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CONTENTS

Editorial.

The Irrigation Problem. Irrigation plays so large a part in Indian agriculture that an examination of its present position and future possibilities is highly important. The several irrigation works that have been constructed vary in their scope and are expected to meet the following requirements: (1) to supply water to the land where the normal rainfall is insufficient, (2) to supplement rain which though sufficient may be precarious and (3) to serve more as a precaution against famine than as a requirement of a normal year. There has been considerable development of irrigation since the examination of the position and the preparation of a report by a special commission in 1903. Except in certain most favoured tracts the absolute security of the harvest throughout India depends upon the existence of some form of irrigation. The recent developments notwithstanding, the possibilities of the extension of irrigation are still so great.

The percentage of area under irrigation to the total cultivated area is nearly 30 for Madras, the figure being higher in three other provinces, Bombay including Sind, the Punjab and the North Western Frontier Province. As regards the total area under irrigation, Madras takes the second place among the provinces, the Punjab having a 20 % greater area than Madras. The irrigated areas of Madras under tanks are as extensive as those under canals. Nearly 2·5

million acres of fertile deltaic land have been afforded the benefit of an assured supply of water by the irrigation systems of Godavari, Kistna and Cauvery. Until very recently the only one successful example of a storage reservoir has been the Periar system. The Cauvery-Mettur project which has just been completed is intended to improve the existing water supply of a million acres already under irrigation (Old Cauvery Delta) and to bring under irrigation another 220 thousand acres. Two other projects are under the consideration of Government, namely, the Tungabadhra and the Lower Bhavani. The former is a major one and is expected to cover a large area, nearly 1,600 square miles, in the districts of Bellary, Anantapur and Kurnool, a tract liable to scarcity and famine. The latter is intended to irrigate about 200 thousand acres in the Coimbatore district.

Hitherto the projecting of new irrigation schemes has remained a concern mainly of the Irrigation Department. Helping the agriculturist by providing him with an assured supply of water is no doubt the function of the Irrigation Department but every scheme of irrigation presents its own special agricultural problems. There are questions connected with the suitability of the soil for irrigation including the conformation of the subsoil, and problems relating to the nature of the crops that would be grown and the character of the supply that would be required of them. It is the Agricultural Department that can give expert advice on these points and obviously there is every necessity for the two departments, Irrigation and Agriculture, to collaborate in launching any new scheme of irrigation. That such collaboration and consultation between the departments concerned did not exist in earlier years was evident from the evidence presented before the Royal Commission on Agriculture, and the Commission have in their recommendations pointed out the desirability of establishing closer relations between the departments. There have been instances though outside Madras where the lack of such consultations has resulted in the failure of particular schemes. In the Punjab two years after the colonisation of the Lower Bari-Doab Canal area was commenced, a soil survey of the tract revealed the fact that the area of the cultivable land was very considerably less than what had been anticipated. Nearer Madras, in Mysore, we know that one of their earlier projects, the Marikanavai, was not as successful as was first considered to be, as a good portion of the area was not suitable for intensive cultivation. They however took a lesson from this and had a thorough soil survey made of the area to come under irrigation in their later Krishnarajasagara project to determine the nature of the soil and the crops to be grown.

There is now in Madras a special Irrigation Board of which the Director of Agriculture is a member and the Agricultural Department

is consulted in considering every new scheme of irrigation. Conducting soil surveys by the Agricultural Department has come into prominence in this Presidency in connection with the three projects, Cauvery—Mettur (already completed), Lower Bhavani and Tungabhadra still under consideration. The survey has as its object the study of the following factors :— (1) the presence of soluble salts and their possible effect on irrigation, (2) nature of subsoil, whether it permits of easy drainage or not and (3) the nature of the profile down to the greatest possible depth to which the irrigation water is likely to penetrate. This study may yield data as to the suitability of the land for irrigation and the type of crop to be grown. The requirements and the nature of irrigation should obviously vary for crops like sugarcane, rice, cotton and millet.

In older schemes the new area brought under irrigation was invariably devoted to rice and even in the Cauvery—Mettur project a good portion of the area is expected to be put under rice. Though rice is the easiest of the crops to grow provided there is an assured supply of water, in these days of severe depression we have to consider what crops can be grown which are likely to bring a greater return to the cultivator. Obviously it is the duty of the Agricultural Department to try and find out the most advantageous cropping to be followed in the new area and it is well that a demonstration farm has been started for the Cauvery—Mettur area in the Tanjore district. We also know that it is at the suggestion of the Agricultural Department that the time of water supply to this new area was changed from September to July as the former period was definitely unsuitable for a rice crop. Though this scheme has been brought into existence already, the concerned survey was only carried out recently by the Government Agricultural Chemist, and we understand that the analytical work is still in progress.

The Lower Bhavani project is a new departure as it is primarily intended for the irrigation of dry crops. The survey of the area to come under irrigation has already been completed and a preliminary report of the same can be found elsewhere in this issue. As regards the Tungabhadra project it has to be considered more as a protective scheme rather than a productive one as the area to come under the project is subject to recurring famines and we are actually experiencing one such just now. More than 50 per cent. of the area in this project is black cotton soil and there have been differences of opinion whether this soil is suitable for irrigation. The black soils are generally fertile and of high moisture holding capacity and should respond to irrigation but we can probably be absolutely sure of it only after the survey which is just being undertaken by the Agricultural Chemist has been carried out and the data collected. So long as rice is not the main crop to be grown in this area, this question of the suitability of the soil for irrigation is probably not of great importance.

Connected with the irrigation projects there is the question of making the most economic use of the water supplied. That there is an undue wastage of water in the canal irrigated tracts is recognised but probably the cultivator cannot be blamed entirely for it. Sometimes it is the uncertainty of the supply that is the cause of such wastage. With regard to rice growing however, we cannot ignore the two considerations, namely, the fertilising value of the silt brought down with the irrigation water and the beneficial effect on the crop of a constant change of water in the fields. It is known that too much and indiscriminate use of water in certain soils brings about harmful effect on the soil. It is pointed out by experts that the marked deterioration of some ten per cent of the total area commanded by the Deccan canal in the Bombay Presidency is largely attributable to this cause. This naturally takes us on to the important question of proper drainage to the areas brought under irrigation. We are almost certain that several of the troubles which have arisen in the irrigated tracts in regard to water-logging and formation of alkali lands have been brought about by the failure in the past to consider and pay sufficient attention to the natural drainage of the tract simultaneously with the irrigation proposals Among the industrial crops sugarcane is very sensitive to the want of drainage and in fact the absence of proper drainage facilities is the limiting factor to the successful extension of the area under this crop in several parts of Madras. Rice is probably the only crop which is not so sensitive to defective drainage. In Java, for instance, the extension of sugarcane cultivation has gone hand in hand with special drainage schemes and the charting of drainage maps.

Connected with the question of irrigation comes the water requirements of crops about which our knowledge is still very limited. In Madras, the duty of water has been determined roughly for the chief crop, rice, by the irrigation authorities mainly with a view to regulate the size of the sluices and sub-channels to take the water through to the fields. Even these rough figures are not available for other crops. It is only recently that regular field experiments have been started in the different agricultural research stations to determine the quantity of water required for crops like rice, cotton, sugarcane, millet, etc. There is a special irrigation experiment which is being run by the Deputy Director of Agriculture, Eighth Circle, in Coimbatore District to determine the water requirements of crops like, cotton, groundnut, tobacco, ragi (E. Coracana) etc. which are to be grown in the new Bhavani project area. These experiments in progress can only be considered the beginning of a vast subject and experiments both in the laboratory and fields are necessary with regard to elucidation of points like: (1) the relation between the quantity of water supplied and the amount of produce obtained from the different

crop plants, (2) the critical stages in the plant's development in relation to its water needs, (3) varietal differences in crops with regard to their water requirements and (4) relation between the climatic factors and the agronomical practices with water requirements. While all the above relate to the agricultural side, there are questions connected with the physical and engineering problems which require investigation. These are the study of the movements of the water table and their effect in producing waterlogging or dessication, improved methods of irrigation both as regards the distribution of water by modules and the lay out of land for irrigation and hydrodynamical problems connected with such questions as the design of irrigation works and water-borne silt. The Punjab is the only Province which has got a separate section to carry on researches in irrigation problems and it is possible some of the results obtained there might be applicable to other parts of India as well. Though the results obtained by the researches are not likely to be of any immediate value in the irrigation systems already in use, they may be found useful in designing future irrigation projects.

It was the great importance of the subject, irrigation, that made the Madras Agricultural Students' Union choose it for a symposium during its annual conference in last December. We should like to draw the attention of our readers to two of the papers contributed to this conference and published elsewhere in this issue.

CERTAIN FACTORS AFFECTING THE MARKETING OF COCONUTS

BY J. S. PATEL, M.Sc., Ph. D.,

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With reference to the magnitude of trade, coconuts, copra coconut oil, coir and coconut cake are important products. During the last four to five years the Indian consumption of nuts has increased rapidly. This is partly accounted for by the fall in the prices of nuts and the consequent attempt on the part of the producer to dispose of his produce in the most remunerative manner. When the price of copra is low the producer is able to realise more money by disposing of the nuts as whole nuts for edible purposes. Excluding Madras, Hyderabad, Mysore and Travancore the consumption of nuts for the remaining parts of India is about 150 million nuts per annum. India imports annually about 12 million nuts from foreign countries. The imports, however, have not increased appreciably in recent times. It is interesting to note that India has been the net importer of coconuts since 1900, in spite of the fact that at one time there were large exports of coconuts, copra and coconut oil from India. The imports of nuts therefore may be said to be due to the proximity of nut producing centres as well as due to the traditionl channels of trade. In the exports of nuts the district of Malabar is most important. The total exports from the ports in Malabar averaged to about 100 million nuts per annum. The most important nut exporting centres are Calicut, Badagara, and Ponani, Calicut alone exporting about 50 million nuts.

Types of nuts. There are two distinct types, the dry and fresh or green. The dry nuts that are commonly called "Kottai" are the nuts which are stored for generally 8 to 12 months. These are lighter for transport and can be kept for a longer period without deterioration. The demand for these stored nuts is mainly from the Punjab and the U. P. and the supply is mainly from Malabar and Mysore. The price for stored nuts is generally Rs. 5 per 1000 higher than the price for fresh nuts. The nuts are graded according to the size by the exporters and the grades are known by the number of nuts in a standard gunny bag. The grades vary from 110 to 400 nuts per bag. The prices are generally higher for the bigger nuts. The nuts are also classed according to the nature of husking, the grades being from costliest to the cheapest; unhusked, slightly husked, partially husked, and fully husked.

Price of nuts. The price of stored nuts is based on the prices of edible copra, and the prices of fresh nuts which are intended for up country consumption are slightly higher than the prices of fresh nuts

which are converted into the crushing quality of copra. Markets obtain their supplies from more than one centre of production and therefore the price at any one centre of production is affected by the changes in the prices at other centres of production. Bengal, Orissa, Godavary, Mysore and Malabar supply fresh nuts to Northern Indian markets. The prices in Bengal are affected by the prices in Orissa which depend upon the prices in Godavary district. The prices in Godavary district also affect the prices in Tanjore and in turn are affected by prices in Mysore. The prices in Mysore must be competitive with the prices in Malabar. Thus the prices all over India are governed by the price on the West Coast.

Prices and freight. The coastal freights for nuts are not heavy as keen competition between the country crafts and among the steamship companies act as safeguards against uneconomic freights. Internal transport excepting in Bengal is however, by rail and the freights largely make up the cost of the nuts. The railway freights on nuts are the highest in South Indian, and the Nizam's State Ry. And these are higher by about 50 per cent than in other railways. The example of the exports from Tanjore District is a typical case of the effect of railway freights on trade. There are specially reduced rates from a number of centres in Tanjore to Madras Beach. The reduction, however, is not the same for all the stations. It varies from 21 per cent to 37 per cent of the original scheduled railway freights. The effect of this is to unnecessarily favour certain exporting centres. The reduced rate, however, is only applicable to Madras Beach and the cost of carrying nuts to, say, Chingleput would be more than the freight for Madras. The effect of this anomalous position has been to divert all the trade with intermediate stations to Madras with consequent flooding of the Madras market. The special rates are not in direct proportion to the distance; even though Thillaivilagam is nearer to Madras Beach by 25 miles than Kulikarai the freight per maund from the former station is Rs. 0−10 - 8 as against Rs. 0−8 2 for Kulikarai. The freight charges in spite of the reduction work out to about 55 to 72 per cent of the present value of the nuts in Tanjore, even though the distance between the exporting centre and Madras Beach is not more than 250 miles. It must also be remembered that this is with reference to a district the exports from which by sea are possible. In 1932 the total exports of nuts to Madras Beach from the important trade centres in Tanjore District amounted to 1·6 millions while in 1933 the exports from the same centres amounted to 6·4 million nuts. Thus the effect of the reduction in the freight has been to increase the trade with Madras by 400% mainly through diversion from other centres of consumption.

Copra. There are mainly two types of copra; crushing and edible. Each of this type has a number of grades mainly depending on the

moisture content for the crushing quality of copra and depending on the size for the edible grades of copra. The prices of edible grades are purely governed by the law of supply and demand. It is obvious that the prices of the edible copra cannot fall below the prices of crushing grade copra.

The prices of copra depend upon the prices of oil and cake. A ton of copra when crushed ordinarily yields 12½ cwts of oil and 7 cwts of cake. The price of copra therefore should be the price for 12½ cwts. of oil, 7 cwts. of cake minus the cost of crushing. In actual practice, however, this relationship is not sometimes maintained exactly. Under these circumstances the oil miller suspends the purchase for crushing or only purchases copra in order to meet his forward contract for the delivery of cake and oil. On an average the oil mills on the West Coast obtain Rs. 4 per candy of copra crushed. 82½ per cent. of the total consumption of copra in India is consumed by the oil millers on the West Coast. The total consumption of copra in India may be estimated at 200,000 tons per annum. Out of this quantity about 25,000 tons may be estimated as being consumed as whole copra. The remaining 175,000 tons of copra are crushed in the oil mills. The quantity that will be crushed on the West Coast must be about 165,000 tons. It is therefore clear that the amount of copra consumed as copra is comparatively very little. In the marketing of copra, therefore, the most important point to be considered is the ability of the oil millers to purchase and crush copra.

To enable the oil miller to crush copra, there must be a market for his cake and oil, and the prices of copra, oil and cake should be so related that he is able to obtain the cost of crushing. There is no doubt that there is adequate market for the oil that is produced by these mills. There is also a fairly good market particularly in Bombay and Kathiawar for the disposal of the cake. But this market is limited and it must be remembered that every district in India has supply of local cake and the substitution of one cake by the other is extremely difficult if not impossible in India in the absence of organised dairying. The fall in the prices of cereals and the policy of the Governments to promote the consumption of home grown stuff as cattle feed has led to a reduction in the consumption of cake on the continental markets. The European market therefore for the cake is restricted. But the present Indian exports to Europe of coconut cake is so small that this is not a factor which reacts detrimentally on the copra crushing industry. It might then be asked, what the difficulty is which the oil miller has to face, and through the oil miller the producer has to meet. There is considerable difficulty in covering the cost of crushing copra. And there are a number of factors which have led to the present position. The first oil mills were established in Cochin and Ernakulam—the places which were then, the most important centres of trade in

copra. Subsequently mills have sprung up in the centres where copra is produced. These mills have been able to compete with the mills in Cochin and Ernakulam as they directly purchased copra from the middlemen, while the mills in Cochin have to obtain copra after paying freight charges for its conveyance to Cochin.

The total capacity of the West Coast mills for crushing copra has been far in excess of the Indian requirement of oil and cake. In 1932 the power driven mills on the West Coast worked to less than 50 per cent of their full capacity, while their crushing capacity is 270,000 tons per annum, they crushed about 130,000 tons of copra only. Of the mills on the West Coast, the mills in Cochin and Malabar worked to only 35 per cent and 45 per cent of their full capacities while the mills in Travancore worked 65 per cent of their full capacity. That while the mills in Cochin and South Kanara are working to only about 1/3 their full capacity the mills in the neighbouring State of Travancore are working at 2/3rd of their capacity is a point that needs careful examination. The differential export duty on oil in Travancore, in fact subsidises the oil crushing industry in that State. Copra, coconut oil, cake and nuts are subject to export duty when exported from this premier coconut growing state. The actual amount of duty, however, is more on copra and nuts than on its equivalent of oil and cake. In exporting a ton of copra a duty of about Rs. 7 more has to be paid than in exporting its equivalent of oil and cake. This practically amounts to a subsidy of Rs. 7 to the oil miller for every ton of copra crushed. This subsidy is ultimately paid by the producer. Thus the oil millers in Travancore are able to successfully compete with the oil millers on the West Coast. The effect of this competition may be beneficial to the consumer but is certainly harmful to the producer. It is not difficult to visualise the chaos that would be caused through the price war between the oil millers in Travancore on the one side and the oil millers elsewhere in India when the crop is plentiful. Apart from the local markets in South India for oil and cake the most important markets for oil are Calcutta, Bombay and Karachi, and for the cake Bombay and Karachi. Thus Calcutta wants only oil while Bombay wants both oil and cake and Karachi requires oil and some cake. The coastal freights are such that it is cheaper to ship copra rather than oil and cake. This has resulted in the establishment of copra crushing industry in Bombay and Karachi as the millers obtain in addition to the cost of crushing the benefit of cheaper freights on copra. The millers in Bombay and Karachi stand to gain to the extent of about Rs. 4 per ton by purchasing copra from the West Coast instead of obtaining oil and cake from the West Coast. This has then set up another competition for the West Coast oil millers.

The freights from Colombo to the important Indian ports are lower than the freights from the West Coast ports. Particularly so

in the case of oil. This is so much that the Bombay oil miller finds it costlier to import copra than to import oil. For every ton of oil that he obtains from the imported copra he stands to lose Rs. 1—12—0. In addition to the lower freights for oil the lower import duty on oil reacts detrimentally in the oil milling industry. Roughly the price of the cake covers the cost of crushing. The price of copra therefore should be purely based on its oil value i. e., the price of copra should be 60 per cent of the price of oil. Or in other words the price of oil should be 166 per cent of the price of copra. The duty on oil therefore should be 166 per cent of the duty on copra. But this has not been the case up to 1933, and up to that period the imports of oil into India were very large as compared to the imports of copra. Even at present when the low freights are taken into consideration it is cheaper to import oil from Ceylon than to import copra. The freight for a ton of oil from Ceylon to Bombay is only Rs. 7-8-0 while from Cochin to Bombay a shorter distance it is as much as Rs. 12 i.e., a difference of Rs. 4-8-0. The effect of these freights has been to close down our markets particularly in Calcutta and Rangoon.

We have seen that the price of copra depends upon the price of coconut oil and cake. It has also been mentioned (1) the establishment of oil mills in the centres of consumption namely Bombay and Karachi, (2) the preferential export duty on oil from Travancore and (3) the low freights from Ceylon as compared with the Coastal freights are the factors which adversely affect the coconut industry and therefore the producer.

Ultimately the Bombay price for the coconut oil is the price in Ceylon plus the import duty, plus the freight and incidentals. The price on the West Coast should therefore be the Bombay price minus the freight and incidentals. It is evident that the price of the coconut oil on the West Coast will be affected by a change in any of these four factors viz., the price in Ceylon, the import duty, the freight from Ceylon to India and the freight from West Coast to other Indian ports.

THE DRAINAGE ASPECT OF IRRIGATION.

By B. VISWANATH, F. I. C, F. C. S.

It is very kind of the Secretary of the Union to have invited me for the College Day and Conference and to take part in the symposium on irrigation this morning. I regret to have to deny myself the pleasure of attending the functions, but I am glad of the opportunity to associate myself once again—though from a long distance -with this function and to give a paper for the symposium.

I have been asked to contribute a paper on any aspect of irrigation. In recent years, I have had occasions to participate, as Agricultural

Chemist to the Government of Madras, in discussions on soils and irrigation in connection with the new irrigation projects in the Presidency and to lay down a scheme of soil survey and irrigation research. The discussions on the importance of drainage in an irrigation system as a preventive and curative measure against soil deterioration being still fresh in my mind, I have chosen the drainage aspect of irrigation for my theme.

Drainage is an aspect of irrigation which, unfortunately, did not receive the attention it deserved in the execution, in the past, of the irrigation projects in several parts of the country. As a result of this neglect, the public and the Government are becoming more and more alive to the troubles involved and are anxiously striving to at least mitigate the evil effects of irrigation.

The Evil consequences of irrigation systems with inadequate and inefficient drainage provision are well known to those who have experience with the working of the old irrigation projects in the Godavari, Krishna, Guntur, Tanjore and Madura districts in the Madras Presidency, and of those in Bombay and the Punjab. When I was working in Mesopotamia, I could realise the extent to which damage by irrigation could go. In that ancient land, whose praises were sung as the Garden of Eden, the barren and desolate country of the present day, stands vividly in contrast to its ancient richness and prosperity, as witness to the fact of man's inability to use wisely the advantages which nature has conferred.

In bringing under irrigation an area that has been cultivated under rainfed conditions, we are upsetting the equilibrium between the soil, climate and crop. This equilibrium is the result of natural adjustment of the several agencies through a long series of years. Compare for example the low rainfall area of the Ceded districts and the high rainfall region in the West coast of the Presidency. In the one case baking heat alternated with low rainfall has developed a state of soil and sub-soil with good retentive capacity for water, while in the other the soil is porous with poorer retentive properties. When irrigation is super-imposed over conditions as in the former, a steady accumulation of underground water occurs, ultimately leading to waterlogging and the formation of saline and alkaline soils.

A soil under irrigation is not a simple existence of the two components, water and inert solid matter lying side by side. The two components are subject to a series of very complicated interactions brought about by frequent irrigations and intensive cropping. The intensity and the result of these reactions depend on the relative amounts of the interacting compounds and on their chemical composition. Sooner or later the result will be the development of saline and alkaline conditions in the soil, slowly but steadily followed by a

rise in the sub-soil water level. The behaviour of the salt laden soil depends on whether the soil is put under continuous or intermittent irrigations in a given season or year. Under continued irrigation conditions alkalinity will be more in evidence and salinity is diminished owing to dilution and hydrolysis. Under intermittent irrigations alkalinity is diminished, but salinity may attain highly injurious concentrations. If the soils and waters are rich in sodium salts, coupled with low calcium concentrations, there occur a series of base-exchange reactions by which the composition of the soil clay is altered and the soil is rendered impervious. Uuder such conditions soil management would be difficult and the result would be that in course of time the soil would deteriorate even to the extent of becoming infertile.

When the soils are rich in calcium salts, there is no marked change in the composition of the soil clay and the trouble is chiefly due to excessive salt concentration in the soil water. In such soils, at the time when water is applied evaporation is high. Percolation will also be rapid, but very soon the soil is left containing an amount of water equivalent to the saturation capacity of the soil. The phase that follows is one of decreased evaporation and diminished percolation, both going on at a steadily diminishing rate until the water content is reduced to the neighbourhood of minimum capillary capacity. The position now is that the soil particles are surrounded by films of water containing the salts in solution. The power of the root-hair to take water from this film depends on the difference in the osmotic pressure between the cell sap and the water film and on the force with which the water is held to the soil particle, which force depends on the surface tension of the soil solution. Unless the salts are taken away from the sphere of activity, the surface tension increases. The loss of soil water decreases as the concentration of dissolved salts increases, and the effect of this is to increase the water holding capacity of the soil and at the same time to decrease the availability of the water to the plant. To prevent this condition arising, more and more irrigations will have to be given and with each irrigation and rainfall the sub-soil water level continues to rise rapidly. Nearly a third of the irrigation water applied finds its way to the underground water table. With the rise in the level of the underground water, the salts are carried to the surface and the problem then is to lower the sub-soil water level to such a depth that goes beyond the root zone of the crops. This can be done by drainage only.

It is, therefore, seen that water, the only vehicle by which nourishment can be conveyed to the plant, is capable of doing immense harm when it is redundant and stagnant. It is then unfavourable to vigorous and healthy plant growth, makes the surrounding atmosphere damp and humid and unhealthy to human beings, live stock and plant growth.

When once salts are allowed to accumulate in the soil and the damage is done, it is a difficult and tedious and expensive process to effect improvements and bring the soil back to its original state by means of drainage. Drainage as curative process is many times more difficult than drainage as a preventive method. Because, by then, the general rise in the water table would have taken place and an equilibrium would have been established in the system, and the flow of the ground water as relieved by drainage and evaporation from the soil will be equal to the volume of water continually added by irrigation and rainfall. Besides, the base-exchange reactions occuring in the soil would have made the soil practically impermeable to water.

The provision of a system of drainage, simultaneously with the execution of an irrigation project, will render the transition from stagnant saturation to drainage saturation simple and easy and will constitute an efficient protective measure against deterioration. To produce efficient drainage both underground and surface water must be dealt with. It is not possible to wash off surface accumulations of salts by a sudden rush of water over the land into an open drain. Although this has been practised with fairly good results, the effect is only temporary. An examination of the soil always showed that the salts were merely washed down into an insignificant depth only to rise again as soon as the soil is left to dry. Drainage of percolation water is necessary for the removal of the salts outside the sphere of activity. The truth of the fact in hydraulics that the velocity of a stream of flowing water is decreased in proportion as the area of the channel in which it flows is increased, is likely to prove useful in adjusting the shape of the drains with due regard to the slope of the land in designing an effective drainage system. Any method of field drainage requires in the long run a main drainage system over the entire area under the irrigation project. This can only be provided as a Government undertaking.

An efficient system of drainage keeps the soil sufficiently permeable to air and prevents its being saturated with water. The soil is thus in a fit state to be worked on the surface into a fine tilth. In this condition it is fit to take moisture, other than rain, from the atmosphere, which is a constant and inexhaustible vehicle for water vapour. The process of deposition of dew, is dependent on the relative temperatures and on the degrees of aqueous repletion of the air and soil at a given time. This kind of moisture absorption is more in evidence with the soils of Hagari, which may be considered as representing the type of soils of the Tungabhadra project area. In this area the temperature of the soil during the day is moderated, by the evaporation of a large amount of water vapour, whilst the humidity lost is replaced by the dew deposited during nights. The amount of dew deposited can be judged by an inspection of the fields early in the morning and before sunrise. The relative powers of soils to absorb water from

the atmosphere have been ascertained to vary from 26 tons to 36 tons of water per acre of soil.

It is obvious that well pulverised and cultivated soils attract much more dew than those which are compact and close. If under irrigation there are facilities for the rapid removal of surplus water by surface and percolation drainage, the soil would soon be fit for working and being brought into a condition to absorb the dew, thus indirectly contributing to the economic use of irrigation water.

Drainage, therefore, is a good protective measure and a doubtful curative agent for the evils that necessarily arise from irrigation. The provision of a sound drainage system should be done with due regard to the depth, composition and distribution of the deposits of soil and subsoil. Much has yet to be done by soil scientists and drainage engineers before land drainage in this country can be put on a scientific basis, affording data by which the various classes of soils can be drained with the maximum efficiency and minimum expenditure. In this then, as in other departments of Agricultural Science, we see that though much has been done, more yet remains to be done. We have as yet taken a few onward steps and the direction of further advance—dictated at once by policy and business exigencies—should be by painstaking research coupled with sound reasoning based on mature experience and judgment.

SOIL SURVEY OF THE LOWER BHAVANI PROJECT AREA

By T. LAKSHMANA RAO, B.A., D.I.C. & M. R. BALAKRISHNAN, B.A., B.Sc. (*Ag.*)

The object of this paper is to give in a succinct form the work of an Agricultural Chemist and the necessity for consulting him in launching any new irrigation project. With this purpose a descriptive account is given of the work done by the Chemistry Section here in connection with the Lower Bhavani Project.

This project aims at constructing a dam across the river Bhavani at a place 9 miles west of Satyamangalam and taking a channel from there across the country in a south-easterly direction to join the river Cauvery somewhere near Kodumudi. The strip of land which thus lies between this channel on one side and the rivers Bhavani and the Cauvery on the other is about 60 to 70 miles long and of an average breadth of 4 to 5 miles. The total area which will thus get to be under irrigation when the channel becomes a *fait accompli* will be about 200,000 acres, the main crops being millets, nadam cotton and occasionally groundnut. There is no doubt that when the area comes under irrigation we will be greatly adding to the prosperity of the whole tract by enabling ryots to go in for more paying crops which for want of water they are unable to raise now.

The Tract. The whole area is an extremely undulating one with numerous elevations and depressions and cut up at intervals by small water courses. The soil with very few exceptions is lateritic throughout, red in colour, sometimes loamy, but often sandy or gravelly and largely admixed with fragments of quartz which may often be seen thickly covering large areas presenting a characteristic feature. The soil is generally shallow varying in depth from 9 to 27 inches, 17 inches being the average of the rainfed area. In gardens under well irrigation which are often situated in hollows the soil is deeper and finer in texture. In no case, however, was it found to extend below 4 feet. The parent rock which is usually struck before the depth is reached is gneiss, sometimes massive and granitic in character, especially at lower depths and at other times stratified in layers which may be horizontal or inclined or compressed in folds. Before the parent rock is struck however, a layer of friable weathered rock is struck of varying depth just below the surface soil. Sometimes a compact layer of fragmenting quartz also occurs just underneath the surface soil and above the decomposing rock. The soil profile therefore, characteristic of the tract, could be described in the following terms:

0—17 inches.	Red loam, often sandy or gravelly.
17—30 inches.	Layer of broken quartz and crystalline felspar.
30—36 inches.	Red silty loam.
36—45 inches.	Weathered friable rock.
Below 45 inches.	Hard parent rock.

The shallow nature of the soil connotes a limited amount of weathering accounted for partly by the contour and general slope of the land favouring a large run off and partly by the limited rainfall and the quartzose nature of the parent rock. Erosion by carrying away some of the surface soil would further account for the limited depth of the soil.

Soil Survey: For purposes of survey soil samples were taken from spots roughly about 3 miles distant from each other and for the most part from areas devoted to the raising of dry or rainfed crops. Samples were taken at 9 inches depth down to 27 inches. Samples were drawn at intervals adjoining garden areas under well irrigation to see what changes, if any, the soil had undergone as the result of irrigation and cultivation. Altogether about 200 samples were thus drawn. The work done in the laboratory on these samples comprised the following:

1. Mechanical analysis into the usual fractions, viz., fine gravel, coarse sand, fine sand, silt, fine silt and clay.

2. Determination of certain factors relating to the water relationship to the samples, viz., maximum water holding capacity, pore space, volume expansion and apparent and real specific gravity.

3. Determination of moisture in the air dried sample and loss on ignition.

The actual details of the methods employed will not be given here, but an attempt will be made to illustrate how the several figures obtained could be used with advantage in getting an idea of the water requirements of soils of this type.

The mechanical analysis shows that the majority of the samples contains over 85 per cent of coarse fractions, i. e., gravel, sand and fine sand. Of the remaining 15 per cent of fine fractions the average clay is only 4·5 per cent which is a very poor content of clay and indicates an extremely poor capacity for absorbing and retaining moisture. By far the most important of the determinations made was that of the estimation of the maximum moisture holding capacity. The average was only 26 per cent with but 8 samples having above 30 and one going down as low as 14. Under the field conditions this figure which was obtained under ideal laboratory conditions would be still lower with the result that the soil has an extremely poor retentive capacity. Pore space and specific gravity estimations showed again, the extremely porous nature of the soil and the futility of a copious irrigation on soils of this type. The estimated figures for specific gravity and moisture holding capacity enable us to calculate the water required for saturation and irrigation, if we assume that the quantity would be that which is required to saturate the soil to a depth of 9 inches. If a heavier irrigation is to be given we may assume a 12 inch depth. Figures thus calculated are found to be 2·78 inches for a 9 inch saturation and 3·71 inches for a 12 inch saturation. While this is actually so in theory, there may be some loss of water as part of the irrigated water will percolate down to the lower layers with which the top layer is in contact.

The amount of water required for irrigation would also depend upon other factors than those considered above, viz., the actual depth of the soil, nature of the crop, etc. which is best found by trial in each case.

The project contemplates the division of the entire area into first and second crop blocks, water being available for irrigation purposes, only alternatively for each block at a time. Such being the case the extremely porous nature of the soil of the project area, would in the absence of suitable measures to prevent it result in a considerable loss of water from the irrigation channels through seepage. The water thus lost might find its way into wells and serve to raise the water levels inside the wells. Again on soils of this type a frequent light irrigation is likely to be more advantageous than a heavy irrigation with long intervals. Because both by rapid drainage and by the poor retentive capacity of the soil a heavy irrigation will only result in loss of water, without benefitting the crop.

Our attention has been confined in this paper mainly to the soil and its water requirements and to show how an examination in the laboratory has helped us to decide on the quantity and frequency of irrigation. A lot more work will have to be done on the chemical analysis of the soil before any pronouncement can be made as regards suitable crops to be grown and the amount of plant food that is available in the soil. Generally speaking, however, with the work done so far, it is possible to just indicate in a very rough manner what kind of future cropping might make the tract more prosperous. Wet crops like paddy, betel and even sugarcane and plantain seem to be out of the question. The present dry crops of the tract might very profitably be replaced by irrigated varieties of the same. Yet another possible direction of future cropping might lie in the raising of orchards like pomegranate, oranges and limes which will get the necessary amount of water from the new channel and get their drainage problems automatically solved by the texture of the soil.

CERTAIN ASPECTS OF THE IRRIGATION POLICY OF THE MADRAS GOVERNMENT.

By Mr. A. S KUPPUSWAMY AYYAR B.A., B.L.,
Advocate, Tinnevelly

Contribution for repairs to Irrigation Works from Ryotwari Land-holders. The Government's obligation to repair and maintain Irrigation Works serving ryotwari lands has been unquestioned till recently. But under G. O. 773 dated 2—5—33 and an order of the Board of Revenue passed in pursuance of the same (published in answer to question No. 711 in the local Legislative Council on 27—2—1934), this well accepted feature of Ryotwari administration has been substantially modified.

The genesis of the order is somewhat strange. An officer of the Madras Government was asked to enquire and report on the question of retrenchment of Land Revenue Establishment. He discovered in the course of his investigations, that the state in this country "has perhaps too generously assumed" the obligation to repair Irrigation Works and suggested that the ryots under Minor Irrigation Works in charge of the Revenue Department may be required to bear their share of this obligation in the shape of payment of contributions. The Government accepted the officer's suggestions without any discussion and asked the Board of Revenue to implement the same by suitable instructions to District Collectors. The Board welcomed the new source of income and extended the principle to all classes of Irrigation Works, major and minor. It issued a blank cheque to the District Collectors to decide the proportion of the costs of repairs to be recovered from the ayacutdars. The ryot's share may be any fraction less than the whole. Four illustrative cases calling for contribution

are given by the Board such as the repair of a sluice or the revetment with stone of an earthern bund or provision of a new masonry head-sluice for a channel etc. It will be difficult to imagine any case of a repair that cannot be said to be analogous to one or other of these illustrations. The four given examples are fair specimens of all cases of repair that are likely to occur. Thus, the G. O. and the Board's order raise a general question as to the state's duty to repair Ryotwari Irrigation Works at its own cost.

The theory that the State has "too generously assumed" the duty, itself admits the fact of assumption *ex-hypothesi*. It has also got high authority behind it. Under the Irrigation Cess Act, ryotwari wet land is exempt from cess though the Irrigation Work serving the same might be repaired by the Government at heavy cost. What cannot be claimed directly as cess cannot be demanded indirectly as a contribution. The Government's obligation towards ryotwari landholders cannot be on a lower level than that of a Zemindar towards his ryots. The Zemindar is under an absolute obligation under Sections 138 and 139 of the Estates Land Act which only reproduces the common law of the country, to repair Irrigation Works. It cannot be gainsaid that the state's duty to repair and maintain Irrigation Works is as much a part of the ryotwari tenure as its right to a share of the net income. It may also be added that the Government's half share of the net income from ryotwari lands brings Rs. 6½ crores to the Exchequer and its total Irrigation Budget (non-capital) serving not only ryotwari but all other interests as well, comes up only to about Rs. 1 crore.

An additional ground for contribution is put forward in the Board's order, viz., that there is a saving to the ryot, of Kudimaramat labour as in the case of a stone-revetment of tank bund on account of repairs effected by Government. The following remarks of the Indian Irrigation Commission 1901—3 (See part II para 227 of the Report) furnish a complete answer to this plea. "The value of the Kudimaramat Work is indeed small and if the question of cost only were to be considered, Government might well afford to bear it". The institution of Kudimaramat which by the way has been found by the commission to have almost ceased to exist, cannot be converted into a source of additional taxation.

The theory of contribution from the whole body of ayacutdars under an Irrigation Work is opposed to the principle of Ryotwari tenure, under which the State deals directly with the ryot. The ryotwari system has broken up the corporate life of the old village community which is now only a memory of the past. In the absence of a suitable agency for common action among the ayacutdars, the demand for contribution cannot be effectively met or equitably distributed among the ryots.

Thus the novel claim underlying the recent order of Government violates a well-settled and fundamental obligation of the State under Ryotwari Tenure. It is an additional hardship for the ryotwari landholder in this period of economic trouble. It is also unworkable.

Suspension of the Tank Restoration Scheme Investigations since 1931. An important feature of the Irrigation Policy of the Government relates to a scheme of " Tank Restoration " which was in charge of a special section of the Irrigation Department. The T. R. S. Scheme was started in 1883 on the advice of the Famine Commission of 1878 which recommended a systematic treatment of the " minor works " which were recognised to be below their state of full efficiency and incapable of effecting their proper amount of irrigation. The Irrigation Commission of 1901—3 made a full examination of the progress of the work till then and " strongly recommended " that the work of tank restoration should be more vigorously prosecuted and that the grants for maintenance of minor works should be increased until it has been completed " within 15 years ". Double the period has expired since then. The work is still unfinished. In the meantime, the retrenchment axe has fallen upon it in December 1931. In spite of numerous representations, the Government refuse to lift the axe. The scheme is now under an order of indefinite suspension.

The large Irrigation interests served by the scheme as well as its financial bearing do not appear to have been properly appreciated by the Government of Madras in their true perspective.

The " minor works " which are the beneficiaries under the scheme are as many as 35,708 serving an area of 26 lakhs of acres forming 40% of the total area under State Irrigation Works in the Presidency. The owners of this large area, are the millions of ryotwari landholders in the Presidency who are among the worst victims of the present economic depression.

The annual expenditure to Government on account of the scheme is only Rs. 4 lakhs (vide answer to question No. 714 dated 27--2—1934 in the Legislative Council). The revenue accruing from the lands under " minor works " covered by the scheme is Rs. 140 lakhs. An expenditure of less than 3% of the revenue for the conservation and restoration of the Irrigation Works yielding the same, might well have been spared the application of the retrenchment axe.

The Irrigation Commission recommended an annual expenditure of Rs. 13 lakhs for the investigation and restoration of the minor works out of the then revenue of Rs. 78 lakhs yielded by the lands under the same. The proposed expenditure forms 16⅔% of the revenue as against the present actual expenditure of 3% of the revenue.

The total cost of the remaining T. R. S. work is estimated by Government at Rs. 38 lakhs on one basis and Rs. 63 lakhs on another

basis. (Vide Administration report P. W. D. 1930-31). If it is taken roughly at a central figure of Rs. 50 lakhs, a six years' programme may be adopted for completing the work begun in 1883. An annual allotment of Rs. 8 lakhs for 6 years out of an annual revenue of Rs. 140 lakhs from the lands concerned cannot be said to be an extravagant request.

Such a programme, while it is urgently called for in the interests of ryotwari landholders will also help in a solution though partial of the problem of Educated and other un-employment in the Presidency.

Kudimaramat in Ryotwari Villages. The question of Kudimaramat or ryot's share of the obligation to maintain Irrigation Works has been raised from time to time during the last 60 years; but a true and sound policy for administration is yet to be laid down. The working of the institution was examined by the Indian Irrigation Commission of 1901-3 and according to the Commission "Kudimaramat has almost ceased to exist". (Vide para 269 of Report Part II.) But the Madras Government has built an elaborate edifice of obligations (Vide Board's Standing Order No. 86 paras 5 and 6) based on the assumption that the institution is still alive and can be trusted to function properly. It rests on a theory of collective responsibility for the maintenance of Irrigation Works in the whole body of ryots holding lands under the same. It is a relic of the old village communal life. Unfortunately, the ryotwari settlement with individual ryots has cut at the root of corporate life in villages. The ryots called upon to perform their Kudimaramat obligations feel helpless in the absence of the machinery and resources for joint action that their fore-fathers commanded. So, the problem is one of reviving an ancient but defunct institution.

Firstly, the extent and scope of the Kudimaramat obligation have to be clearly defined, as recommended by the Irrigation Commission. Secondly, a suitable method of revival of the institution has to be devised.

The principle and scope of Kudimaramat have been expressed by the Irrigation Commission in the following terms:— "Much is not required; merely the attention that will prevent rapid deterioration—the stitch in time that will save nine. The repairs are all petty works. The value of the work done is indeed small and if the question of cost only were to be considered, the Government might have very well afforded to bear it; but the point is, that the work is so petty and so scattered that such repairs cannot be carried out properly by any departmental agency". Kudimaramat is not a ground for shifting on to the ryot the responsibility for any substantial repairs. It is not among its primary objects to save expenditure for the Government.

When floods occur and breach canal or tank bunds, temporary ring-bunds have to be put up in front of the breached spots pending

the permanent restoration of the bunds. The Government throws this duty on the ryots as Kudimaramat. But in cases where the cost even of a temporary ring-bund as frequently happens is substantial amounting to several hundreds of rupees or the Irrigation work concerned is a long canal serving several villages, the ryots have neither the resources nor the machinery to cope with such a situation. A costly ring-bund for a big breach does not come within the principle of the "petty stitch in time" enunciated by the Irrigation Commission. The commission has also recognised the difficulty of enforcing Kudimaramat in the case of channels serving more than one village. But in the absence of a satisfactory solution of the problem binding on both the Government and the ryot, every big flood brings in its train a crop of such controversies.

The most important and vital of the whole group of problems raised by Kudimaramat is the question of devising a suitable agency for performing its duties. There is no evidence so far that the Government has in the recent past ever addressed itself to this problem in spite of the recommendation of the Irrigation Commission. Kudimaramat obligation is a corporate duty placed on all the ayacutdars under an Irrigation Work. Unless a suitable machinery is created for doing the corporate work, it will be futile to expect that the obligation will be properly discharged. A small committee elected by the ayacutdars of a tank with necessary provisions for an efficient executive and control, supervision and guidance may perhaps be expected to shoulder this burden. The question of finance also has to be considered. The tank fishery will be an appropriate and sufficient source of income. It is now in the hands of Local Boards in some cases. In many others, the fisheries are in the hands of some leading ryots on behalf of the rest and there are numerous complaints of mismanagement and misappropriation of such fishery rents. In too many cases there has been civil and criminal litigation in respect of the fishery rent.

Thus, if Kudimaramat is to be revived as it must be in the interests of the ryots as well as the Government, (1) its scope has to be defined clearly, (2) a suitable agency has to be created for performing its functions and (3) the question of finance has to be settled.

* The editor does not hold himself responsible for the opinions expressed by the contributors.

IMPRESSION OF THE II YEAR TOUR

By H. RAMANATHA RAO, *Class II.*

A long educational tour is one of the many attractions of the II year, and we were looking forward eagerly to such a tour and lo! it started on the 4th of January. Visiting district after district, we were a happy party seeking knowledge from those "toilers of the soil"

whose vocation, if less dangerous, is certainly more noble than that of the "toilers of the sea".

At Nandyal, we meet at noon on the 4th of January. The evening is spent in going about the Farm, where the cholam ears brush across us, the giant grass forms an arch over the bunds and the spotted yellow cotton flowers are vivid on a back-ground of green. A little channel runs across the Farm, its babbling music floating through the air—the only water source for the Farm in the arid tract. The next morning we are busy in a groundnut factory.

And now in Panyam horticultural gardens, we are told of budding and grafting, and how man's creative brain decides the future of a fruit tree. An old gentleman with the wisdom of age and the fervour of youth thirsts for more knowledge; and from his vast experience he is writing a book. There is his rival, too, with a wise head on young shoulders, intensely practical none-the less with an ideal, taking long strides towards the goal of all horticulturists. We do not miss Mahanandi—a visit to the nearby plantain garden,—and a dip in its sacred waters; a load is off our heads. They say it is our sins; but I maintain that it is the Nandyal dust.

The next day, bound for Guntur, we pass through magnificent scenery—steep ascents and hairpin bends, tunnels and viaducts, and a panoramic view of the country around from a height well above 3000ft. These give us a mysterious feeling, not unlike that of the first pioneer while far below in the valleys the villager perhaps wonders at the rumbling noise that this "strange monster" makes as it leaps from crag to crag. Soon the shadows lengthen, the valleys are cast in gloom while the dying rays yet shine on the hill tops somewhere hidden by the curve of a hill.

A "lowing herd" is climbing down its sides, a little cloud of dust close in its wake. The darkness sets in; sombre-looking hills, deep ravines clothed in inky darkness under a canopy of spangled heavens move us to ecstacy while the crescent moon shimmers on the dew-besprinkled foliage. Here is paradise to forget oneself in, but the eternal "chug chug" and a shrill hoot bring us back to realities, and we are in Guntur.

Here in Lam Farm, a lot of chillies and tobacco, one for the masses and the other for the classes; but an impartial insect world with sympathy for none devastates both to the chagrin of man.

Next we are in the *Metropolis*. Here in the heart of the city, the mind leaps back to those Nallamalais and yearns for solitude, for, *Strangely enough there is society in that solitude.*

The next day we move southwards. The Metropolitan skyline slowly merges in the horizon and once again we see rural India. Time

and again little streams are crossed. Paddy fields stretch as far as the eye can see and the tiller of the soil stands in the field and gives a broad smile at the running train.

" For him light labour spreads her wholesome store, just gives what life requires and nothing more "

We alight at Tindivanam and at the Government Farm learn about Oil seeds. The staff is kindness itself and stands us a 'Tea'. In a beautiful little outhouse, we do justice to it, while the lengthening shadow of a picota plays on its walls, producing a delightful effect of light and shade.

The sugar factory at Nellikuppam, Palur Farm, and then to Aduturai. The Coleroon is passed and with it, many other streams. We traverse the great Cauvery Delta, the streams run majestically over plains miles and miles long. Over this land watered by the sacred Cauvery we travel to historical Trichy. Here is evidence of the " Glory that was Ind ". We hurry to the Grand Anicut where the Cauvery in spite of her unique self-sacrifice is made to give her last drop of water.

Next we are at Dindigul. A visit to the Sirumalais—4½ miles of precipitous path and after this, what a scene is unfolded; The coffee bushes cover the hill sides; their crimsom berries form a pleasing contrast to the almost promiscuous splashing of green everywhere. From the highest summit we look around; again those Nallamalais leap back to our memories. Below in the plains little fires are seen in the dark, their smoke slowly curling upwards. The wind howls among the trees. We climb down to our resting place and have a hearty meal, and the rest is forgotten in sleep.

We arrive in Udumalpet and start about our work. We have by this time enough material for a symposium on the crops that we see. Soon we are homeward bound. " Alas ! the train is exceedingly slow " For a fortnight we have been 'nomads' and now to the routine of College work.

Our thanks are due to Messrs. K. Raghavachari, P. N. Krishna Iyer and E. K. Nambiar, who were our guides during the tour and bore with us with no little sympathy and tolerance during the fortnight.

ABSTRACTS

Field experiments with vernalised wheat. (*U. S. Department of Agriculture, Circular No. 325, September 1934.*) The circular reports about the experiments conducted by U. S. Dept of Agriculture, Washington, to find out the commercial possibility of vernalising certain standard varieties of winter and spring wheats. The principles of vernalising are similar to that followed by the Russian workers by chilling for different period of days, the pre-germinated seed, though it was felt that more than average skill was required to prevent excessive moulding and

sprouting. The commercial possibilities were also restricted as the cost of the treatment would increase considerably by the use of cold storage rooms and mechanical refrigerators. The results did not indicate any significant modification of the time of heading by such vernalisation. As regards yield, it has been found doubtful if yields of vernalised spring wheats would be increased to such a degree to attract the farmers, considering the technical process of vernalisation, though the Russian workers recommended the commercial use of the method on the ground that vernalised winter wheat outyielded spring wheats and that the Durum yield better when vernalised. It has a limited scope for certain winter areas, where vernalised winter wheat may be grown with advantage for late winter and very early spring sowing, when the autumn sowing has been prevented by excessive rainfall or drought, as the winter wheats tolerate low temperature during the initial stages better than spring wheats. Nowhere else except in Russia, vernalisation seems to have been useful from the preliminary reports published so far. The imperial Bureau of Plant Genetics, Cambridge will be issuing a second bulletin shortly which will review further advances made since the publication of Lyssenkos' work. N. P.

Investigation into the causes of breakage in milling paddy. The subject of breakage was investigated with special reference to the degree of maturity at harvest, climatic conditions immediately before and after harvest, method of drying the sheaves in the field, threshing and storing the grain, and the protection of the produce from heavy dew at night and from intense sun's rays during day, while at the threshing floor.

Alternate exposure to dew and sunlight increases sun-cracks on the grain, contributing to a higher percentage of broken grains in the milled product. Sun cracks develop even in the field if the crop is over ripe before it is harvested. Shade drying minimises breakage. (*Annual Report of the Rice Research Officer, Burma—1933-34*). S. R. S.

Gleanings.

Eradication of Khaki Weed (Alternanthera repens). In small areas Khaki Weed is best destroyed by hand-grubbing or chipping but as it has the power of sending out roots from the joints, there is always the chance, unless the work is carried out in hot, dry weather, of the cut pieces growing again, so that the cut up plants should be raked up and burnt. In 1918 an officer of the Department of Agriculture and Stock, Mr. F. B. Smith, B. Sc., Assistant Agricultural Chemist, visited Beaudesert to inquire into the destruction of Kha i Weed by chemical means, and reported that the weed was easily destroyed by common salt (butcher's salt, or any coarse, common waste salt) at the rate of 1—2 tons per acre. A weak arsenical solution containing 0·2 per cent. arsenic will also be found effective where the poisonous spray could be used. The value of salt as a weed destroyer lies in its property of absorbing moisture both from the soil and plant tissues, and so kills the plant by thirst; thus to prove effective, it should be applied in hot, dry weather. *Queensland Agricultural Journal* Vol. XLII—1934.

Preparation of Coal Tar-kerosene Emulsion as a Protection Against Certain Insects (Field Ants and White Ants.) The formula, as given by Uichanco, is as follows:

Stock Solution.

Laundry soap	500 grams.
Coal tar, or "alquitran" (without creosote)	5 litres.
Kerosene	3 litres.
Water	4 litres.

Shave soap into water and boil until dissolved. Remove mixture from fire, and, while still hot gradually add to it kerosene and coal tar which have been mixed in a separate container. As this mixture is added, beat briskly with a small branch with many twigs until a fairly complete emulsion is formed.

How to use. To be diluted with water 10 times its volume. Seeds and Plant cuttings are immersed in the solution for about 10 to 30 minutes before sowing or planting. (*Philippine Agriculturist*—Vol. 23, No. 7, 1934 p. 605)

Cost of Production of Cotton in Egypt. The average cost of production for cotton per feddan in Egypt is given in the following tables :—

			PT.
Cost of one sack of chemical manure (fertiliser).	...	...	100
Cost of tagawi seed for sowing (1/3 to 1/2 Ardeb).	...	Average.	37·50
Ploughing (from 60 to 120 PT. per feddan).	...	...	90
Planting.	...	...	5
Weeding (6 to 10 P. T. per eddan),	...	...	8
Lightening (Chopping) seedlings (6 to 8 P. T. per feddan).		...	7
Three hoeings (azig) 40 to 45 P. T per feddan.	...	...	42·50
Waterings by gravity (if by elevating machinery add 40).		...	40
Picking leaf worm (18 to 30 P. T. per feddan).	...	...	24
Picking cotton (P. T. 20 per cantar) 4 cantars.	...	...	80
Uprooting cotton stalks.	...	...	9
Watchmen.	...	...	7·50
Total cost per feddan	...		450·50
(or Roughly about.			60 Rs.)

1 feddan = 1·038 acres = 0·42 hectares.
97½ P. T. = 1 £ Sterling.
1 cantar = 99 lbs. of lint.

To estimate the gross revenue per feddan, allowance must be made for the land tax, which averages 120 P. T. per feddan. Rentals range at present between £ 3 to £ 5 Egyptian per feddan on high yielding lands. (*International Cotton Bulletin*, Vol. XII No. 46, January 1934.)

Cheapness of Japanese Cotton Goods. The reasons for Japan being able to produce goods at a cheaper rate than any other country (according to Mr. A. R. Pearse, the Ex-General Secretary of the International Cotton Federation) are :—

1. The devaluation of the yen. This is probably equivalent to a 50% reduction of wages and all overhead charges. Overhead charges in Japan represented in normal times 30 to 35%. The yen devaluation hence accounts for 15 to 18% in the lower cost of the article.

2. Low overhead charges. Salaries of all office workers, mill managers are only a third and less of what one pays in England. Rents and taxes are cheap. The branches are maintained in the most inexpensive way. The Japanese do not rely on the services of another native firm. The parent house has always a well trained staff at its disposal to take the management over at the head office.

3. The mills do not sell abroad direct but through the intermediary of a few firms which are engaged as well on importing raw cotton for the mills. By this system saving in commission and exchanges are effected The export and import firms do not earn much money but look for big turn overs and content themselves with smaller profits. Freights and other expenditure such as insurance are cut down by concerted action of a few combines. There are considerable savings in packing. Finishing plants are joined to the mills, thus avoiding sending to and fro and the re-examination of the goods.

4. In the purchase of raw cotton, the mills never or only in very rare cases, hedge their purchases. The spinner buys his cotton when he considers it low price or when he sees sales of yarn improving. If the market goes against him he averages, buying more cotton with every considerable fall. He can afford to do so as he has large reserves accumulated during the war. The cotton merchants on the other hand hedge their purchase and give part of the benefit of their speculation to the mills in exchange for an advantageous sale of manufactured goods.

5. The manufacturers very often send missions of technical men abroad to investigate new markets. The industry in co-operation with the Government maintains show rooms in charge of competent officers in several parts of the world.

6. 85% of the mill operatives are girls, majority of whom remain only about three years in a mill because their one aim in life is to get married and become mothers. They are paid at the rate of approximately a shilling a day of 8½ hours. There is no old age pension, sickness insurance but the mills maintain for the sake of workers theatres, cinemas, schools, gymnasium, hospitals. Birth control is contrary to Japanese religion and national views. The girls really enjoy a much happier life in the mill compound than in their homes. Any girl who really insists on returning home can do so. There is no necessity for them to become members of trade unions. The employer organises their lives. He sends some of the wages to the parent and saves part for the girls so that they may have enough money to furnish themselves with a dowry. The girls have no chance to fritter away their earnings. There is a sort of family spirit between the employer and the employed. The Japanese realise that they live in the century of collectivism and that individualism is dead. Every operation and every salaried person regards his employer as the head of his family.

7. The Japanese are shrewd businessmen, painstaking, hardworking, quick in making decisions, ready to pick up a new variety of cotton or a new machine. They keep their machinery up to date, quickly replacing worn out parts. They are past masters in mixing cotton. The mills are cleaner than any mills in Asia and most mills in Europe using Indian cotton.

8. The Japanese make all their textile machinery in their country, which cheapens their cost of producing yarn and cloth. They are always on the lock out for improvements. The combines set entire mills apart for one or two counts.

9. Japan has succeeded in developing small workshop industry along side the big mill industry. Advancement in these lines has taught the small manufacturers the export business and examination of goods before despatch in order to make sure that they will not injure the reputation of the Japanese goods.

10. The actual necessities of life are very few, as rice and fish are the staple foods and the pleasures of the Japanese are inexpensive and simple in the extreme. Smoking is very inexpensive and the wine of Japan made from rice is very cheap.

11. Out of 8,200,000 spindles in Japan, 8,100,000 are controlled by the Japan cotton spinners' association. *International Cotton Bulletin* No. 49, 1934).

Respiration of Fruits. In his Friday evening discourse on November 9 at the Royal Institution, Dr. Franklin Kidd discussed the respiration of fruits. The lecture opened with a number of demonstrations illustrating the way in which oxygen enters fruits and carbon dioxide escapes from them in the process of respiration. Failure of the mechanism for the escape of carbon dioxide is considered as the possible cause of bitter pit, a disease which is responsible for great losses to orchardists. The changes in respiratory activity throughout the life of

a typical fruit such as the apple were then described and corresponding changes in chemical constitution of the fruit considered. The conclusion arrived at is that the primary sugar which forms the basis of respiratory oxidations is the active or gamma form of fructose. Attention was then given to the sudden rise in respiratory activity which occurs at maturity and upon which ripening depends. This change called the climacteric, probably occurs when the acidity of the fruit falls to a certain point, and can be delayed by keeping the fruit in the presence of carbon dioxide. Oxygen is also necessary for the change. After the climacteric, the fruits begin to produce odours, and if these are not allowed to escape freely, fruits become injured. The injuries due to this cause are responsible for the large amount of wastage in fruit storage. The recent discovery that ripening fruits produce a toxic substance which is probably ethylene was discussed. Unripe fruits exposed to the vapour of ripe fruits are stimulated to begin ripening at once. The intermediate stages in the oxidation of sugars in respiration were discussed. In the absence of oxygen, the climacteric change which initiates ripening does not occur. The storage life of fruits can be lengthened by treatments which reduce their respiratory activity, such, for example, as certain manurial treatments in the orchard and the storage of fruit in atmospheres rich in carbon dioxide and poor in oxygen. (*Nature, No. 3394, Vol. 134, Page 766.*)

Rubber in Tree Surgery. A Plastic rubber tree cavity filler has been perfected as the result of experiments conducted by the Good Year Tyre and Rubber Company and the Akron, Ohio, parks department. The filler readily adheres to the cavities or scars of damaged trees and prolongs their lives indefinitely. Supplementing the cement is a new tree paint for minor cuts and scars that may be used to cover cuts resulting from pruning and trimming. (*Scientific American, December, 1934.*)

Research Notes.

A simple device for estimating shedding in rice.

Shedding or shattering is one of the most important characters in rice, as the loss of grain at harvest time is a factor in the reduction of yield. This character varies with varieties. the wild varieties being the highly shedding ones. The only recorded attempt to measure this character quantitatively, is that reported by Mendiola. The principle of this method consists in dropping the rice panicle from a definite height on a wiremesh, the degree of shedding being measured by the number of grains shed from such an impact. The method of dropping involves difficulties in controlling the way in which the panicle falls, as the surface of impact of the panicle is not always the same.

The study of a number of families for the inheritance of this character, necessitated the improvisation of a simple device, the principle of which is the

Fig. 1.

SIDE VIEW OF THE APPARATUS

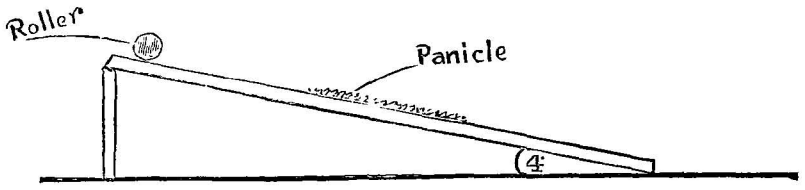
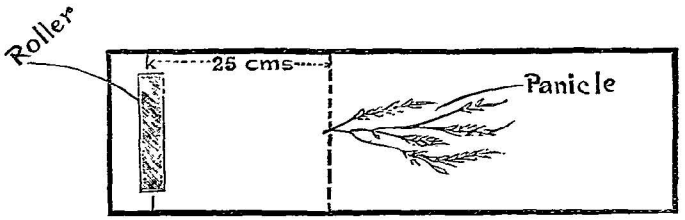


Fig. 2.
TOP VIEW OF THE APPARATUS SHOWING THE ROLLER & THE PANICLE IN POSITION



impact of a uniformly moving roller on the rice panicle. The apparatus consists of a wooden inclined plane kept at a constant angle of about 4° and a weighted glass roller weighing about 500 grm. and 1" in diameter, which is allowed to roll from a constant mark at the top of the plane over the rice panicle whose base is always kept at a definite distance from the top line of the plane. (Figs. 1 and 2). Due to the impact of roller over the panicle, a number of grains are shed and the percentage of the shed to the total number of grains in the panicle is taken as a measure of the degree of shedding of the panicle.

This instrument has been used at the Paddy Breeding Station, Coimbatore, during the last two seasons in estimating the degree of shattering in the F_2 and F_3 families of a cross segregating for the character and has given very satisfactory results.

K. Hanumantha Rao,
Assistant to Paddy Specialist.

College News & Notes.

Estate News. Messrs K. Ramiah and P. V Ramiah have left for Delhi as official delegates to attend the meeting of the Soils and Crop Wing of the Board of Agriculture from 25th February to 3rd March. Mr. K. Ramiah is also attending the meeting of the Advisory Board of the Imperial Council of Agricultural Research from 18th to 23rd February, as a member of the Rice Research Sub Committee

We are glad to note that Rao Bahadur M. R. Ramaswami Sivan has been elected by the Inter-University Board as a member of the Soils and Crop Wing of the Board of Agriculture.

College Cricketeer for Trichy. It is pleasing to note that M. Narasinga Rao of class III was invited to play for the Indians against the Europeans, in the Health week cricket Tournament, held at Trichy, and that he acquitted himself creditably.

The College Athletic activities. Dr. Patel's wards secured the Rao Sahib Muthuswamy Iyer's memorial shield for football. They met Mr. C. Narasimha Iyangar's wards in the final and won by a goal.

The Parnel cup Hockey matches and the Cecil Wood cup tennis singles matches are in full swing.

The various tournaments, both indoor and outdoor, for the Club Day celebrations coming off on the 23rd instant were keenly contested and are practically over.

In the Tennis Handicap Doubles Tournament, Radhakrishna Rao and H. Adisheshaya beat Arther and Ittyachan and were adjudged champions.

Mr. C. Ramaswami:- With the arrival of Mr. C. Ramaswami the "Cambridge Blue" as the Dy. Director of Agriculture, VIII circle, the College Sports especially Tennis and cricket, will no doubt receive an impetus.

News in brief. Mr. S. V. Ramamurthi, I. C. S. Director of Agriculture, opened an exhibition at the Agricultural Research Station, Aduturai, arranged on behalf of the Mirasdars by the Agricultural Department. In opening the exhibition the Director of Agriculture envisaged the possibilities of growing sugarcane extensively in the new area under the Cauvery-Mettur project, and emphasised its desirability.

The Director of Agriculture, Mr. S. V. Ramamurthi gave an inspiring address on Agricultural Education at Kumbakonam. He said that agriculture was languishing for want of co-operation between agriculture and the literate and educated men. The primary important factor influencing agriculture was the man who was neglected. The illiteracy of the massess needed to be removed and he made the bold suggestion that conscripting the services of undergraduates and of unemployed graduates would go a long way to solve the difficulty. He also suggested the re-organisation of high school education, providing a course in agriculture for 50% of the boys and one in industrial mechanics for 30% which would reduce unemployment among educated classes considerably. The extent to which educated people were employed is the acid test of the suitability of education for the prevailing conditions of life. (*Ext. Hindu* Feby. 10.)

Park Fair Exhibition An Agricultural exhibition was arranged at the Madras Park Fair during X'mas week and was well visited. Seeds of improved strains from the crop Specialists, samples of green pepper and ginger from VII circle, fruit varieties and potatoes from the Botanical gardens, Ootacamund, Sapotas and chakrakeli from I circle, fungoid diseased specimens, posters and charts from the Government Mycologist, Honey-extractors, Live-Beehives, specimens of insect pests etc. from the Entomologist and malt samples, cream jaggery activated charcoal etc. from the Government Agricultural Chemist were on show. Preparation of cream jaggery and centrifuged sugar were demonstrated and appealed to the visitors.

The Lalgudi Loan and Sale Society was opened by Sir T. Desikachariar on the 9th of February 1935. The Society has been formed as a wing of the Lalgudi Sivagnanam Co-operative Agricultural Society on the advice of Mr. K. Gopalakrishna Raju, Provincial Marketing Officer, and has as its object the securing of good price for the paddy of its members, the providing of loans to the members when the paddy is held up for better prices, the issuing of bi-weekly market report of the prices of paddy and the standardisation of weights and measures used for paddy. (*Ext. Hindu*, February, 10.)

Banana Research. We learn that the Imperial Council of Agricultural Research has provided a grant of Rs. 50,000 for the banana research scheme submitted by the Director of Agriculture, Madras.

The Secretary of the Cecil Wood Memorial Committee, Mr. V. T. Subbiah Mudaliar, sends us the following:—

The Cecil Wood Memorial Committee has collected Rs. 220 out of Rs. 350 promised as donations towards the memorial fund. Liberal contributions towards the fund are solicited from the old students, colleagues and admirers of Mr. Wood. The contributions promised, or otherwise, may kindly be sent early to the Secretary Cecil Wood Memorial Committee to facilitate the accounts being closed and suitable memorial being put up by the next College Day. The committee also invites suggestions from the donors regarding the form, they wish the memorial should take.

Crop and Trade Reports.

Cotton Crop, Madras—1934—35. *Fourth Forecast Report.* The average of the areas under cotton in the Madras Presidency during the five years ending 1932-33 has represented 9 per cent. of the total area under cotton in India. The area under cotton up to the 25th January 35 is estimated at 2,135,100 acres. When compared with the area of 2,044,500 acres estimated for the corresponding period of last year, it reveals an increase of 4·4 per cent. 351,600 acres have been reported as sown since the last December forecast was issued. This extent is made up of 135,300 acres under Tinnevellies, 116,300 acres under Cambodia, 48,100 acres under Salems, 49,000 acres under Northerns and Westerns and 2900 acres under Cocanadas. The area sown in December and January exceeds that sown in the corresponding period of the previous year by 69,400 acres or by 24·6 per cent. An increase in area in the current year occurs in all districts outside Ganjam, Vizagapatam, Bellary, Nellore, Ramnad and Tinnevelly. The increase in area is reported to be due to the want of timely rains for paddy—to the reduction in the area under groundnut and paddy, and to the better prices prevailing for cotton in the sowing season. There is a marked decrease in Bellary (127,300 acres) and Tinnevelly (95,700 acres) due to adverse seasonal conditions. The area under irrigated cotton mainly Cambodia is estimated at 252,300 acres as against 214,000 acres, for the coresponding period of last year, an increase of about 18 per cent. Picking of the *mungari* or the early sown cotton crop in the Deccan is over. The yield was below normal. Yields below normal are reported from all the main cotton growing districts outside Kistna and Salem. The yield is the lowest in Anantapur (58 per cent). The seasonal factor for the Presidency works out to 87 per cent. of the average as against 98 per cent. for the corresponding period of last year. On this basis, the yield works out to 445,600 bales of 400 lb. lint as against 450,000 bales for the corresponding period of last year. It is however too early to estimate the yield with accuracy as the harvest has not yet commenced in the major portion of the area and much will depend upon the future weather conditions and the toll taken by insect pests.

The estimated area and yield under the several varieties are given below:—

(Area in hundreds of acres; yield in hundreds of bales of 400 lb. lint).

Variety.	Area 1st April to 25th January		Corresponding yield.	
	1934—35	1933—34	1934—35.	1933—34.
	Acres.	Acres.	Bales.	Bales.
Irrigated Cambodia.	2,410	1,981	1,376	1,231
Dry ,,	2,432	1,357	487	288
Total Cambodia	4,842	3,338	1,863	1,519
Karunganni in Coimbatore.	1,223	1,339	250	311
Uppam in the Central districts.	364	294	55	45
Nadam and bourbon.	227	315	10	16
Total Salems.	1,814	1,948	315	372
Tinnevellies (a)	4,653	5,049	1,074	1,300
Northerns and Westerns.	8,460	8,677	868	1,052
Cocanadas.	1,462	1,303	321	242
Others.	120	130	15	15

(a) Includes Uppam Karunganni and mixed country cotton in the South.

The wholesale price of cotton lint per imperial maund of 82—2/7 lb. as reported from important markets towards the close of January 1935 was Rs. 22—4—0 for Cocanadas, Rs. 21—1—0 for red northerns, Rs. 21—15—0 for white northerns, Rs. 22—12—0 for (early crop) westerns Rs. 31—8-0 for Cambodia, Rs. 29—2—0 for

Coimbatore Karunganni. Rs. 27—11—0 for Tinnevelly Karunganni, Rs. 26—1—0 for Tinnevellies and Rs. 25—5—0 for Nadam. When compared with the prices in the previous month, these prices reveal a rise of 4 per cent. in the case of Northerns, 19 per cent in the case of Westerns and 7 to 11 per cent. in the case of Cocanadas, Cambodia, Karunganni, Tinnevellies and Nadam.

Gingelly Crop, Madras—1934-35. *Third Report.* The average of the areas under gingelly in the Madras Presidency during the five years ending 1932—33 has represented 12 per cent. of the total area under gingelly in India. The area sown with gingelly up to the 25th December 1934 is estimated at 462,600 acres. When compared with the area of 608,000 acres estimated for the corresponding period of last year, it reveals a decrease of about 24 per cent. The decrease in area is general outside Guntur. Cuddapah, Nellore Chingleput, Chittoor, Salem and South Kanara and is largely due to the insufficiency of rains at sowing time. The main crop has been harvested except in the south where the harvest is in progress. The crop suffered from drought to some extent and the yield is reported to be below normal except in Kistna. Coimbatore, Ramnad and South Kanara. The yield is markedly low in Anantapur (20 per cent.) and Bellary (60 per cent). The seasonal factor for the Presidency works out to 84 per cent. of the average as against 96 per cent. for the corresponding period of last year. On this basis, the yield is estimated at 53,300 tons as against 79,400 tons for the corresponding period of last year, a decrease of about 33 per cent.

Groundnut Crop Madras 1934—35 *Final Report.* The average of the areas under groundnut in the Madras Presidency during the five years ending 1932-33 has represented 49·9 per cent of the total area under groundnut in India. The area sown with groundnut in the Presidency in 1934 is estimated at 2,323, 300 acres. When compared with the correspoding estimate of 3,830,400 acres for the previous year and the area of 3,779,365 acres as per season and crop report of fasli 1343, this reveals a decrease of 39·3 and 38.5 per cent respectively. The estimated area for this year is less than the normal area of 3,317,650 acres by about 30 per cent. The decrese is general and is due partly to the insufficiency of rains at sowing time and partly to the low price of groundnut prior to and at the time of sowing The harvesting of the summer and early crop of groundnut was finished by October. The harvesting of the winter or main crop is proceeding. The crop suffered from drought in most districts and its condition is below normal expect in Ganjam, East Godavari, Kistna, Ramnad and Tinnevelly where it is normal or above normal. The condition of the crop is markedly below normal in Bellary (45 per cent), Anantapur (33%) and Cuddaph (60%). The seasonal factor for the Presidency works out to 77 per cent of the average as against 94 per cent in the previous year as per season and crop report. On this basis, the yield is expected to be 892,800 tons of unshelled nuts as against 1,776,700 tons in the previous year, a decrease of about 50 per cent. The yield in an average year is estimated at 1,660,990 tons.

The wholesale price of groundnut shelled per imperial maund of 82-2/7 lb as reported from important markets towards the close of December 1934 was Rs. 4—14—0 in Cuddalore. Rs. 4—10—0 in Vizagapatam and Vizianagaram Rs. 4—2—0 in Adoni and Cuddapah, Rs. 4—0—0 in Salem and Rs. 3—14—0 in Nandyal. When compared with the prices of October 1934, these prices reveal a rise of 14 per cent in Cuddapah, 12 per cent in Vizianagaram, 11 per cent in Nandyal, 8 per cent in Adoni and Cuddalore, 7 per cent in Vizagapatam and 5 per cent in Salem

Sugarcane Crop-Madras 1934-35—*Final Report.* The average of the areas under sugarcane in the Madras Presidency during the five years ending 1932-33 has represented 3 7 per cent of the total area under sugarcane in India. The area planted with sugarcane up to the 25th December 1934 is estimated at 122,470 acs

When compared with the area of 120,250 acs. estimated for the corresponding period of last year, it reveals an increase of 1·8 per cent The estimate of the previous year was less than the final area of 121,650 acs. by about 1·2 per cent. The present estimate of area exceeds the second forecast by 7,760 acs, The excess occurs mainly in Ganjam, Vizagapatam, South Arcot, North Arcot, Salem, Coimbatore and Trichinopoly. The increase in area in comparison with the final forecast of 1933 occurs in all districts outside Ganjam, Vizagapatam, Bellary Cuddapah, Chingleput, Chittoor, North Arcot, Tanjore, Tinnevelly and the West Coast. The harvest has just commenced and yields below normal are expected in all districts outside East Godavari, West Godavari, Guntur, Kurnool, Nellore and Malabar where the yield is expected to be normal. In South Kanara, the yied is expected to be slightly above normal, Only half the normal yield is expected in Anantapur. The Seasonal factor for the presidency is calculated at 91 per cent of the average as against 95 per cent in the previous year. On this basis, the yield is estimated at 320,940 tons of jaggery as against 324,550 tons estimated in January 1934, a decrease of 1·1 per cent. The final estimate for 1933-34 was 349,000 tons.

The wholesale price of jaggery per Imperial maund of 82-2/7lb. as reported from important markets towards the close of December 1934 was Rs. 10—5—0 in Erode, Rs. 7—1—0 in Trichinopoly, Rs. 6—5—0 in Nandyal, Rs. 4—15—0 in Guntur and Cuddapah, Rs. 4—12—0 in Vellore, Rs. 4—8—0 in Rajahmundry and Bellary and Rs. 4—2—0 in Vizagapatam and Ellore. When compared with the prices of the previous month, these prices reveal a fall of 29 per cent in Ellore, 27 per cent in Rajahmundry and Bellary, 25 per cent in Vizagapatam, 15 per cent in Cuddapah and 3 per cent in Vellore. The prices remained stationary in Guntur, Nandyal, Erode and Trichinopoly.

Castor Crop, Madras 1934—35. *Final Report.* The average of the areas under castor in the Madras Presidency during the five years ending 1932—33 has represented 21·5 per cent of the total area under castor in India. The area under castor in the Madras Presidency up to the 25th November 1934 is estimated at 289,200 acres. When compared with the area of 319,400 acres estimated for the corresponding period of last year, it reveals a decrease of 9·5 per cent. The estimate for last year was above the actual area of 304.668 acres by about 4 8 per cent. The decrease is general outside Vizagapatam, East Godavari, Guntur, Kurnool, Cuddapah, Chittoor, Tinnevelly and the West Coast. The yield is expected to be 89 per cent of the normal as against 100 per cent in the previous year according to the season and crop report. On this basis, the yield is estimated at 26,100 tons as against 32,700 tons estimated for the corresponding period of last year and 31,140 tons estimated in the season and crop report of last year. The wholesale price of castor seed per imperial maund of 82-2/7 lb. as reported from important markets towards the close of November 1934 was Rs. 4—10—0 in Trichinopoly, Rs. 4—0—0 in Vizianagram, Cuddapah and Salem and ranged from Rs. 3—11—0 to Rs. 3—13—0 in the other markets. When compared with the prices reported at the corresponding date of last year, these prices reveal a rise of 25 per cent in Trichinopoly, 19 per cent in Salem, 16 per cent in Bellary, 15 per cent in Vellore, 14 per cent in Cuddapah, 9 per cent in Ellore 5 per cent in Vizianagaram and Guntur and a fall of 2 per cent in Vizagapatam.

Paddy Crop-Madras-1934-35—*Intermediate Report.* The main crop of paddy has been harvested in parts of the Circars, Deccan, and the West coast. The yield is reported to be generally normal outside Bellary, Anantapur and Malabar where it is reported to be below normal. The main crop of paddy in parts of the districts of Guntur, Nellore, Chingleput, Chittoor, North Arcot and Coimbatore and the second crop of paddy in Malabar are reported to have been affected by

drought to some extent. The season was late and unfavourable for the crop in the non-Periyar area of the Madura District and in the districts of Ramnad and Tinnevelly. In parts of the districts of Trichinopoly, Tanjore and Madura, the crop is reported to have been affected to some extent by insects or diseases. The condition of the crop is satisfactory in the other districts. The wholesale price of paddy per imperial maund of 82-2/7 lb as reported from important markets towards the close of December 1934 was Rs. 3—0—0 in Nellore, 2—14—0 in Madura, 2—13—0 in Selam, 2—10—0 in Nandyal and Tinnevelly, Rs. 1—10—0 in Rajahmundry, Rs. 1—13—0 in Berhampore, Rs. 1—14—0 in Nagapatam and ranged from Rs. 2 to Rs. 2—8—0 in the other markets. When compared with the prices reported in the previous month, these prices are stationary in Berhampore, Guntur, Trichinopoly, Madura, Tinnevely and Cochin; they have risen by 30% in Cocanada, 14 per cent in Cuddapah, 11 per cent in Nellore and 4 per cent in Salem and are lower by 17 per cent in Nagapatam, 16 per cent in Rajahmundry, 11 per cent in Vellore and 4 to 8 per cent in the other markets.

Ginger Crop, Madras 1934—35. *Final Report* The area under ginger in 1934 is estimated at 11,000 acres in Malabar as against 11,951 acres in the previous year. The decrease in area occurs mainly in the Ernad taluk and is attributed to insufficient rainfall. The seasonal factor is estimated at 70 per cent of the normal as against 100 per cent in the previous year. On this basis, the crop is expected to yield 2,758 tons of dry ginger as against 3,860 tons estimated for the corresponding period of the previous year. The wholesale price of dry ginger at Calicut towards the close of December 1934 was Rs. 17—10—0 per imperial maund of 82-2/7 lb. When compared with the price reported towards the close of August 1934, there has been a rise of 37 per cent.

Pepper Crop, Madras 1934—35. *Final Report.* The area under pepper in 1934 in the districts of Malabar and South Kanara is estimated at 88,700 acres in Malabar and 8,500 acres in South Kanara as against 88,954 acres in Malabar and 8,057 acres in South Kanara in the previous year. The condition of the crop is good. The harvest has just commenced. The seasonal factor is estimated to be 100 per cent in each district as against 80 per cent in Malabar and 90 per cent in South Kanara in the previous year. On this basis, the yield is expected to be 13,300 tons for Malabar and 1,280 tons for South Kanara as against 10,740 tons for Malabar and 1,090 tons for South Kanara estimated in the previous year. The wholesale price of pepper per imperial maund of 82-2/7 lb. as reported from important markets towards the close of December 1934 was Rs. 24—4—0 in Calicut, Rs. 23—1—0 in Tellicherry and Rs. 21—7—0 in Cochin. When compared with the prices reported in August 1934, these prices have risen by 10 per cent in Calicut, 12 per cent in Cochin and 17 per cent in Tellicherry.

Weather Review (JANUARY—1935)

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		-0·2		South	Negapatam	5·0	+3·4	5·0
	Berhampore *		-0·3			Aduthurai *	3·7	-0·9	3·7
	Calingapatam	0·1	-0·2	0·1		Madura	0·7	+0·1	0·7
	Vizagapatam		-0·6			Pamban	3·7	+1·6	3·7
	Anakapalli *					Koilpatti *	0·8	-0·7	0·8
	Samalkota *	0·0	-0·1	0·0		Palamkottah	1·8	+0·3	1·8
	Maruteru *		0·0						
	Cocanada	0·3	+0·1	0·3					
	Masulipatam	0·1	-0·2	0·1	West	Trivandrum	1·7	+1·0	1·7
	Guntur *		-0·0		Coast	Cochin	0·5	-0·3	0·5
						Calicut	0·6	+0·2	0·6
Ceded Dists.	Kurnool	0·1	-0·1	0·1		Pattambi *	0·0	-0·3	0·0
	Nandyal *	0·0	-0·1	0·0		Taliparamba *			
	Hagari *	0·2	-0·0	0·2		Kasargode *	0·3	0·0	0·3
	Bellary	0·1	-0·0	0·1		Nileshwar *		-0·3	
	Anantapur					Mangalore		-0·1	
	Cuddapah	0·2	-0·3	0·2					
Carnatic	Nellore	1·2	-0·5	1·2	Mysore	Chitaldrug	0·4	+0·1	0·4
	Madras	0·6	-0·5	0·6	and	Bangalore	0·1	0·0	0·1
	Palur *	4·0	+1·8	4·0	Coorg	Mysore		-0·2	
	Palakuppam *	1·9	-0·7	1·9		Mercara	0·7	+0·5	0·7
	Cuddalore	2·7	+1·2	2·7					
Central	Vellore	1·5	0·0	1·5	Hills.	Kodaikanal	2·3	-0·5	2·3
	Hosur cattle farm *	0·3	0·0	0·3		Coonoor	2·6		2·6
	Salem	0·9	+0·7	0·9		Ootacamund *	0·2	-0·9	0·2
	Coimbatore	0·4	-0·1	0·4		Nanjanad *	0·2	-1·2	0·2
	Coimbatore Res. Inst. *	0·3	-0·2	0·3					
	Trichinopoly	0·8	+0·2	0·8					

* Meteorological Stations of the Agricultural Department.

Summary of General Weather Conditions.

The most important feature of the weather during the month is the occurrence of the severe cold wave which passed over Northern India. From the 3rd onwards temperatures continued to be below normal in North West India and in and around the Central parts of the country. The temperature along North West Frontier Province fell off rapidly from the 12th instant. Temperatures 15 to 20° below normal were recorded in Punjab, Rajputana and other places and the cold wave quickly spread eastwards affecting various places in Northern India and Bombay Deccan. Frost occured in the plains of Punjab and Rajputana on several occasions during the period of the cold wave. From the 20th onwards night temperatures began gradually to rise, though the minimum still remained below normal over East Central India and East Central Provinces. A similar cold wave swept over Northern India during the period of the Bihar Earthquake last year.

The Western disturbance which affected the extreme north on the 31st of last month formed into a low pressure area over North Western India on the 1st. After causing a few light showers in Beluchistan, Kashmir and Punjab, the "low" weakened and passed away eastwards. It also caused widespread rain in the United Provinces, Bihar and Chota Nagpur. Four more Western disturbances appeared on the 4th, 7th, 19th and 27th instants respectively. They passed away eastwards after causing rain or snow in Kashmir, Punjab and Beluchistan. But the last disturbance which appeared on the 27th developed into a storm and crossing the coast between Karachi and Dwaraka on the 29th caused widespread rain on North Western India and West United Provinces. On the 30th, the "low" got weakened and passed away eastwards.

During the month local rain occurred in South East Madras, North Madras coast, West Central Provinces, Bihar, Bengal and Malabar.

Rainfall was slightly below normal in the Circars and above normal in the South.

Weather Report for the Research Institute Observatory.

Report No. 1/35.

Absolute Maximum in shade	88·5°F.
Absolute Minimum in shade	58·8°F.
Mean Maximum in shade	84·5°F.
Departure from normal.	-1·5°F.
Mean Minimum in shade	65·4°F.
Departure from normal	+1·0°F.
Total rainfall	0·25″
Departure from normal	-0·23″
Heaviest fall in 24 hours	0·13″
Total number of rainy days	1
Mean daily wind velocity	3·0 m. p. h.
Mean humidity at 8 hours	79·8%
Departure from normal	+4·3%
Total hours of bright sunshine	184·2
Mean daily hours of bright sunshine	5·9

General Summary:—Rainfall is in defect and humidity above normal. Lowest minimum recorded was 58 8 on the 1st January.

Departmental Notifications.

Postings and transfers. Mr. K. Kuppamuthu offg. A. D. to L. R. S. Hosur; Mr. P. M. Appasami Pillai A. F. M. L. R. S. Hosur to be A. A. D. Namakkal; and Mr. T. A. Rengasami Iyengar A. A. D. Namakkal to be A. A. D. Hosur.

Leave. Mr. M. Gopala Chetti on L. A. P. for 3 months from 20—2—35; Mr. T. A. Venkasami Rao A. D., Tiruvalur extension of L. A. P. for 1½ months in continuation of 1 month's leave already granted; and Mr. K. M. Thomas, assistant in Mycology on L. A. P. for 2 months from 4—2—35.