low price level notwithstanding, as it is only a passing phase and India still remaining the cheapest fibre producer most suitable for general packing and transport requirements, the industry is bound to come into its own before long. For it is highly important to remember that " several countries have experimented in the growing of jute, but nowhere outside India has it proved a success ". The chief management of this industry as represented by the Indian Jute Mills Association, " while enthusiastically trying to retain the existing trade, are also initiating a policy of research with the object of discovering fresh market and new uses for Indian jute ".

The United Kingdom, Germany, France, Italy and Belgium are regular importers of Indian jute for purposes of converting it into piece-goods, bags, carpets, rugs and other sorts of jute goods which

are placed on the market. Regarding other new uses successfully attempted in a competitive spirit by manufacturers at Dundee are "the use of jute goods to the linoleum and furnishing trades, to the tailor trades, to the boot, shoe and slipper trades, to the cable industry, and for various other purposes, including even road making". (Murray.) Thus the opportunity for the wide application of this material and the expansion of the industry looks very bright, even in spite of the policy of economic nationalism and the encouragement of research on the development of new packing materials in countries like Poland, Italy, Egypt, Chile etc. No wonder then that in pursuance of the recommendations of the Royal Commission on Agriculture the Indian Central Jute Committee has been constituted early in 1936—a distinct land mark in the annals of this industry—"to deal with the interests of all the branches of the trade from the field to the factory. The functions of the committee would be to undertake agricultural, technological and economic research, the improvement of crop forecasting and statistics, the production, testing and distribution of improved seed, enquiries and facilities relating to banking and transport facilities and transport routes and the improvement of the marketing." (Review of Trade in India 1935—36). This Committee which is now financed by the Imperial Council of Agricultural Research has commenced to function actively and is shortly appointing a Jute Specialist at Dacca.

After having thus surveyed the history and the importance of the industry in India some aspects of cultivation of the crop, extraction of the fibre, etc., are briefly outlined in the following paragraphs.

The jute plant (Jew's Mallow) belongs to the Natural Order Tiliaceae. *Corchorus capsularis* and C. *olitorius* are the two chief species under cultivation for fibre. There are many cultivated races belonging to both these species. Races of C. capsularis which have short, round fruits are largely preferred to those of C. olitorius which have long cylindrical fruits, because, it is said, they are more tolerant of adverse conditions, such as water-logging or submersion or high temperature with the added advantage of better fibre yield.

The season for cultivation of this crop commences from mid-February or early March and ends in September or early October. The period from sowing to flowering is only three and half to four months when the crop is usually cut for fibre. With the first precipitation fields are ploughed several times to a fine tilth and while there is adequate moisture in the soil seeds are sown broadcast cross-wise to ensure even distribution of the seeds using a seed rate of about 10 lbs. to the acre. The sown area is harrowed to cover the seeds, and compacted, if necessary, to retain moisture and help germination.

Viable seeds complete germination in 3–5 days. Subsequent cultural operations are thinning once and weeding as often as necessary

and practicable. A month old seedlings are thinned down to a fairly uniform spacing of about 4 inches to 6 inches between plants. More space is not generally allowed as it will encourage branching which affects fibre yield.

Silt-renewed alluvial or loamy soil is typical for jute cultivation. As for the manurial requirements of this crop application of cattle manure at 5 tons or castor cake at 7 mds. (82 lbs per Md.), per acre is considered ample. Other concentrated fertilisers need not be resorted to under ordinary circumstances, though jute responds well to liberal doses of them in combination with the natural bulky manures. Manuring to improve the fertility of large portion of areas lying enmeshed and inundated by the Ganges and the Brahmaputra rivers and their branches and tributaries is not a serious necessity. Elsewhere liberal application of manures such as dung, house sweepings and ashes is justified better. Green manuring with any suitable crop is also beneficial in areas not liable to submersion. A crop of cold weather paddy after jute is an excellent economic rotation and in that case manuring the jute crop is a sound policy. Jute is said to be an exhausting crop and it is interesting to remember that the fibre being purely a non-nitrogenous substance, the actual drain on the mineral substances of the soil is caused by the non-fibrous portion of the plant. Jute dislikes alkaline lands but tolerates temporary water-logging.

Jute is harvested with hand sickles immediately after flowering or just when seeds are set and sometimes, though rarely, later. But it is best to cut the crop in the first and second stages as then it yields fibre of superior quality. With further maturity it may yield a little more but then that fibre is weaker and inferior. Usually each cultivator leaves a patch of the crop to mature for seeds, for the next crop.

Retting, stripping and washing constitute a set of operations in succession following harvest by which fibre is extracted and prepared for the factory. Each of these processes is simple in technique but delicate and difficult in practice and has to be done skilfully and dexterously. For this the plants are made into small bundles and stacked in the open for a few days when the leaves whither and drop off. Getting rid of the leaves is necessary as otherwise they merely add to the bulk and hinder the progress of retting and also spoil the water. These bundles are then steeped in deep clean and clear water for varying periods from 10 days to even as long as a month depending mostly on the maturity of the crop. During this time the bark gets softened and loosened from the central core. When large heaps are immersed the inner bundles ret easier and earlier which, if left longer than necessary under water, will over-ret. The appreciation of the correct degree of retting is highly essential and is born of experience. By under-retting the fibre gets gummy and by over-retting it loses its essential qualities viz., strength, gloss and colour.

Retting is in reality a process of fermentation during which the tissue in which the fibre is embedded is softened and deteriorated. It can be artificially expedited by the addition of ammonium salts or the salts of phosphoric acid in small quantities to the water. Such artificial hastening though not ordinarily required is sometimes resorted to as a measure of expediency, such as to meet urgent market demands especially during competition and late harvest.

The process of stripping or separating the fibre from the stem and washing and cleaning it is described by Royle as follows:— "The proper point being attained the native operator standing up to his middle in water takes as many of the sticks in his hand as he can grasp, and removing a small portion of the bark from the ends next to the roots, and grasping them together he strips off the whole with a little management from end to end without breaking either stem or fibre. Having prepared a certain quantity into this state, he next proceeds to wash off; this is done by taking a large handful; swinging it round his head he dashes it repeatedly against the surface of the water drawing it through towards him, so as to wash off the impurities; then, with a dexterous throw he fans it out on the surface of the water and carefully picks off all remaining black spots. It is now wrung out so as to remove as much water as possible and then hung up on lines prepared on the spot, to dry in the sun."

When completely dry lots of the fibre are pressed and packed into standard bundles of 400 lbs. each. A moderate out-turn of such finished fibre may be 1,200—1,500 lbs. from an acre which is about 4—5 per cent of the green weight of the entire crop at harvest. The fibre must be packed damp-proof and stored somewhat loosely in ventilated godowns lest the somewhat hygroscopic fibre should swell, "sweat" and deteriorate.

Characteristics of good fibre are light colour, 4—6 feet or more in length, freedom from dirt and spots, and durability. Of the several commercially recognised varieties of jute fibre each having some distinct qualities and indicated through different trade marks the following are popular in the market.

1. *Serajgange* (*Deswal*)—soft, fine and strong, light grey in colour.
2. *Narainganje*—soft, long and strong, reddish.
3. *Deora*—somewhat coarse and inferior to 1 and 2.
4. *Desi*—moderately strong and dark in colour.

The several articles of use that could be made with jute have been incidentally mentioned before and need not be repeated here.

The unique place of Bengal and portions of the adjacent provinces constituting a jute growing zone, as it were, in India is due to the existence of ideal conditions for the cultivation of the crop and consequently the development of the manufacturing industry such

as—a high temperature (between 60° and 100°F), fertile deep soil capable of moisture retention, a well distributed minimum rain-fall of 50 inches per annum, fairly cheap labour, availability of plenty of clean clear water for retting, and transport facilities.

Absence of any one condition or a combination of them is a serious handicap in the spreading of jute cultivation outside this zone on a large and competitive scale. And there does not seem to exist any published record of a remarkable success of this crop outside this area where its substitutes Bimilipatam jute, crotolarias and agaves, probably because of their greater adaptability are grown in large acres. But, on reading Finlow and Mollison on the extension of jute cultivation in India one wonders why the jute industry could not be given a fair trial in at least those areas of the Madras Presidency which compare favourably with Bengal. Finlow's thought-inciting opinion on the possibility of this crop in parts of Madras is quoted below. " Outside Bengal, the climatic conditions in Madras seem to be more favourable than in any other part of India visited by me. The Malabar coast has already been described as having a climate similar in many ways to that of Bengal. The physical features of the district are very different ; but there is no apparent reason why jute should not thrive on a considerable scale in the large area of rice land in Malabar and South-Kanara. In Ganjam, again, the conditions appear fairly favourable. The rain-fall which, while not heavy, is probably sufficient to raise the crop, and it is well distributed; the soil especially inland is distinctly good; and the district is well supplied with irrigation. The great deltas of the Godavari, Kistna, and Kaveri rivers .....would at first sight appear to be ideal centres for jute cultivation. In practice the difficulty will be probably the question of the time of sowing especially in the low lands."

During the period 1905 to 1909 experiments on the introduction and cultivation of Bengal jutes at the Samalkot and Thaliparamba agricultural stations have been conducted. The initial high hopes that were entertained on the success of these experiments faded away by 1908 and were prematurely discarded for the following apparent reasons :—

1. Insufficient knowledge of the crop and incorrect time of sowing.
2. Difficulty to early preparation of the land and to secure the required tilth.
3. Inadequate manuring.
4. High cost of growing the crop and preparation of the fibre, and
5. want of sufficient skilled labour.

It may be pointed out that the experiments with this crop were rather empirical and for a comparatively short period only. As such significant and valuable results were not obtained which could be used

as the last word on the prospects of development of the Industry in Madras. Such of those difficulties as were experienced during this short lived endeavour should have helped deeper thinking to earnestly devise ways and means to surmount them. Instead disappointment seems to have prevailed. Further it is not improbable that with the change in the outlook of the agricultural department at about this period to improve local crops and to organise separate crop sections with wider scope for expansion and immediate results, the importance of jute and other long fibre crops was not so striking to justify an equal share of attention. Anyhow Finlow's strong opinion expressed to Couchman in 1908 that "the prospects of jute in Madras is decidedly hopeful" still remains unheeded, though it deserves consideration.

An examination of the Season and Crop Reports for Madras from 1902 to 1936 shows only inconsiderable acreages under jute during most years—varying from about 500 to a little more than 2,000 acres distributed in Ganjam, Vizagapatam, Godavari, Guntur and Nellore districts, to mention only the most important ones. In exceptional years, however, the acreage under jute (Corchorus sp.) has been very remarkable as seen from the following figures:—

Period	Total acres for the Presidency	Acres for Vizag. district only.
1919—1920	10,889	10,807
1923—1924	14,358	13,492
1935—1936	25,354	24,425

It is clear therefore that this industry is not altogether unpopular with the ryot. That this crop has a place among the other commonly grown fibre crops of this Presidency, namely Hibiscus, sunn-hemp etc., and also has a decent chance of success in some localised areas are quite evident. Hence it may not be out of place to indicate the necessity for a policy in favour of this crop with a view to exploit the scope of its industry in all its aspects in suitable places of Madras. For this a scheme of experiments, demonstration and propaganda seems highly essential to tap potentialities which may ulitimately bring in a measure of prosperity to the needy and favourably located cultivator and others.

"Men talk as if victory were something fortunate. Work is victory. Wherever work is done, victory is obtained. There is no chance, and no blanks" (Emerson).

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EXTRACTS

A Coincidence or What? This year I was asked to remove a growth from the upper eyelid of an Ayrshire cow. The growth, which was the size of a cricket ball, was removed and the surface cauterised and dressed with an ordinary wound lotion; but after a time the growth recurred, and also the lower lid became affected. The cow being very old and nearly due to calve, the owner did not have the growth removed a second time, but said that as soon as she had calved he would have her destroyed. A good heifer calf was born, but here comes the coincidence—the calf had only one eye. There is no doubt but that the growth was malignant. (*The Veterinary Journal*, Vol. 93, No. 9, September 1937.)

A Treatment for Swallowed Needles. A Mastiff puppy, six months old, when playing with its mistress, was seen to swallow a needle and cotton at 10-30 p. m. The treatment consisted in taking a large handful of cotton wool, teasing it out and mixing with butter into pills the size of a large walnut. The puppy was fed with these and swallowed about sixteen or eighteen of them. This was followed two hours later with two ounces of liquid paraffin, being repeated every two hours, until the bowels acted. At 6 a. m. the next day the puppy had a large evacuation which contained the needle and thread entangled in large ball of the cotton wool. I have also found this very satisfactory for safety-pins and jagged pieces of bone. It is always better to use long-fibre cotton wool. (*The Veterinary Journal*, Vol. 93, No. 9, September 1937.)

ABSTRACTS

Feeding Experiments with Canned Food Packed in Aluminium Containers by Gulbrand Lunde, Valborg Aschehoug, and Hans Kringstad. (*Journal of the Society of Chemical Industry*, September 1937).

When sardines and other foods are canned in aluminium containers, small quantities of the metal will be dissolved by the food during storage. When storage continues over a period of several years, the metal content of the food may rise to about 100 mg. per kg, i. e., not more than may be dissolved by certain foods during domestic cooking in aluminium utensils.

Experiments with mice fed on canned food containing about 0·05 mg. of aluminium per animal per day were carried out during the most rapid period of the growth of the animals; the animals developed normally and showed no abnormal signs to indicate that aluminium in canned food has any injurious effect. No accumulation of aluminium in the animals could be found.

A similar test was made with rats, each animal being fed daily on canned food containing about 0·4 mg. of aluminium. The aluminium consumed by the animals was quantitatively eliminated with the excreta. Growth was normal. In another test rats were fed up to the fifth generation on four year old canned food containing aluminium. No injurious effect was demonstrable. Growth was just as good in the first as in the last generation, and equalled the growth of the control groups fed on ordinary stock diet and on food canned in other material. Determination of the aluminium content of the rats' lungs, heart, spleen, kidneys, liver, and muscle-tissue showed that no accumulation or retention of aluminium had taken place. (Author's abstract).

Gleanings.

Preserving Eggs. A new chemical preserving process, invented by a Chinese scientist in California, is said to prolong the freshness of eggs, possibly for years. The Chinese are known to have a secret process by which eggs retain their edibility for a hundred years, but this is declared to be something different. By the new process, the porous egg shells of natural calcium carbonate are coated with more of the same material thereby excluding all air and moisture, adding strength against breakage in handling and retarding deterioration. (*Industry*, Calcutta, October 1937).

Conditioning of Silk in Bengal. A conditioning house for raw silk, it is understood, is shortly to be established by the Government of Bengal for developing the silk industry of the Province.

The conditioning house which will be perhaps the only one of its kind in India will be equipped with testing and conditioning appliances and will be entrusted with the function of testing the standard of not only raw silk but of silk fabrics as well produced in the country and certifying as to their quality. The fixation of a standard or grade of quality by the house will, it is expected, go a long way in checking frauds and malpractices and inspiring the confidence of the prospective buyers. (*Industry*, Calcutta, October 1937)

Utilisation of molasses. During the past five years, the Biochemistry Department of the Indian Institute of Science, Bangalore, has been engaged on the study of technical problems relating to the utilisation of cane molasses, the chief by-product of modern sugar Industry. A number of interesting results of practical value have been obtained and were recently reported to the Indian Sugar Tariff Board. One of the most important findings is the development of a process for the conversion of molasses into a dry, solid product which will not absorb moisture and can stand transport over long distances.

The product is a good fertiliser and is much more efficient in its action than the original molasses. Its nitrogen fixing capacity is also very high. It can easily be applied to land.

The manufacture of the dry powder is a very simple process. The chemicals required for this purpose are cheap and abundantly vigorous and is accompained by considerable evolution of heat, so that the entire mass boils spontaneously within a few minutes. On cooling the product dries rapidly and can be easily powdered.

It is estimated that the new product will be worth at least Rs. 15 to Rs. 20 per ton as fertiliser (as compared with other known fertilisers on the market). (*Industry*, Calcutta, October 1937.)

Permanganate in Fertilizer. Addition of potassium permanganate in small amounts to fertilizers has been found in England to increase the yield of radishes,

lettuce, and of other vegetables. It also has the effect of removing moss and earth-worms from lawns which suggests its use on the greens of golf courses. Presumably one of the effects of this powerful oxidising agent is to convert organic nitrogen to nitrates in the soil as well as to supply small amounts of manganese sometimes deficient in the soil. D. H. K. (*Scientific American*, October 1937).

Adlay (*Coix Lachryma—Jobi* **Linn**) is a grain capable of supplementing rice, with the same delectability. It lends itself for the preparation of the various foods just like rice. It is more wholesome than wheat or rice with its greater fat and protein contents.

Adlay is dibbled—2 to 3 seeds in each hole spaced 2 to 2½ feet apart in high lands. The seed rate is 6—10 lbs. per acre. The crop tillers well, covers the ground and is cut when mature, in 4—5 months, and yields 1000 to 1900 Madras Measures of grain an acre. A ratoon crop can be taken, when conditions are favourable. It is remarkably free from diseases, but subject to parrot damage. (*The Tropical Agriculturist*, Vol. LXXXIX, No. 3, September 1937).

Crop and Trade Reports.

Paddy—1937-38—Intermediate Monthly Report. The harvest of first crop paddy has either concluded or is concluding in parts of the Central districts, the South and the West Coast. The yield is expected to be normal in Tanjore and slightly below normal in the other districts. The condition of the standing crop is generally fair.

The wholesale price of paddy per imperial maund of 82⅔ lb. as reported from important markets on 8th November 1937 was Rs. 3—0—0 in Madura, Rs. 2—12—0 in Chittoor and Virudhunagar, Rs. 2-10-0 in Vellore and Trichinopoly, Rs. 2-8-0 in Vizianagaram, Kumbakonam and Tinnevelly, Rs. 2—7—0 in Masulipatam, Rs. 2—6—0 in Bezwada and Guntur, Rs. 2—5—0 in Ellore and Hindupur, Rs. 2-4-0 in Cocanada, Rajahmundry, Anantapur and Cuddalore, Rs 2—1—0 in Conjeevaram and Rs. 1—15—0 in Negapatam. When compared with the prices published in the last report, i. e., those which prevailed on 4th October 1937, the prices are stationary in Bezwada, Masulipatam, Guntur, Cuddalore, Vellore and Negapatam, reveal a rise of about 38 per cent. in Chittoor, 14 per cent. in Kumbakonam and Madura, 8 per cent. in Trichinopoly, 7 per cent. in Virudhunagar, 6 per cent. in Hindupur and 5 per cent. in Vizianagaram, and a fall of about 5 per cent. in Tinnevelly and 3 per cent. in Cocanada, Rajahmundry, Ellore and Conjeevaram.

Sugarcane—1937—Intermediate report. The condition of the sugarcane crop is generally satisfactory throughout the province and the yield is expected to be normal if the season continues to be favourable.

The wholesale price of jaggery per imperial maund of 82⅔ lb. as reported from important markets on 8th November 1937 was Rs. 5-8-0 in Adoni, Rs. 4-12-0 in Mangalore, Rs. 4—10—0 in Erode, Rs. 4—6—0 in Trichinopoly, Rs. 4—2—0 in Salem, Rs. 3—15—0 in Cuddalore, Rs. 3—14—0 in Coimbatore, Rs. 3—10—0 in Rajahmundry, Rs. 3—7—0 in Chittoor, Rs. 3—5—0 in Vellore, Rs. 3—0—0 in Vizagapatam, Rs. 2—13—0 in Cocanada, Rs. 2—6—0 in Bellary and Rs. 2—5—0 in Vizianagaram. When compared with the prices published in the last report i. e., those which prevailed on 4th October 1937, these prices reveal a rise of 12 per cent. in Chittoor and 4 per cent. in Vizagapatam and a fall of 16 per cent. in Vizianagaram, 15 per cent. in Cocanada, 8 per cent. in Rajahmundry, 7 per cent. in Trichinopoly, 6 per cent. in Coimbatore and 3 per cent. in Bellary, the prices remaining stationary in the other centres.

Groundnut—1937—Intermediate Report. The condition of the winter crop of groundnut is satisfactory in East Godavari, West Godavari, Chingleput, Coimbatore, Trichinopoly, Madura, Ramnad, Tinnevelly and Malabar. Elsewhere the crop has been affected by the hairy caterpillar in parts of Bellary, South Arcot, Salem and Tanjore and by drought in the remaining districts.

The wholesale price of groundnut (shelled) per imperial maund of 82⅔ lbs. as reported from important markets on 8th November 1937 was Rs. 5—4—0 in Vizagapatam, Rs. 5—0—0 in Cuddalore, Rs. 4—8—0 in Vizianagaram, Rs. 4—5—0 in Erode, Rs. 3—15—0 in Cuddapah and Vellore, Rs. 3—14—0 in Coimbatore, Rs. 3—13—0 in Adoni, Rs. 3—12—0 in Nandyal and Bellary and Rs. 3—11—0 in Hindupur. When compared with the prices published in the last report, i. e., those which prevailed on 4th October 1937, these prices reveal a fall of about 14 per cent. in Vizianagaram, and Nandyal, 13 per cent. in Cuddapah, 10 per cent. in Bellary, 9 per cent. in Cuddalore, 7 per cent. in Erode, 6 per cent. in Vellore, 5 per cent. in Adoni and one per cent. in Vizagapatam.

Gingelly—1937-38—Intermediate monthly report. The gingelly crop has been affected to some extent by drought in parts of Bellary and Anantapur. The yield is expected to be normal outside these districts.

The wholesale price of gingelly per imperial maund of 82⅔ lbs. as reported from important markets on 8th November 1937 was Rs. 6—15—0 in Trichinopoly, Rs. 6—8—0 in Cocanada, and Tinnevelly, Rs. 6—7—0 in Cuddalore, Rs. 6—6—0 in Salem, Rs. 6—5—0 in Ellore, Rs. 6—4—0 in Tuticorin, Rs. 5—12—0 in Vizianagaram, Rs. 5—9—0 in Rajahmundry and Rs. 5—8—0 in Vizagapatam. When compared with the prices published in the last report, i. e., those which prevailed on 4th October 1937, these prices reveal a rise of about eleven per cent., in Salem, two per cent. in Vizianagaram and Tinnevelly and one per cent. in Vizagapatam and Tuticorin and a fall of about five per cent. in Rajahmundry and two per cent. in Ellore, the prices remaining stationary in the other centres.

Cotton—1937-38—Intermediate monthly report. In parts of the Central districts and the South the sowings of cotton are still in progress. The area under the crop is expected to be slightly above normal in the districts of Salem and Coimbatore and generally normal in the other districts. The condition of the young crop is generally fair.

In the Deccan, the sowings of *hingari* or late cotton have concluded and are expected to be above normal in the Bellary district where cotton was sown in the place of korra in parts. The yield from *mungari* or early cotton is expected to be generally below normal. The germination of the *hingari* crop is satisfactory.

The local cotton trade is not generally active at this time of the year. The wholesale price of cotton lint per imperial maund of 82⅔ lb. as reported from important markets on 8th November 1937 was about Rs. 18—15—0 for Cocanadas, Rs. 13—13—0 for Westerns (*mungari* crop), Rs. 16—4—0 for Westerns (*Jawari* crop), Rs. 22—12—0 for Cambodia, Rs. 25—5—0 for Coimbatore—Karunganni, Rs. 18—14—0 for Tinnevelly—Karunganni, Rs. 17—8—0 for Tinnevellies and Rs. 21—4—0 for Nadam cotton. When compared with the prices published in the last report, i. e., those which prevailed on 4th October 1937, the prices reveal a fall of about 18 per cent. in the case of Westerns (*mungari* crop), 14 per cent. in the case of Westerns (*Jawari* crop), 12 per cent. in the case of Tinnevelly—Karunganni 10 per cent. in the case of Cambodia and Tinnevellies, 6 per cent. in the case of Coimbatore—Karunganni and one per cent. in the case of Nadam, the price of Cocanadas remaining stationary. *(Director of Industries, Madras.)*

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1937 to 12th November 1937 amounted to 490,599 bales of 400 lb. lint as against an estimate of 533,100 bales of the total crop of 1936-37. The receipts in the corresponding period of the previous year were 582,532 bales. 394,431 bales mainly of pressed cotton were received at spinning mills and 200,620 bales were exported by sea while 95,885 bales were imported by sea mainly from Karachi and Bombay.

(*Director of Agriculture, Madras*).

Association of Economic Biologists, Coimbatore.

Two meetings of the Association were held on 25th October 1937 and 15th November 1937 respectively. The following papers were presented at the meetings:—

Coconut Breeding. *By Dr. J. S. Patel, M. Sc., Ph. D.* At the Agricultural Research Station, Kasaragod, it is found that on an average of 12 years, 13 per cent of the trees yielded 21 per cent of the total crop and 7 per cent of the trees produced only 2 per cent. The characteristics of these 13 per cent. eco-types of the palms are: (1) presence of relatively a larger number of leaves in the crown, which is not so much due to the higher production of leaves as the greater longevity of the leaf, (2) reduction in response to cultural, manurial and seasonal conditions.

Apart from the variations in the yield of nuts, these eco-types vary in the production of female flowers, the setting, the size of the nut and the thickness of the meat. In order to determine whether this variation is inherited, and to what extent it is possible to combine these characters, crosses have been made between the eco-types exhibiting these characters. Suitable selfed and naturally pollinated material forms the control.

About 30 per cent. of the population is not regular in the production of nuts. Crosses have also been made between regular and irregular bearers.

It is well known that the dwarf type of the palm commences to yield earlier than the ordinary tall type. The dwarf type and the tall eco-types have been crossed.

It was found that a larger proportion of crossed nuts germinated earlier than the selfed and naturally pollinated nuts, and among the crosses those with the dwarf male as one of the parents germinated most rapidly.

On the whole it is found that variability with regard to the characters like the period for emergence of successive leaves, and the height and the girth of the seedling, are more in the F_1s than in the selfed first generation. Of the progeny of the twenty tall type of parents, tree No. I/121 and II/107 are superior in respect of the above mentioned three characters and also in respect of early separation of leaflets. It appears that the progenies of parents producing a very large number of female flowers are better than the progenies of trees yielding exceptionally well. The development of the F_1s of dwarf × tall crosses is outstanding.

Studies on the White Moth Borer of Sugarcane in S. India. *By M. C. Cherian, B. A. B Sc., D. I. C. and C. K. Subramanian.* The White moth borer (*Scirpophaga*) is reported from different countries such as Congo, Shanghai, Formosa, Borneo, Java, Ceylon, Burma, India etc. It has been studied to some extent in North India while information on this pest under South Indian conditions is rather scanty. The results of the studies of this borer have shown that, though not a major pest as *Diatraea sticticraspis*, it is not so unimportant as once considered.

Life history. The moths are sluggish creatures and do not live for more than 3 to 4 days. Under Coimbatore conditions the pest takes 54—74 days to complete its life cycle; the egg, larval and pupal (including prepupal) periods being 6—10, 34—42 and 14—22 days respectively.

Symptoms of damage. The symptoms of damage are many of which the mining of the mid-ribs, cross-holes on the leaves, dead-hearts of various sizes, peculiar exit holes for the emergence of moths and bunchy top of the mature canes are the more important.

Extent of damage. Regarding the extent of damage, it may be stated that the pest attacks both young shoots as well as mature and immature canes. Though not a major pest as *D. sticticraspis* this borer also is capable of inflicting some injury to the cane. Counts of infestation in a few fields in Coimbatore are given. The pest has been noted from many districts of this presidency.

Species of Scirpophaga in S. India. Previous workers have stated that there are two species of *Scirpophaga*, viz. *S. monostigma* (black spotted) and *S. auriflua* (without spots). The authors have shown that both the spotless and the spotted forms are derived from the progeny of either. Detailed studies of the genitalia of the moths are in progress.

Natural enemies. Considerable progress has been made in the study of the natural enemies of the pest. In addition to the egg parasite, *Telemous* sp. seven larval parasites have been collected and valuable information gathered on four of these.

Remedial measures. Handpicking of adult moths, collection of eggmasses, removal of affected plants, etc., are suggested. The egg parasite of *Diatraea* moths, *Trichogramma minutum*, does not appear to parasitise *Scirpophaga* eggmasses in nature. Earthing up of cane shoots said to be successful in Mysore is being tried in the Central Farm.

The Colour of Black Soils—the Influence of Organic Matter. *By P. Venkataramiah and C. Raghavendrachar.* Various hypotheses have been put forward to explain the dark colour of black soils, i. e., (i) presence of large quantities of organic matter, (ii) their being derived from dark coloured rocks, the basalts, (iii) presence of titaniferous magnetite in the sandy fraction, (iv) the presence of an iron-organic colloidal matter; but none of these have successfully explained the dark colour. The authors in a previous paper have shown that the black soils have a high SiO_2/R_2O_3 molar ratio and Ca and Mg in the silicate complex of the clay fraction which prevents the oxidation of iron; while in the red soils with a low molar ratio of SiO_2/R_2O_3 and a low Ca and Mg content, the iron is capable of being oxidised to give the red colour, though both types of soils have about the same iron content.

Examining a number of black soil profiles, it was noticed that they had a zone of black soil at the top and a light coloured zone in the lower depths and while the silica sesquioxide molar ratio and the Ca and Mg contents of both zones were about equal, the organic matter content (estimated by digesting soil with 5% NaOH) of the upper dark layers was higher than that of the lower layers. When treated with H_2O_2, the dark colour of the upper zone did not disappear, while when the soil was treated with N/5 HCl, and washed free from chlorides, and then treated with H_2O_2, the dark colour of the upper zone disappeared and the soil assumed the same light colour as that of the lower zone. During the oxidation the CO_2 evolved was estimated by absorption in soda lime.

In a laterite profile (Taliparamba, North Malabar,) similar differences in depth of colour of the upper and lower zones were observed, and similar treatment with H_2O_2, resulted in discharge of the colour of the upper zone soil. The

upper zone of a laterite profile had an organic matter content 2·5 times that of an upper black soil zone.

The dark colour of two surface soils of black soil is thus probably due to the association of organic matter with a clay having a high SiO_2/R_2O_3 ratio and a Ca and Mg silicate complex which gives a darker colour to an already grey soil and in the case of the laterite soil the presence of organic matter gives a darker shade to a red soil.

Absorption of soil moisture during germination of cotton seed. *By T. V. Rangaswami, B. Sc., Ag.* Germination plays an important role in economic crop production. Quantity of soil moisture present at the time of and subsequent to sowing is one of the chief causes that affect germination. The control of moisture during germination is of paramount importance in cotton. "This done, out-of-season growth also may prove successful within certain limits."

The present note deals with absorption of soil moisture during germination by different varieties of cotton seeds. It was found that the rate of absorption depends upon the moisture saturation in the soil and also on the nature of the seed (whether acid treated or normal). Varietal variations were also noticed. In the absorption, two phases, viz. a mechanical or prewelling process followed by physiological absorption were observed. Invariably a 'lull period' existed between the two phases of absorption. The growth of the radicle was closely associated with higher absorption of moisture. Response to this metabolic activity was greater under lower saturations than under higher saturations. In some cases higher saturations of moisture were found to be not utilized and in others they were even harmful for normal activity. Incidently it was also demonstrated that water enters the embryo through the seed coat besides through the micropyle during germination.

College News and Notes.

Students' Club. "Students should take an active part in politics" was the subject of an interesting debate which took place on 11—11—'37 with the Principal in the chair. Messrs. K. Mahabala Shetty and V. Srinivasan were the mover and the opposer respectively. After a discussion in which many students took part the motion was put to vote and carried by a majority.

Cricket. The students of the Agricultural College had a fixture with the officers on 31—10—'37. Contrary to the popular expectation, the students gained a smashing victory. The officers put on a modest total of 117 runs, the principal contributor being C. Ramaswami (75). Dinker Rao and Kothandaraman on the students' side captured 4 wickets each for the loss of 20 and 28 runs respectively. The students replied with 159 for 5, Kothandaraman having retired with his 60 and Mukundan remaining unbeaten with his 55.

The Inter-collegiate tournament began well with the Agricultural College meeting the local—Government College on the 13th November, ending in brilliant victory for the former. The Agricultural College batted first and declared at 202 for the loss of 8 wickets. K. K. R. Menon was brilliant with his 45 closely followed by Kothandaraman with his 37. Rama Iyengar was unbeaten with his 35 runs. P. S. Srinivasan claimed 5 wickets for 68 runs. The Government College was then dismissed for a paltry 72 runs, the distinguishing batsman being K. Subramaniyam who scored 38 runs. Dinker Rao was very successful with the ball, taking 5 wickets at the cost of 20 runs. Kothandaraman followed him by claiming 4 wickets for 27 runs.

14—11—37 saw a brighter cricket. The Trichy Railway Institute played with the Agricultural College. The vistors, batting first, sent up 155 on the board for all out. Sundaram Chetty was the hero of the day with his bat and he was unbeaten with his polished 52 runs. He exhibited some powerful and fine strokes. The other principal scorers were George (27) and Timmins (26). Timmins began well and hit up an excellent, straight six but he was unfortunately dismissed soon. The bowling credit goes to Dinker Rao who broke down 4 wickets for 45. The Agricultural College, batting next, declared at 158 for 3. Shiva Rao played a steady game and quickly scored 69 runs. Next to him came C. N. Babu and Kothandaraman with 43 and 16 respectively. As C. Ramaswami was run out very early, the visitors were deprived of a chance of seeing the test player's polished and brilliant batting.

Hockey. In the semi-final round of the Coimbatore Hockey Tournament, played on 27—10—37 on the Forest College Grounds, the Stanes High School defeated the Agricultural College by 1 goal to nil after an exciting contest.

Both the sides put up a strong fight. The winners combined well and scored their only goal just five minutes before the full time. The college players put up a good defence. K. K. R. Menon, the college goalie, saved a number of goals and but for him, the college would have fared worse.

The Victoria College, Palghat, played with the Agricultural College on the 7th inst. in connection with the Inter-collegiate tournament. The latter won the match by 6 goals to 1.

Having come out victoriously in the first match of the Inter-collegiate tournament the Agricultural College met the local Government College on the 15th instant. The match ended in a draw.

Visitors. The Honourable V. I. Munuswami Pillai, Minister for Agriculture and Development, visited the Central Farm, the College Dairy and some sections of the Agricultural Research Institute on the 30th of last month, along with Mr. N. S. Varadachari, Parliamentary Secretary.

Mr. N. S. Apte, Director of Agriculture, Gwalior, visited the Institute on 22—10—'37.

Mr. A. G. Beattie, Senior Agricultural Officer, Nigeria, arrived here on the 16th from Hosur. He visited the various Breeding Stations and the Research Institute during his stay here of about a week.

Academic Council. For one vacancy in the Council, consequent on the resignation of Mr. K. Raghavachari, Mr. H. Shiva Rao was elected.

M. Sc. Degree. We are glad to note that Mr. P. Abraham of the Cotton Section has been awarded the M. Sc. degree of the Madras University for his thesis on "*Studies on the anatomy of the cotton flower*".

RETIREMENT

Rao Bahadur N. S. Kulandaiswami Pillai, another "Saidapet Veteran" retired from service on the 9th of the month. Joining service as some of his predecessors had done in the Revenue Department he was like them deputed for training in the Saidapet Agricultural College. He served in the subordinate cadre as Farm Manager at Koilpatti and as a district work officer in the sixth circle till 1918 when he was promoted to the gazetted rank. He was confirmed as Dy. Director in 1931. Except for two breaks, one in connection with an enquiry

into the marketing possibilities of Tanjore rice in Ceylon and the other for the period he was acting as the Head quarters Dy. Director at Madras the whole of Mr. Pillai's service was spent in the V circle which comprises the districts of Trichinopoly and Tanjore, and the many improvements now in evidence in the agricultural practices of these two districts owe not a little to the indefatigable and persistant efforts and organising capacity of Mr. Pillai. In recognition of his good services the Government honoured him with the title of Rao Saheb in 1933 and that of Rao Bahadur recently. We wish him a long and happy retired life.

OBITUARY

It is with deep regret that we have to announce the death of B. Dasappa Malli on the 13th November at Coonoor where he was working as Agricultural Demonstrator.

Young in years and full of promise as a very capable propaganda officer it was a shock to us to hear of his untimely demise. We offer our sincere condolences to his relatives in their bereavement.

Weather Review—OCTOBER 1937.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	7·1	−0·9	41·4	South	Negapatam	11·6	+1·1	26·0
	Calingapatam	8·2	+0·2	29·7		Aduthurai *	8·6	+0·8	22·1
	Vizagapatam	9·2	+2·1	28·9		Madura	1·6	−6·2	14·9
	Anakapalli *	8·8	+1·1	40·0		Pamban	9·8	+0·8	25·3
	Samalkota *	8·4	−0·8	35·9		Koilpatti *	4·2	+8·1	15·6
	Maruteru *	10·4	+2·8	33·8		Palamkottah	7·8	+1·0	16·3
	Cocanada	10·3	+2·4	40·2					
	Masulipatam	10·0	+1·9	33·7					
	Guntur *	9·8	+4·1	32·3	West Coast	Trivandrum	12·8	+2·2	52·5
						Cochin	16·2	+3·0	118·6
Ceded Dists.	Kurnool	4·4	+0·9	22·1		Calicut	11·2	+1·0	121·7
	Nandyal *	3·7	+0·5	28·4		Pattambi *	17·4	+5·2	86·7
	Hagari *	2·4	−1·1	15·7		Taliparamba *	...	...	...
	Bellary	4·0	+0·1	15·0		Kasargode *	13·8	+3·0	167·3
	Anantapur	11·2	+7·5	30·9		Nileshwar *	9·3	0·0	150·1
	Rentachintala	...	...	...		Mangalore	9·3	−1·8	141·5
	Cuddapah	7·0	+2·0	21·3					
	Anantharaju-pet *	11·6	+9·7	29·5	Mysore and Coorg	Chitaldrug	2·3	−1·9	17·4
Carnatic	Nellore	11·1	+2·7	48·5		Bangalore	3·7	−2·2	29·2
	Madras	10·4	−1·3	29·5		Mysore	11·5	+5·2	37·9
	Palur *	8·4	−2·0	21·3		Mercara	8·4	0·0	115·7
	Tindivanam *	11·9	+2·7	28·7					
	Cuddalore	11·7	+0·7	22·8	Hills	Kodaikanal	12·9	−3·2	54·5
Central	Vellore	8·9	+2·6	33·3		Coonoor	11·0	...	46·9
	Salem	4·7	−2·0	24·4		Ootacamund *	8·4	+1·9	48·5
	Hosur *	3·3	+0·7	25·7		Nanjanad *	7·9	+0·5	43·9
	Coimbatore	5·1	−1·3	17·7					
	Coimbatore A. C. & R. I. *	3·5	−2·2	15·9					
	Trichinopoly	7·5	+0·6	32·8					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 published in Fort St. George Gazette.

The Bay depression which formed in the Southwest Bay of Bengal off Cuddalore, after moving westwards merged into the unsettled conditions off Malabar Kanara Coast, caused a cyclonic storm in the Arabian Sea centred near latitude 16°N, longitude 71°E on 4th. The storm later moved as a low pressure wave and induced a shallow depression over the North Deccan and got filled up on 7th near Pendra. On 12th, a trough of low pressure extended over the Bay of Bengal from off the Coromandel Coast to off the Arakan Coast, enclosing a small depression at each end of trough. The two depressions within the trough later coalesced together and developed into a cyclonic storm on 13th, which moved in the North-Easterly direction, causing widespread heavy rain in Bengal and Assam.

Thundery weather prevailed in the second and fourth week in certain portions of the Bay of Bengal and in parts of the Arabian Sea and the Andaman Sea.

The setting of the North-East Monsoon was recorded at the end of the third week. But the monsoon became fairly active in the South-West Bay and the

South of the Peninsula and caused fairly wide-spread rain in the southern half of the Peninsula, on 30th and 31st.

Thunder showers were very common throughout the Peninsula, during the last three weeks of the month and had, scattered and widespread thundershowers, in Malabar, Kanara, Mysore, and Madras.

Rainfall was generally in excess all over the Presidency and most markedly so in the Deccan Districts.

Chief falls reported were :—

Negapatam	4·4″	on 31st.
Cuddalore	5·8″	,, 1st.
Kodaikanal	3·5″	,, ,,
Pamban	3·8″	,, ,,
Trivandrum	4·8″	,, ,,
Maruteru	3·9″	
Anantharajupet	3·8″	
Tindivanam	6·6″	
Kasargode	4·3″	
Ootacamund	4·0″	

Special Reports of Heavy Rainfall.

Vanoor	7·6″	On 1st October.
Panruti	6·3″	
Villupuram	5·7″	
Tindivanam	5·0″	
Ulundurpet	5·0″	

Weather Report for the Research Institute Observatory :

Report No. 10/37.

Absolute maximum in shade	91°F
Absolute minimum in shade	65°F
Mean maximum in shade	86·9°F
Departure from normal	−0·9°F
Mean minimum in shade	70·6°F
Departure from normal	+0·4°F
Total rainfall	3·47″
Departure from normal	−2·28″
Heaviest fall in 24 hours	1·05″ recorded on 28th.
Total No of rainy days	8 days.
Mean daily wind velocity	1·0 M. P. H.
Mean Humidity at 8 hours	77·4%
Departure from normal	−1·5%

Summary. The mean maximum and minimum were almost normal. The mean Humidity was in defect by 1·5%. Rains occurred mostly during the first and fourth weeks of this month and the heaviest fall of 1·05″ was recorded on 28th. Rainfall was in large defect. P. V. R. & P. G.

Departmental Notifications.

Transfers.

Name of officer.	From	To
Mr. B. P. Papayya	A. A. D, Tadepalligudem	A. A. D. Chintalapudi (New Sub-circle).
„ T. S. Dakshinamurthi	A. D. Guntakal	A. D. Adoni.
„ C. Annamalai	A. D. Palmanier	F. M. Kalahasti.
„ K. B. Vydeswara Iyer	F. M. Kalahasti	A. D. Chengam.
„ N. V. Kalyanasundaram	A. D. Chengam	A. D. Palmanier.
„ M. Ratnavelu	A. D. Gingee	A. D. Tiruchengode.
„ K. M. Venkatachalam Pillai	A. D. Tiruchengode	A. D. Gingee.
„ T. Natarajan	F. M. A. R. S. Samalkota	Asst. L. A. Coimbatore.
„ M. C. Menon	F. M. Taliparamba	A. D. Calicut.
„ M. P. Sankaran Nambiar	A. D. Calicut	A. D. Tellicherry.
„ P. A. Narayana Nambiar	A. D. on leave	A. R. S. Taliparamba.
„ K. Krishnamurthi	F. M. Anakapalli	A. D. Parvatipur.
„ K. Suryanarayana	A. A. D. Parvatipur	A. A. D. Salur (New Sub-circle).
„ V. Suryanarayana	Asst. L. A. Coimbatore	A. D. Tadepalligudem.
„ T. G. Anantarama Iyer	F. M. Hosur	C. F. Coimbatore.
„ M. K. Swaminatha Iyer	F. M. C. F. Coimbatore	VI circle, Madura.

Leave.

Name of officer.	Period of leave.
Mr. V. Suryanarayana, A. L. A. Coimbatore	L. a. p. for 1 month from 23—10—37.
„ K. Sivasankara Menon, A. D. Perintalmanna	„ for 1 month from 3—11—37.
„ K. S. Ramanna Rai, A. D. Mudabidri	„ for 2 months from 12—10—37.
„ M. C. Krishnaswami Sarma, A. D. Dindigul	„ for 2 months from 5—11—37.
„ K. P. Anantanarayanan, Asst., Entomology-section	„ for 1 month from 3—11—37.
„ T. K. Mukundan, A. D. Wallajah	„ for 2 months from 20—11—37.
„ C. S. Krishnaswami, Asst., Mycology section	Extension of l. a. p. for one month & 13 days from 11—11—37.
„ D. Panakala Rao, A. D. Nandigama	L. a. p. for 1 month and 2 days from 22—11—37.
„ P. S. Narayanaswami, Physiological Scheme, Cotton section	L. a. p. for 1 month from 8—11—37.
„ M. Ratnavelu, A. A. D. Gingee	Extension of l. a. p. on m. c. for 2 months from 9—10—37.

ADDITIONS TO THE LIBRARY, OCTOBER 1937.

A. Books.

1. *California Soils.* Weir, W. W. & Storie, R. C. (1936). 2. *Land Value Rating.* Douglas, F. C. R. (1936). 3. *Farm Tenancy in the United States, 1918—1936—A List of Selected References.* Bercaw, L. O. O. (1937). 4. *The Coconut Industry of the Philippine Islands.* Cooke, F. C. (1936). 5. *Leguminous Forage Plants.* Robinson, D. H. (1937). 6. *Chrysanthemums.* Taylor, H. V. (1936). 7. *Domestic Preservation of Fruits & Vegetables.* Adams, Miss. M. L. (1937). 8. *Pyrethrum Flowers.* Gnadinger, C. B. (1936). 9. *The Mathematical Problem of the Price Index.* Montgomery, J. K. (1937). 10. *Outlines of Marketing.* Agnew, H. S., etc. (1936). 11. *A Book on Joshi's Modern Designs--Dwellings.* Joshi, K. C. (1937). 12. *The Farmer and His Debt.* Qureshi, A. I. (1934). 13. *Better Villages.* Brayne, F. L. (1937). 14. *Animal Breeding Plans.* Lush, J. (1937). 15. *Nervous Systems of the Ox (Anatomical Study).* Chelva Ayyangar, H. W. (1937). 16. *The Design and Analysis of Factorial Experimets.* Yates, F. (1937).

B. Reports.

1. Indore Institute of Plant Industry Progress Report for 1937. 2. Report on Demonstration Work carried out in the Western Circle of the Agricultural Department, Central Provinces and Berar, 1936. 3. Report on Demonstration Work carried out in the Eastern Circle of the Agricultural Department, Central Provinces and Berar, 1936. 4. Annual Report of the Royal Botanic Garden and the Gardens in Calcutta and of the Lloyd Botanic Garden, Darjeeling for 1936-'37. 5. 16th Empire Cotton Growing Corporation Annual Report, 1937. 6. Administration Report of the Acting Director of Agriculture, Colombo for 1935. 7. Malaya Agricultural Department Annual Report for 1936. 8. S. S. & F. M. S. Agricultural Department—Reports of the Field Branch for 1936. 9. Annual Report of the Agricultural Department, Uganda Protectorate, Part (I), 1936. 10. Kenya Colony and Protectorate Agricultural Department Annual Report, 1936. 11. British Guiana Administration Report of the Director of Agriculture for 1936. 12. Zanzibar Protectorate Agricultural Department Annual Report, 1936. 13. Trinidad and Tobago Administration Report of the Director of Agriculture. 1936. 14. Annual Report of the Director of Agriculture, New Hampshire, Agricultural Experiment Station for 1936. 15. 49th Annual Report of the South Carolina Experiment Station of Clemson Agricultural College for 1936. 16. Windsor Tobacco Sub-station Report for 1936.

C. Special Publications.

17. Report on the Preliminary Conference on the Better Utilisation of Forest Areas for Grazing. 18. Notes on Indian Tobacco (Supplement to Indian Trade Journal). 19. Report on the Punjab Erosion Committee, 1932. 20. India in 1934—1935. 21. Karachi Cotton Annual, 1935—1936. 22. Report on the Food Investigation Board for the year 1936 (England). 23. Proceedings of the 13th Annual Convention of the National Fertiliser Association for 1937. 24. 10th Annual Report of the New York State Association of Dairy and Milk Inspectors, 1936. 25. Fifth Annual Year Book of the Iowa Poultry Improvement Association, 1937.

D. Bulletins, Memoirs, Etc.

26. Factors affecting Spray Success in the control of Coffee Leaf Disease, *Mys. Agr. Exp. Stn. Bull. 15, 1937.* 27. Supply and Distribution of the Various Types of Indian Cotton during the season of 1935-36. *ICCC. Stat. Bull. 6, 1937.*

28. Co-operative Village Banks. *Reserve Bank of India, Agr. Credit Dep. Bull. 2.* 29. Soil Erosion; and 30. The Cultivation of Fruits in Ceylon, with Cultural Details. *Cey. Agr. Dep. Bull. 89 and 90.* 31. Antiseptic and other Treatments in the Storage of Trinidad Citrus Fruits with an Appendix on Mycological Notes on Citrus Wastage; and 32. Storage Investigations with Trinidad Citrus Fruits, 1935—1936. *Trinidad Low Temp. Res Stn. Mem. No. 5 and 6.* 33. The Variability of Plant Density in Fields of Wheat and its Effect on yield. *Austr. Comm. C. S. & I. R. Bull. 109.* 34. Cotton Variety Tests of 1934 and 1935; 35. Effect of Seed Treatments on Seedling Emergence, Severity of Seedling Blight and Yield of Rice; 36. Fertilizer Experiments with Cotton in Type-of-Farming Areas; 37. Growth and Fruiting Responses to Pruning and Defloration of Tomato Plants; and 38. A Study of Factors concerned with Rice Growth. *Arkansas A. E. S. Bull. 344; 345; 346; 347 and 349.* 39. Some Moisture Relations of the Soils from the Erosion Experiment Stns. *U. S. Agr. Dep. Tech. Bull. 562.* 40. Annotated List of the Insects and Mites associated with Stored Grain and Cereal Products, and of their Anthropod Parasites and Predators. *U. S. Misc. Pubn. 258.* 41. Soil and Water Conservation in the Pacific North-west. *U. S. Farm Bull. 1773.* 42. Marketing Policies of the California Walnut Growers' Association. *U. S. Farm Credit Admn. Bull. 10.* 43. Transportation of Milk in the Philadelphia Milkshed. *U. S. Farm Credit Admn. Bull. 13.* 44. Scientific Irrigation Management. *Hawaii A. E. S. Bull. 52.*

E. Circulars, Leaflets Etc.

45. Brief Instructions for the Guidance of Lay Persons regarding Improvement of Animal Industry, Chiefly Cattle Sheep and Poultry; and 46. Some Do's and Don'ts in Regard to Poultry and Sheep Breeding. *Mys. Agr. Dep. Cir. 56 & 58.* 47. Traps for the Black Beetle Pest of Coconut Palms; 48. Paddy Cultivation (How to obtain a Higher Yield); 49. Useful Live Fence-posts for Coconut Areas; 50. The Oil Treatment for Killing Diseased Plantain Plants; 51. The Planting of Young Trees; 52. Soil Erosion—General Considerations; 53. Pseudo Fowl Pest; 54. The Coffee Berry-borer; 55. Pink Disease, A Common Disease of Fruit Trees; 56. Pine Apple Cultivation; 56(a). Breeding Places of the Black Beetle of Coconuts; and 57. The Principles underlying Spraying for the Control of Plant Diseases. *Cey. Agr. Dep. Leaf. 92, 93, 94, 95. 96, 100, 101, 103, 104, 107, 108 and 116.* 58. Fowl Pest; 59. The Potato Root Eelworm; and 60. The Chrysanthemum Midge. *Eng. Min. Agr. & Fish. Adv. Leaf. 281. 284 and 286.* 61. Sea Island Cotton Culture. *Geor. Agr. Exten. Ser. Cir. 268.* 62. Tree Root Systems. *N. Dak. Exten. Ser. Cir. 152.* 63. The Relation of Rainfall to the Development of Late Blight of Irish Potatoes in the Coastal S.ction of South Carolina. *S. Carolin A. E. S. Cir. 57.* 64. Tobacco Shrinkages and Losses in Weight in Handling and Storage; and 65. Artificial Drying of Forage Crops. *U. S. Agr. Dep. Cir. 435 and 443.* 66. Production of Egg Plant. *U. S. Leaf. 131.*

Rural Reconstruction Overseers.

Extract from G. O. No. MS. 1221 dated 1st June 1937—Development Department.

Sub:—District Economic Councils—Establishment—Overseers—Appointment of—Certain districts—sanctioned.

In order to help District Economic Councils in carrying out their programme of rural reconstruction, the Government are pleased to sanction the appointment under the President of the District Economic Council of a Rural Reconstruction Overseer for a period of one year from the date of employment on a pay of Rs. 50—4/2—90 per mensem in the following districts:—

1. Nellore,
2. Cuddapah,
3. South Arcot,
4. North Arcot,
5. South Kanara,
6. Chittoor,
7. Kurnool,
8. Madura,
9. Kistna,
10. Malabar and
11. Ramnad.

The Overseers will be appointed either by direct recruitment or by transfer as and when required by the President, who will be the appointing authority. No consultation with the Madras Public Service Commission will be necessary. The candidates should possess the qualifications prescribed for candidates for selection for appointment as Minor Irrigation Overseer, P. W. D. Overseer or Agricultural Demonstrator. No age limit will be prescribed. The President should arrange to give the selected candidate a course of training in rural reconstruction work and also in elementary town planning as applied to villages. During the period of training a direct recruit will be paid Rs. 35 per mensem only.

2. The Overseers will draw travelling allowance under the Madras Travelling Allowance Rules. The pay and allowance of these officers will be debited to "47. Miscellaneous Departments—g. Bureau of Commercial Intelligence including Statistics—B. District Economic Councils—Establishment—Voted."

3. Necessary special rules including these posts in the Madras General Subordinate Service will be issued in the Public Department. This order should not be given effect to before the issue of these rules.

"True Extract"

Institute of Plant Industry, Indore. C. I.

Research Studentships. Two research studentships in Genetics and Plant Breeding carrying an honorarium of Rs. 50 per mensem in the first year are offered at the above institute by the Indian Central Cotton Committee. Candidates should possess an M. Sc. degree or honours B. Sc. degree in Botany. B. Sc. (Agriculture) and B. Ag's will also be considered but *all* applicants must produce evidence of special training in Genetics and Plant Breeding or Experimental Statistics. Forms of application and particulars of the conditions of tenure may be obtained from the *Director, Institute of Plant Industry, Indore.* Applications should reach Indore not later than December 31st, 1937. The successful candidates will be required to take up their studentships on April 1st. 1938.

(Sd.) T. R. Low,
Director,
Institute of Plant Industry.