# Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXIII] NOVEMBER 1935 [No. 11.

CONTENTS



## Editorial.

**Commercial Crops Market Act.** The cultivator does not often realise an adequate price for his produce on account of the number of middlemen it has to pass through before it reaches the consumer. The establishment of direct contact between the grower and the consumer, will remove this handicap and confer benefit on the grower, and one of the ways in which this can be done, is by the institution of open Markets.

Berar was the first Province to legislate on this matter through the Berar Cotton and Grain Markets Law of 1897 and even as early as 1918 there were 21 such markets in that province. This was followed by the Central Provinces Municipal Act of 1903 by which Municipal Committees were empowered to frame by-laws for the inspection of markets and regulation of fees levied for them. Several cotton markets arose out of this Act in the Central Provinces and there were in 1918 nine such markets, including the most important of them at Nagpur.

The Indian Cotton Committee on examining the question in 1918 not only reported favourably about the working of the Berar cotton markets but also recommended the establishment in other Provinces of markets on the Berar system. In the Bombay Presidency an Act was passed in 1927 to regulate cotton markets. While the bulk of the transactions under the Berar Act was in cotton, the Bombay Act was definitely limited to cotton.

The Royal Commission on Agriculture also examined this question and recommended the establishment of regulated markets for all important crops at a few principal centres in each Province suggesting that each Local Government should take the initiative and legislate in the matter. Included in their recommendations were also certain directions regarding the management of markets, the functions of the market committee, the personnel of the committee and so on. The commission foresaw the possible difficulties about the relationship between the regulated market and the Council of any Municipality or the Local Board in the area in which the market was to be established and emphasised the need for the careful drafting of the legislation to overcome such difficulties.

Such regulated markets have since been established in some of the Indian States like Hyderabad and Indore, the former being a pioneer in making the Markets Act applicable to all agricultural produce including cotton. At the present day the Act is in force at five centres in Hyderabad and is being extended to two other centres.

The Indian Central Cotton Committee has recommended the establishment of open markets for cotton in all Provinces on the Berar system and addressed an enquiry to all Provinces about cotton marketing organisation. The subject was also discussed at one of the meetings of the committee in 1922.

In Madras, we believe the idea of a cotton market was first mooted at a meeting of the Cotton Growers and Sellers in Coimbatore district in 1918. It was first resolved then to form an association and consider the possibilities of establishing markets for cotton at Coimbatore, Pollachi, and Tiruppur. A committee which went into the question decided as a beginning to open a market at Tiruppur under the auspices of the Municipality and controlled by the rules of the association, the opening of markets at other centres being postponed until enough experience was gained at Tiruppur. The Tiruppur Municipal Council agreed to the proposal, and acting on the instructions of the Government, framed by-laws for the management of the markets under the Municipal Act which was in force at the time, and which according to the opinion of the Advocate General with the Government of Madras, contained provision inter alia for such a step. A site for the market was selected and even the necessary buildings were put up. The by-laws proposed were on the model of the Berar system with certain modifications to suit local conditions. Meanwhile the Madras District Municipalities Act of 1884 under which the by-laws had been framed was replaced by a fresh Act of 1920 and the by-laws were declared to be illegal and *ultra vires* under the new Act. Government then considered the question of special legislation and prepared a draft bill known as "The Madras Industrial Crops Markets Bill" but this proposal was later abandoned as the proposed legislation contained

certain features of controversy the chief of them being the provision to levy a tax on all cotton entering the municipality but not necessarily entering the market "yard". In the meantime the personnel of the municipal council had also changed and the regulation drafted by them for running this market as a combined grain and cotton market did not help in improving matters. Nothing further was done for the next eight years until the Indian Cotton Committee considering a report on the investigation into the finance and marketing of cultivator's cotton in the Madras Presidency, again addressed the Madras Government recommending the establishment of regulated cotton markets. The matter was taken up once again and the Madras Commercial Crops Act of 1933 was passed by the Madras Legislative Council. The commercial crops included in the Act besides cotton, were groundnut and tobacco.

The rules of the Act were duly published in the Gazette and under section 3 of the Act the Government have declared their intention of exercising control over the purchase and sale of cotton within the municipal limits of Tiruppur a few months back and have invited suggestions or objections regarding the proposal.

Let us examine the present position of Tiruppur as a cotton market. Tiruppur is the centre of the Cambodia tract and handles annually about 1½ lakhs of bales. This constitutes a large percentage of the cotton grown in the area but a study of the marketing in Tiruppur itself goes to show that of the total quantity handled only 8–10% is brought in by the growers themselves. The remainder is taken in by merchants or their agents who have purchased it from the ryots in the villages or in the shandies.

In a detailed investigation in a village near Avanashi it was found that of the total cotton grown in the village 56% was sold in the village itself, 15% was delivered to landlords by tenants and 28% was delivered to ginning factories.

In Tiruppur town there are a large number of commission *mundies* or depots whose owners act as commission agents for the merchants and growers who bring their cotton for sale. These commission agents also provide storing accomodation and advance money to those bringing in produce on the security of the stored stock. Besides the *mundies*, there are also a number of cotton ginneries and presses. Connected with these ginneries there are cotton dealers who buy *kapas*, gin it and sell it as lint directly or supply it to the agents of big mills. There are also other petty brokers hovering round the town offering their help to the seller in the disposal of the *kapas*. Some of the big firms adopt the forward contract system during the busy season by which merchants bind themselves to supply these firms a definite quantity of lint within a stipulated period. Though the purchase is made in the form of lint, the *kapas* is first inspected by the agents of these firms

who satisfy themselves that the quality of cotton to be ginned is upto the required standard. The merchants buy cotton either in the villages through their agents or in the commission *mundies* and ginneries situated within the town. It would thus appear that though an officially regulated market does not exist, the whole town of Tiruppur serves as a market, there however, being no system of control on the conduct of sales, commissions charged, deductions made and on the balances and weights used in weighing the produce. There are also no agencies to inform the growers of the day-to-day prices of cotton.

The grower who brings his cotton to the commission *mundy* is charged a commission of Re. 1 per pothi of 260 lb. of cotton which together with weighment allowances, charities etc. comes to about Rs. 5—8—0 per cartload of 1040 lb. As regards the large proportion of the produce sold in the villages, though figures are not available to compare actually the price obtained by the grower in the village and that obtained at the commission *mundy* at a particular time, it is more than likely that the price offered at the village must be less than at Tiruppur even after allowing for the cartage to Tiruppur. There is no doubt that the small grower who has often to follow the example of other bigger men in the village does not realise the full value of his produce, by not being able to compare it with others in an open market and demand a suitable price.

It is possible that as the Act stands at present, the cotton traders at Tiruppur who are not prepared to come under the control of the Act can evade the law by arranging their transactions outside the municipal limits. This would deprive the market committee of its expected revenues without which the committee cannot function efficiently. If, however, to meet this difficulty the limits of the notified area were to be extended beyond the municipal limits, there is the risk of the benefits of the Act not being realised for want of efficient supervision and proper control over the transactions happening in a wider area.

As it is, only about 8% of the growers bring their cotton to Tiruppur for sale. If the Act should prove beneficial to the majority of growers who sell their cotton in the villages a good deal of propaganda would be necessary to convince the growers that they stand to gain by bringing their produce to the open market even after paying the cess that may be levied by the marketing committee to be set up by the Act. A number of practical difficulties are sure to crop up when the Act is actually brought into effect but the solution of such difficulties will largely depend upon the personnel of the committee to be elected and how they set about to carry on the work. The committee as soon as it is formed should go into the question thoroughly, prepare an estimate of the probable expenditure to be incurred to work the Act efficiently and then decide upon the rate of cess to be levied. If the

committee should manage to reduce their expenses to the minimum and make the cess comparatively cheaper than what the grower has to pay at present in the way of commission and allowances, the chances of the trade being diverted outside Tiruppur municipal limits, may be zero. The Act fortunately provides for a fair representation of the cotton growers in the committee (5 out of 12 which is probably not quite as strong as in other Provinces) and it will be up to them to convince their brother growers of the advantages of bringing their produce to the controlled market.

In other Provinces and States where such Market Acts have been found to work satisfactorily, the area of the market appears to have been purposely limited. In Berar the area is restricted to the market yard and to a radius of a mile from the centre of the yard. In Hyderabad the area includes all within 3 miles radius of the market yard. Here according to the Act no person is allowed to establish any market within 5 miles of the market yard. In the Bombay Act also there is a provision against the establishment of a market within 10 miles of an existing market. In Tiruppur however, private markets are already in existence and provision has been made in the Act for enabling persons owning such places to take a licence under section IV.

Though the advantages of a controlled market have long been recognised the one proposed for Tiruppur will be the first of its kind in Madras. There are a number of other suitable centres in the Province for such markets but their being established will depend upon what amount of success is achieved at Tiruppur. We are sure that this will be borne in mind by the members of the committee to be elected for Tiruppur who should see that the welfare of the grower is the prime consideration in the working of the Act.

We are glad to note that one of the rules in the Madras Act allows the market committee to engage when funds permit, agricultural staff to do propaganda in favour of agricultural improvement.

# THE RICE TRADE OF MADRAS

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**Introduction.** India is the largest rice growing country in the world. Among the several provinces of India, Madras ranks fourth having 11·7 millions acres under rice and producing about 5·4 million tons. Though Burma produces just a little less than Madras, it occupies an eminent position in the rice export trade of India, monopolising nearly 88 per cent. of the exports while the shares of Bengal and Madras are only 5 and 4 per cent. respectively. Although her small share in the Indian rice exports at first sight leads one to believe that the trade situation of rice in Madras is above anxiety, the situation assumed a serious aspect when large imports of rice from Siam and Indo-China started arriving into Madras. This paper deals mainly with the question of foreign markets for Madras rice.

**The output.** The areas of largest production for commercial purposes are in Tanjore, Godavary and Kistna deltas. Though other districts e. g., Ganjam, Vizagapatam, Malabar etc., claim as much as and even more area under rice, than the delta districts, they do not participate in the export trade of rice either external or internal, to the same extent as the former. Probably owing to the concentration of the rice area and similarity of conditions in the delta districts, the number of paddy varieties cultivated is fewer than in other districts. Conversely, the larger number of varieties in the other or non-delta districts indicates the diversity of existing conditions, to which the several varieties have admirably adapted themselves. It is precisely for this reason that these districts, with a large number of varieties are unable to occupy a prominent position in the trade. Therefore the greater uniformity of conditions, in the deltaic area resulting in the growing of fewer varieties, constitute weighty factors in the rice trade of the province.

The following statement shows at a glance the relative importance of some of the tracts for commercial purposes.

| Tracts. | Paddy in thousand tons. | Sea ports of the tracts. |
|---|---|---|
| Godavary and Kistna deltas. (East and West Godavary, Kistna and Guntur) | 1824·6 | Cocanada, Masulipatam. |
| Vizagapatam and Ganjam. | 1152·4 | Vizagapatam. |
| Cauvery delta and valley. (Tanjore, Trichinopoly and Salem) | 1120·3 | Negapatam. |
| Coastal districts. (North and South Arcot, Chingleput). | 1281·0 | Madras. |
| West Coast. (Malabar and South Kanara). | 935·1 | Calicut. |
| Other districts. | 1535 1 | — |
| Total. | 7848·5 | |

The above abstract of the relative importance of the several tracts needs no explanation.

Srinivasan (1934) has critically examined the sufficiency of the output to meet the needs of the province and has reported, in detail the movements of the rice from tract to tract within the province.

**The external trade.** In any country, trade is the bed-rock of prosperity. Until the Great War, politicians used to believe in the value of the external trade; and the potential wealth of the country used to be reckoned in terms of the value of exports and the balance of trade. Since the war, the impetus has grown towards self-sufficiency in the matter of production commensurate with local requirements. In addition to the self-sufficiency, the post-war period has seen a greater and wider use of another powerful weapon, to wit, tariff walls, directed to this end. The problem is here presented in its commercial perspective.

(a) *Export trade with foreign countries.* The average value of rice exports from India including Burma to foreign countries is about 32 crores of rupees. The value of exports to the principal foreign countries is given below.

| | Country. | Average (1921–31)* value in lakhs of rupees. |
|---|---|---|
| 1. | Ceylon. | 660 |
| 2 | Germany. | 446 |
| 3. | Straits Settlement. | 285 |
| 4. | China. | 252 |
| 5. | Japan. | 160 |
| 6. | Cuba. | 141 |
| 7. | West Indies. | 136 |
| 8. | Sumatra. | 123 |
| 9. | Netherlands. | 115 |
| 10. | Java. | 109 |
| 11. | United Kingdom. | 102 |
| 12. | Other countries. | 702 |
| | Total. | 3231 |

* (Agricultural statistics of India.)

It is not only the average value of exports that is of use in these considerations, but it is the trend of trade relations between India and other importing countries, that is of greater significance. From a scrutiny of the published annual export figures it is found that the demand from

(a) China is slightly increasing.
(b) Ceylon, Sumatra, Straits Settlements, Cuba, West Indies and Netherlands is being maintained.
(c) Germany, Japan and United Kingdom is declining.
(d) Java is rather unsteady.

The rice exports of India are reported under the following forms (a) Paddy (b) Rice not in husk (boiled rice and cleaned rice) (c) broken rice (d) and other sorts.

Now we will proceed to consider the volume and value of the trade of India under the several forms of rice in detail and the share of Madras in the same. It will be appropriate to consider the fluctuations of trade with reference to the Great War and the present economic depression. The periods may be classified as below.

1. *Pre-war period.* 1909–10 to 1913–14. 2. *War period.* 1914–15 to 1918–19. 3. *Post-war period.* 1919–20 to 1922–23. 4. *Grand period when the prices were very favourable.* 1923–24 to 1927–28. 5. *Depression period.* 1928–29 upto the present day (Figures dealt with are only upto 1931–32).

It is not the magnitude of the export alone that counts, but the form in which the different importing countries take in the commodities. This will help towards a clear realisation as to which importing country requires more of paddy or rice not in husk, or broken rice etc. This knowledge is quite necessary in catering to the requirements of importing foreign countries, and the tables given below furnish the concerned figures.

Pre-war annual average exports of rice may be briefly summarised thus.

| | |
|---|---|
| Quantity of total exports. | 2398 thousand tons. |
| Value of total exports. | 2266 lakhs of rupees. |
| Share of Madras. | 121 thousand tons. |
| Share of Burma. | 1814 thousand tons. |

*War Period.* Rice in its several forms is exported mainly to countries in British Empire like United Kingdom, Ceylon, Straits Settlements and Marutius and to foreign countries like Austria, Germany, Holland and Japan, as seen in table I.

**Table 1.**

| Form of export. | Countries. | War period | | Post-war period | | Grand period | | Depression period | |
|---|---|---|---|---|---|---|---|---|---|
| | | Quantity 1000 tons. | Value lakhs Rs. | Quantity 1000 tons. | Value lakhs Rs. | Quantity 1000 tons. | Value lakhs Rs. | Quantity 1000 tons. | Value lakhs Rs. |
| Paddy | British Empire | 32 | 20 | 36 | 32 | 31 | 29 | 29 | 22 |
| | Foreign countries | — | — | — | — | — | — | 14 | 6 |
| | Share of Madras | 12 | 8 | 1 | 1 | 4 | 4 | 4 | 4 |
| | Share of Burma | 20 | 12 | 35 | 31 | 25 | 24 | 39 | 24 |
| Rice not in husk | British Empire | 1093 | 1257 | | | | | | |
| | Foreign countries | 591 | 631 | | | | | | |
| | Share of Madras | 175 | 289 | | | | | | |
| | Share of Burma | 1271 | 1204 | | | | | | |
| Cleaned rice | British Empire | — | — | 432 | 730 | 334 | 532 | 325 | 373 |
| | Foreign countries | — | — | 414 | 672 | 1134 | 1754 | 1063 | 1160 |
| | Share of Madras | — | — | 1 | 2 | 0·5 | 0 9 | 0·7 | 1·6 |
| | Share of Burma | — | — | 752 | 1190 | 1412 | 2161 | 1347 | 1160 |
| Boiled rice | British Empire | — | — | — | — | 527 | 1138 | 582 | 787 |
| | Foreign countries | — | — | — | — | 59 | 113 | 60 | 96 |
| | Share of Madras | — | — | — | — | 78 | 156 | 88 | 162 |
| | Share of Burma | — | — | — | — | 311 | 490 | 420 | 488 |
| Broken and cleaned rice | British Empire | — | — | 49 | 66 | 82 | 102 | 45 | 39 |
| | Foreign countries | — | — | 12 | 22 | — | — | 33 | 26 |
| | Share of Madras | — | — | — | — | — | — | — | — |
| | Share of Burma | — | — | 61 | 87 | 81 | 100 | 76 | 64 |

(b) *The Markets for Madras Rice—Foreign Markets—Paddy.* Before the war a good deal of Indian paddy used to be exported to Germany

and Holland, where it was cleaned, polished, oiled or glazed according to the tastes and requirements and exported to the United Kingdom. But Madras does not figure in this export.

*Boiled rice.* For boiled rice there is no market in Europe, but there is a considerable demand within India and also in countries where Indian labour is employed such as Ceylon, Federated Malay States etc., as that commodity forms the staple diet of the working classes. It will be found that the trade of Madras consists only in boiled rice, and that her trade is practically confined to Ceylon.

Ceylon is the chief country purchasing boiled rice and its total market demands are to the extent of 450-490 thousand tons per annum. Of this quantity, about three quarters are supplied by India. It is strange to observe that Ceylon though nearer to Madras than any other Indian province is not monopolised by Madras. Probably only one fifth of the Indian imports into Ceylon is contributed by Madras. The following figures indicate how the Ceylon market has been gradually captured by Burma.

*Exports of rice from Burma to Ceylon.*

| | |
|---|---|
| 1913-14 | 44 thousand tons. |
| 1922-23 | 268 ,, |
| 1931-32 | 305 ,, |

*Cleaned Rice.* Straits Settlements and Federated Malay States have demands for a large amount of cleaned rice on account of the large number of Indian residents there. There is of late a good demand in China as well. Germany is the largest purchaser for manufacturing purposes and at times for re-export to the United Kingdom after repolishing and oiling. The following are the total demands of the chief importing countries.

| Country. | Quantity in thousand tons.* | | | |
|---|---|---|---|---|
| | *1929.* | *1930.* | *1931.* | *1932.* |
| Germany | 294 | 245 | 400 | 379 |
| China | ... | ... | ... | 1339 |
| Java | 340 | 245 | 282 | 147 |

* (Year book of Agriculture 1932—U. S. Dept. of Agriculture).

*Inter-provincial markets.* Though the movement of rice to other provinces is not as encouraging as it might be, the prospects of good inter-provincial trade are rosy as the demands are fairly large enough.

| Province. | Demand in* thousand tons. | How supplied at present. |
|---|---|---|
| Bengal | 125 | Chiefly Burma. |
| Bombay (Including Sind) | 255 | do. |
| United Provinces | 400 | do. |
| Bihar and Orissa | 80 | Bengal. |
| Mysore | 150 | Madras. |
| Hyderabad | 200 | do. |

* (Press report of the Crop Planning Conference, Simla).

The possibilities of Madras securing a firm hold on some of the markets noted above are fair enough as the deliberations of the Crop Planning Conference have revealed that none of the importing provinces are pleased with the quality of Burma rice.

Before we proceed to examine the suitability of Madras rice for home trade in India and for foreign countries the import trade also may be considered.

(c) *Rice Imports into Madras.* The imports are generally in the form of rice and seldom in the form of paddy. In the pre-war period there were no imports at all. During the war period there used to be an average annual import of 600 tons of "Rice not in husk". During the post-war and grand periods there were imports. Again in the depression period there has been considerable imports of paddy, as well as rice "not in husk", Siam and Indo-China taking a great share in this trade.

**Table 2.**

*Rice Imports (in thousand tons) into Madras.*

| From. | 1931—32. | | 1932—33. | | 1933—34. | |
|---|---|---|---|---|---|---|
| | Paddy. | Rice. | Paddy. | Rice. | Paddy. | Rice. |
| Siam | ... | 2 | ... | 13 | 1 | 28 |
| Indo-China. | 4 | 12 | ... | 15 | ... | 22 |
| Burma | 106 | 446 | 61 | 377 | 75 | 523 |
| Total. | 110 | 460 | 61 | 405 | 77 | 574 |
| Paddy equivalent to rice not in husk. | ... | 73 | ... | 41 | ... | 51 |
| Total quantity of rice import. | ... | 533 | ... | 446 | ... | 625 |

The above figures open up the interesting and vital economic question, as to how Siam, Indo-China and Burma are able to export such large quantities to Madras.

**The nature of rices in Foreign Markets Boiled Rice.** Ceylon is the largest purchaser of rice from foreign countries. Most of her demand is for boiled rice. For a long time in the past, Madras used to supply her requirements. Cheaper Burma rice, now available, has effected a decrease in her demand for Madras rices. Par-boilng in Burma was usually confined only to long, slender types of grain as the *Emata* and *Letywezian* groups. The prices of the Burma rice, Rangoon No. 2, compare as below with those of the Madras rices.

**Table 3.**

| Year. | Burma Rice. | Price per Imperial maund. | | | |
|---|---|---|---|---|---|
| | | Madras rices. | | Difference in price from Burma rice of | |
| | | Godavari. | Tanjore. | Godavari, | Tanjore. |
| | R. | R. | R. | R. | R. |
| 1929 | 5/1 | 6/4 | 7/11 | 1/3 | 2/10 |
| 1930 | 4/5 | 5/14 | 6/13 | 1/9 | 2/8 |
| 1931 | 2/12 | 3/11 | 5/14 | -/15 | 3/2 |
| 1932 | 2/15 | 3/14 | 4/5 | -/15 | 1/6 |

(Season and crop reports Dept. of Agri. Madras. Year book of Agriculture, U. S. Dept. of Agriculture).

The figures relate to the prices in the districts referred to above. Kolandaswami Pillai (1932) also found a difference of Rs. 3 in the price per bag of Madras Rice and Burma rice in the Ceylon market. It will be seen that the difference is covered by the variation in price prevailing in the producing districts themselves.

*Cleaned rice (Raw Rice).* Cleaned rice is required both in the Eastern and the Western markets. The eastern markets comprise Straits Settlements, China and Federated Malay States. They require large quantities of cheap rice for labourers, with smaller quantities of medium quality and fancy rices for the middle and upper classes. (containing 38–32% and 40–45% '*Big Mill Specials*' (containing 44–45% broken riee) '*Small Mill Specials*' (broken rice) and '*Straits quality*' (containing 32–36% broken rice) are the main grades exported from Burma. The '*Big Mill Specials*' are of the lowest grade exported and they are milled from the smaller types of *Ngasein, Laty wezin* and other types that do not fit into any other grade. These lack uniformity in size, shape and hardness, in addition to red grain being present in considerable quantities. '*Small Mill Specials*' is milled from a better quality of grain of much the same type as *Big Mill Specials.*

Siam and Indo-China also occupy prominent parts in these markets. Indo-China grows largely *Hukey* and *Ramay.* These are also long and broad. The rice of Indo-China, according to Copeland has had no status in the matter of quality and has had to be content with a price based on its nominal designation. She competes mainly in the '*Big Mill Specials*' grade. Siam competes with Burma in the '*Small Mill Specials*' and '*Straits quality*' grades in the Straits Settlements, China etc.

The principal western markets viz. Germany and United Kingdom are supplied with Indian (mostly Burmese) rice up to nearly two-thirds to three-fourths of their demand. Qualities designated as *Rangoon Nos. 0, 1, 2, 3* are taken in these markets. They contain 5, 10, 25 and 27 per cent broken rice respectively. The first two are of the highest quality of rice milled and polished in Burma from specially selected quantities of grain of uniform size, shape and hardness of *Ngasein* or *Emata* types, Nos. 2, 3 being of lower grades in quality either from point of boldness of grain or polish.

America, Spain, Italy and Indo-China are some of the active competitors for Burma. Of the American varieties, *Blue Rose* is the largest grown with a prominent place in the trade. It is of a bold type, and takes easily a fine polish. *Garden Siam* and Japanese types (*Shinriki, Aikokku,* etc.) produced in America in increasing quantities have apparently set a severe competition for the best Burma rices. The Spanish (*Belloch, Oiled*) and Italian (*Italian good, oiled*) rices are of high grade quality of polish and find easy sale in the western markets in preference to rices of about the same quality from other countries.

*Broken cleaned rice.* This is largely used for manufacturing purposes in the western markets and for consumption by poorer classes of people in the Eastern markets.

*Paddy.* The markets for paddy are meagre and the increasing freight rates do not permit a large movement of paddy.

**Summary.** Madras ranks fourth among the provinces in the acreage under rice and third in the output of paddy. Her share in the external trade is very meagre on account of little exportable surplus left after meeting the home needs, unlike other provinces like Burma which produces an equal quantity. The rice exports to other countries from India and the share of Madras are discussed during several periods with particular reference to Great War, and Economic Depression. During the 'Grand' and 'Depression' periods the rice exports (boiled and raw or cleaned) have fallen to about half the exports in the war-period. There were no exports during the post-war period (1919–20 to 1922–23). The demands of the several markets and the nature of rice from the several competing countries in the above markets have been studied. A list of grain measurements is appended to furnish a comparative idea of the boldness and coarseness of rices in the foreign markets.

The rice imports into the province have mounted to the astounding figure of 500—650 thousand tons, nearly a tenth of the total production of rice in the Presidency. The quantity imported from Siam and Indo-china is not so alarming as that from Burma. Since the imports from the above countries have increased suddenly it was a matter of grave concern. The Government of India have recently imposed an import tariff of Rs. 0—12—0 per Imperial Maund on broken rice, the chief form in which the imports from Siam and Indo-china are found. But the measures are not calculated to prevent the unduly excessive imports from Burma, which contribute to a great extent in disturbing the local prices of paddy. It is left to the Government of India to limit production of crops in the several provinces and to prevent undue imports tending to deflation of prices in the importing province.

**Acknowledgments.** To Dr. B. P. Pal, M.Sc., Ph.D., Second Imperial Economic Botanist, Imperial Institute of Agricultural Research, Pusa, my thanks are due for suggesting me this subject. I am indebted to Mr. K. Ramiah, M.Sc., Dip, Agri. (Cantab), Paddy Specialist, and to Mr. K. Venkataraman, M. A. (Hons.), Superintendent, Agricultural Research Station, Maruteru for their valuable criticisms.

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## APPENDIX

**Table 4.** *Measurements in Millimeters of grains.*

| Country. | Name of Variety. | Paddy | | |
|---|---|---|---|---|
| | | Length. | Breadth. | Thickness. |
| | | Over | Over | |
| *Burma*— A | Emata | 9·40 | 3·30 | |
| B | Letzwezin | 8·40 } 9·80 } | 2·80 } 3·30 } | |
| C | Ngaseim | 7·75 } 9·00 } | 2·40 } 2·80 } | |
| D | Medon | 7·35 } 8·60 } | 2·00 } 2·40 } | |
| E | Byat | 9·00 Upwards. | 2·25 } 3·00 } | |
| *Indo-China* | Hukey and Ramay | 7·8 | 3·3 | 2·1 |
| *America* | Blue rose | 8·7 | 3·3 | 2·3 |
| | Fortuna | 10·1 | 2·8 | 1·9 |
| | Honduras | 9·7 | 2·9 | 1·9 |
| *Japanese Types.* | Shinriki | 7·5 | 3·1 | 2·2 |
| | Aikokku | 7·4 | 3·2 | 2·2 |
| | Early prolifics— Wateribune | 7·4 | 3·3 | 2·2 |
| *Bengal* | Patnai | 10·1 | 2·6 | 2·1 |
| *Madras* | G. E. B. 24 | 7·9 | 2·4 | 1·7 |
| | Co. 1. | 8·3 | 2·5 | 1·8 |
| | Co. 2. | 7·5 | 2·7 | 1·9 |
| | Co. 3. | 8·3 | 2·6 | 1·9 |
| | Adt. 1 | 6·5 | 3·1 | 2·2 |
| | „ 2 | 6·2 | 3·0 | 2·1 |
| | „ 3 | 7·7 | 3·0 | 2·0 |
| | „ 4 | 7·9 | 3·1 | 2·0 |
| | „ 5 | 8·3 | 3·1 | 2·1 |
| | „ 6 | 7·6 | 3·1 | 2·1 |
| | „ 7 | 7·6 | 3·1 | 2·1 |
| | „ 8 | 6·1 | 3·0 | 2·1 |
| | „ 9 | 8·2 | 2·9 | 1·9 |
| | „ 10 | 7·4 | 2·9 | 1·9 |
| | „ 11 | 7·7 | 2·8 | 1·9 |
| | Mtu 1 | 8·0 | 2·8 | 1·9 |
| | „ 2 | 8·0 | 2·6 | 1·9 |
| | „ 3 | 8·1 | 2·8 | 2·0 |
| | „ 4 | 8·4 | 2·6 | 2·0 |
| | „ 5 | 7·9 | 2·6 | 1·8 |
| | „ 6 | 8·0 | 2·8 | 2·0 |
| | „ 7 | 8·6 | 2·8 | 2·0 |
| | „ 8 | 8·4 | 2·5 | 1·9 |

# "CONSERVATION OF SOIL MOISTURE IN DRY LAND FARMING"

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In tracts where irrigation works are few, either due to the geographical situation of the place or to the want of sufficient finance to undertake major irrigation works—either productive or protective —rainfall is *ipso-facto* the limiting factor in successful crop production. Such tracts as suffer from this initial disability of a geographical disadvantage and handicap, must needs depend on Nature, to send forth her timely showers on parched up lands and crops. To this class, may be assigned the districts of Bellary, Anantapur, Cuddapah and Kurnool—and portions of Guntur and Nellore. The first four districts verily form the 'Famine zone' of the Madras Presidency and the scope of this article is to show how best an agrarian calamity can be averted by improving the present agricultural practices and by the application of suitable methods for the conservation of soil moisture.

It has come to pass—as evidenced from the statistics at our disposal—that crop failure as a result of inadequate rainfall, is a matter of common occurrence and a normal crop has been purely an accidental achievement.

In such a tract, therefore, where there are large areas of crops for want of proper supply of water, are limited in growth any improvement in the direction of conserving soil moisture, is a distinct step towards better cropping. One could see in these districts, large areas of uneven and undulating ground—not among waste lands but among cultivated fields. The fields are rarely level; depressions, scours and washes being very common features. There is hardly any possibility of the rain water percolating into the soil to the desired extent, as the lands invariably slope to one or several sides and the little water that is received through scanty rainfall is lost irretrievably through the meandering washes that join the stream below. Loss of soil fertility by repeated scouring and want of optimum soil moisture due to the total wastage of unbunded waters during the rains are the attendant results.

The idea of conserving soil moisture is not new to the ryot of the Ceded districts. The indigenous implements that are in vogue bear a testimony to his early knowledge of agricultural facts. Though serious attempts are not made by him to utilise all the rain water to the best possible advantage we could see here and there several embankments put up along the lower levels of fields. But this after all does not serve the entire purpose, as such bunds only impede the flow of water from the field to the exterior and in a way, stop the speedy

scouring of soil. However, this method is not found to be very satisfactory.

The sources of soil moisture are :— (1) rain, (2) Sub soil water, and (3) atmospheric moisture. Soil moisture is the water held by the soil after the excess of water is drained away. The water acts as a solvent for the plant food present in the soil and conveys it to the roots.

It is a well known fact that a soil on which plants are growing, loses much more water than a bare soil as a considerable quantity of water is lost through transpiration by the plants. Different plants transpire different quantities of water in a given time and the more the number of plants in a plot the more is the loss of water sustained. That is how a thin sown crop gives a better yield in a season of less rainfall than a thick sown crop which fares better in a season of abundant rainfall. It is clear therefore that the first step towards the conservation of soil moisture is to keep the land free from weeds which drain away the soil moisture. Hence the necessity for clean cultivation.

Secondly, it is a popular belief that a soil that is compacted in the surface loses a larger quantity of water by evaporation than a soil kept loose at the surface by tillage. In a consolidated soil, dry winds come in contact with the surface and thereby evaporation of water is expedited. If the surface of the soil is kept under good mulch—the sub-soil water is retained for the use of the crop. The mulch at the top not only arrests the movement of water to the surface, where it would be positively lost by heavy evaporation, but by virtue of its possessing certain hygroscopic properties, absorbs also some moisture from the air. Thus the advantage of a loose mulch at the surface is two-fold. Evidence as regards the advantages of soil mulch, apart from weed destruction, is, however, conflicting.

After a heavy rainfall, one can observe that in many of the fields, rain water is lost to a great extent without its getting into the soil. As most of the lands are uneven and as there are no catches for the water to collect, the water flows rapidly out of the field without its getting absorbed by the lower layers of the soil. If this water is allowed to remain in the field during its flow to a greater length of time, there is some chance for the water to get absorbed by the soil. Thus, if fairly good sized bunds are formed along the contours of the fields, the rain water will be caught in these bunds and will be allowed to flow out gradually. Bunding of sloping lands can help the retention of a large quantity of moisture. These bunds can be formed with a Bund former at negligible cost.

Experiments conducted at the Agricultural Research Station, Hagari, have revealed that bunded plots give much better yields than unbunded ones. The results of the "Soil Moisture Experiments"

conducted by the Government Agricultural Chemist at Hagari from the year 1927 to 1934, are conflicting, but some useful data have been collected. In his review of the work done for the last seven years in the conservation of soil moisture, the Agricultural Chemist states among other things that "Bunds are very effective in years of low rainfall, in conserving the water but in years of too much rainfall, the yield was low". Again "deep ploughing once in five years and three years seems to affect the yields such that they vary directly with the rainfall." These observations were made with *Cotton* as the crop.

In regard to the Sorghum crop, (1) "The yields are exceptionally high—in plots where stubbles were removed soon after the harvest of the preceding crop—in years of least rainfall; (2) The bunded plots gave very high yields during the year 1930-31 when there was only 15 inches of rainfall and the yield in this plot was very low in 1933-34 when there was a maximum of 26 inches of rainfall."

One outstanding observation made as a result of these experiments is "deep ploughing once in two years would appear to be the most beneficial one for the yields of cotton, cholam grain and straw and it is not influenced by the amount of rainfall."

Based on the results of the experiments conducted at the Agricultural Research Station, Hagari, in regard to the increased yield obtained in bunded plots and with the knowledge available of soil moisture under dry land farming, it is now proposed to start a number of demonstration plots at a number of centres. The demonstration consists in selecting mostly sloping lands and bunding them into convenient plots along the contours with the Bund former and effecting such other cultural operations as are necessary and comparing the same with a control—which will be entirely in accordance with the existing local practice. This item of demonstration holds, great possibilities for the dry land tracts and every attempt will have to be made to take this to a convincing conclusion. The conduct of bunding and ploughing experiments, as a part of the programme of the "Dry Farming Scheme" in the ryots' lands initiated this year at Bellary holds promises fruitful results.

Perhaps—at a future date—when the dreams of Thungabadra project comes true, when the extensive areas of arid waste are superseded by vast sheets of verdure hue, when fodder famine will be a dead letter and an anachronism when Ceded districts wherefrom people migrate for want of work, will be the repository of agricultural labour—bringing in its wake all the wealth and prosperity to many a ryot—when the dry tract of these backward districts is metamorphosed into wet and garden lands—there will not be any more need to tax ourselves with the methods of the conserving soil moisture, but probably we may be faced with a greater and a more menacing problem of draining away excess water to prevent soil alkalinity.

# THE PRESENT POSITION OF THE MECHANICAL ANALYSIS OF SOILS.

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**Introduction.** The process of mechanical analysis was developed to give more precision to terms such as sand, loam and clay that are employed by a pratical man in describing soils. Its function is to sort out by appropriate means the particles composing a soil into groups of specified limits of diameter. The methods of mechanical soil analysis in their various forms are, undoubtedly, among the more tedious operations, with which soil scientists are confronted. The importance of a determination of this kind lies in the fact that the behaviour of the soil towards water, its power of retaining and handing over the rainfall to the plant and also its physical texture and amenability to cultivation—factors which are of greater importance in the nutrition of the crop than the amount of plant food present—are all determined by the sizes of the particles of which the soil is composed. This fundamental fact has long been recognised and has led to a tremendous amount of work on the part of various investigators, in an effort to devise methods for making mechanical analyses of soils and determining the proportions of particles of various sizes.

**The older methods.** The old standard methods for this purpose may be divided into two groups; in one, the separation is effected by a stream of running water, the velocity of which is increased to carry over successively coarser particles, and in the other by leaving the turbid mixture of soil and water to settle for given periods of time, the longer the time interval, the finer being the group of particles remaining suspended. The former, known as the elutriation method was made quantitative by Schone (1867) and as modified by Meyer (1882) was for long in general use in Germany. The apparatus was further improved and the whole method reduced to an accurate form by Hilgard (1873, 1893) to whom we are indebted for a considerable elucidation of the whole subject. The second or the sedimentation method, depending on sedimentation for a given time, was elaborated by Woff, (1875) critically discussed by Osborne (1886, 1887) and introduced into Great Britain by Hall (1904, 1906) after further examination and modification. The principal disadvantage in practice of these two methods is the repeated pouring off, especially necessary in the heavy clay soils, the large volume of water needed and the great number of beakers to be used. Although in the older United States Bureau of Soils method (1904), time is saved by using a centrifuge, the cost of the apparatus and the absence of necessary electrical facilities have precluded its general adoption in routine laboratories.

**The Concept of Size Distribution Curves.** In addition, the methods of elutriation and sedimentation are "fundamentally defective in that the grouping of particles of various sizes is quite arbitrary, sharp lines being drawn where none exists in nature, and the soil is represented as a mixture of 5 or 6 different substances when in point of fact, the number of components is indefinitely large. In order to avoid an arbitrary grouping of the soil particles and to facilitate the transition from one system to another, Oden (1915) introduced the *Maxwellian* conception of the *distribution* according to size, i. e., to obtain a characteristic curve by plotting as abcissae some quantity related to size against some quantity related to the amount corresponding to every size; based on this idea of expressing the mechanical analysis as a continuous function of particle size, Oden (1916, 1922, 1925) developed a method in which a pan attached to one arm of a self-recording balance (Coutts, Crowther, Keen and Oden, 1924) is placed near the bottom of a vessel containing the soil suspension and by mathematical analysis of the curve showing the increase of weight with time, a curve—known as the summation or size distribution curve (Robinson, 1924) is constructed showing the distribution of the particles as a function of size. Wiegner (1918) has used the same principle employing a different experimental method in which the change in hydrostatic pressure in a given plane in the sedimenting column is recorded by the motion of the meniscus in a balancing column of water. Crowther (1927) has described a sedimentation apparatus in which a sensitive differential liquid manometer is used to show the amount of material remaining in suspension at a definite depth in the sedimenting column. These methods are not, however, suited for routine use in laboratories where large numbers of soils have to be examined and the technique at present contains a source of error that seriously impairs their use for fundamental research work. This error was first brought to light by Coutts and Crowther (1925), who, during their experiments, with the Oden-Keen balance found that owing to the sediment collecting in the scale pan, the liquid below the scale pan becomes less dense, setting up currents in the neighbourhood which seriously perturb the indications of the instrument. Shaw and Winterer (1927) have independently investigated the inherent error using a wide range of particles, both in texture and chemical composition. Their results confirmed those of Coutts and Crowther. Other sources of experimental error in continuous sedimentation methods of mechanical analysis have been pointed out by Fisher and Oden (1923–24). Optical methods using transmission of a beam of light through a glass cell, as a measure of the sedimentation process taking place within it, the transmitted light being received on a photo-electric cell (Richardson, 1934) would appear to obviate the above sources of error. Such methods however are tedious and not suitable for routine adoption.

**The Pipette Method.** The development of a greatly improved method of mechnical analysis, depending on the depth--concentration relationship in settling suspensions, and known as the Pipette-sampling method was worked out independently by Robinson (1922) in England, by Jennings, Thomas and Gardner (1922) in America, and by Krauss (1922, 1923) in Germany. The principle of the method is to take at a predetermined depth $x$, and time $t$ a sample of the suspension by means of a pipette. This sample contains no particle whose velocity of fall exceeds $x/t$; all particles with less velocity are present in the sample in the same concentration as in the original suspension. The pipette sample is evaporated and weighed. Knowing the capacity of the pipette this weight can be expressed as a concentration whose percentage ratio to the concentration of the original suspension gives at once the percentage weight of particles with velocity less than $x/t$. The bulk suspension is then thoroughly shaken to obtain a uniform suspension again and another pipette sample is taken corresponding to a different critical velocity. By suitably choosing the depths and times of sampling a number of values are obtained from which the particle-size distribution of the soil could be ascertained.

In the pipette method, there is the implicit assumption that the sample withdrawn by the pipette comes from the infinitely thin horizontal layer of suspension in which the pipette tip stands. This assumption is not of course true and several workers (Puri and Amin, 1928; Kottgen and Heuser, 1929) have suspected errors due to a disturbance of the sedimenting column and have devised (Jennings *et, al*: *loc. cit.*) pipettes with bent tips of several orifices etc. intended to define more closely the region from which the liquid is removed. Kohn (1928) has demonstrated in an important theoretical contribution to the hydrodynamics of sedimentation analysis that such precautions are quite unnecessary. According to him quite insignificant errors are introduced by the fact that a pipette removes liquid from a sphere round its tip and not from the thin horizontal layer postulated in the simple theory of the pipette method. Kottgen and Heuser (1931) dispute Kohn's view (1931) that disturbances due to stream line processes during decantation and pipette sampling have insignificant effects on the composition of the sample withdrawn.

Bouyoucos (1927, 1928) has introduced a method which, like the pipette method, depends on measuring the density of the suspension after a given time. A hydrometer calibrated to read in grams of soil per litre is placed in the suspension and readings are taken after 1 minute and 15 mins. The results show fair agreement with those obtained by the pipette method (1934). Keen (1928) draws attention to a fundamental defect in Bouyoucos' method. The density variation at different depths of the suspension progressively changes with time while the particles are slowly settling and the actual manner in which

it changes with time depends on the size distribution of the soil and therefore varies from soil to soil.

Marshall (1930) has developed a new centrifuge method of sedimentation analysis capable of extending the range of size distribution for soil particles from 2 μ, the upper limit conventionally ascribed to clay particles, down to 0·02 μ and has later (Marshall, 1931) extended the method to the mechanical analysis of clays down to 0·05 μ equivalent diameter, and used it to study the dispersion of clays combined with different bases.

**British Official and International Methods.** In the year 1923, the Agricultural Education Association of England appointed a Sub-Committee to make a systematic examination of the function and significance of mechanical analysis and to ascertain how far quantitative and accurate measurements could be substituted for those earlier determinations which were necessarily evolved on a conventional and empirical basis. The pipette method propounded by Robinson (*loc. cit.*) proved so successful that it was adopted as the Official Method of the A. E. A. (1926). A beginning of international effort towards reviewing the methods of mechanical analyses was made by the International Society of Soil Science in connection with the Soil Congress at Rome in 1924. Their investigations were considered at a special meeting of the First Commission at Rothamsted in October 1926 and the recommendations finally adopted at the International Soil Congress at Washington in 1927. This Official International Method is based on preliminary dispersion by hydrogen peroxide, hydrochloric acid and ammonia with pipette-sampling similar to those adopted by the A. E. A. in 1925, as the Official British Method. Some minor differences remained and the A. E. A. (Keen, 1928; A. E. A., 1928) has subsequently revised its method so as to bring it into line with the International Method. The revised British Method differs from the International Method only in the one unimportant detail that the analyses are to be expressed as percentages of the air-dry soil. They will however include the air-dry moisture content so that recalculations to the International Method can be readily made.

**Pretreatment for Mechanical Analysis.** Mechanical analysis consists of two distinct series of operations; the soil must be completely dispersed into its constituent particles and these must then be graded into groups or fractions in accordance with their effective size. While it is true that a mechanical analysis based on complete dispersion does not necessarily give so close a picture of the field structure and any associated physical properties as a gentler dispersion method, it has yet the great advantage that it is far less empirical. Mechanical analysis after complete dispersion does define a fundamental and intrinsic soil property, not directly altered by cultivation and manurial treatment, whereas an arbitrary or conventional dispersion such as

boiling with water is liable to variation in its results from soil to soil and worker to worker. The International Method is accordingly based on preliminary dispersion by hydrogen peroxide, hydrochloric acid and ammonia with pipette-sampling for determining particle size. The preliminary treatment with dilute acid was first introduced by Schloesing (1874) and later shown (Hall, 1906; Sreenivasan and Subrahmanyan, 1934) as giving a truer picture of the ultimate physical constitution of the soil by removing calcium carbonate and other materials which bind together a considerable quantity of the finest particles into loose aggregates which otherwise resist disintegration. Besides, such a treatment removes certain soluble salts which otherwise generally induce flocculation of the clay particles. The use of hydrogen peroxide in pretreatment has been advocated by Robinson (1922) who showed that oxidation of the soil organic matter prior to dispersion is necessary to overcome its cementing action on the soil particles.

**The Newer Methods of Dispersion.** Since the decision at Washington to adopt hydrogen peroxide and hydrochloric acid treatment of soils as an essential preliminary stage in the preparation of soil suspensions for mechanical analysis by the pipette method, the following objections have been raised.—1. Hydrogen peroxide is an expensive and troublesome reagent in many countries. 2. Hydrogen peroxide is decomposed so rapidly by catalysis in certain soils (especially if manganese dioxide is present) that it is extremely tedious, if not impossible to reach a definite end-point in the oxidation. 3. The acid treatment results in considerable loss of soil constituents taking place which cannot be answered except by saying that it is inevitable, and when this loss assumes such alarming proportions as 30—40 per cent. as it actually does in certain calcarious soils, it cannot altogether be ignored. 4. The removal of calcium carbonate reduced the value of mechanical analysis in soils with much of this material. Several cases have also been recorded in which the Official International Method gives poor results in certain types of soils. Thus, Joseph and Snow (1929) found that for Sudan soils, decantation methods (Joseph and Martin, 1921) appear essential, hydrogen peroxide unnecessary, acid pre-treatment not essential and sodium carbonate better than ammonia. They raise the question whether other soils with high silt contents may not really be clay soils difficult to disperse. Bodman (1928) found little difference between the acid-hydrogen peroxide method and the former American method of rubbing up with very dilute ammonia, except that in highly organic and calcareous soils higher results for the finer fractions were given by hydrogen peroxide and in hard pans by the ammonia method. Dennett (1928) in Malay found no necessity for hydrogen peroxide in non-organic soils. Similar observations were made by Charlton (1927) and Puri and Amin (*loc. cit.*) for Indian soils. Groves (1928) observed that certain ferruginous soils do not

respond to the usual preliminary treatment with hydrogen peroxide and found a method of pre-treatment with ammonical hydrogen peroxide followed by repeated gentle rubbing with a rubber pestle to give a satisfactory dispersion with such soils. In a useful compilation of methods for physical and chemical analyses of soils, Prescott (1928) states that the disturbance due to gypsum may be avoided by extracting soil with a large volume of dilute hydrochloric acid. The United States Bureau of Chemistry and Soils (Alexander, 1930; Olmstead and Alexander, 1930: Olmstead *et al*, 1930) has developed a modified hydrogen peroxide method in which hydrochloric acid treatment is omitted. In soils containing manganese dioxide, acetic acid is added with the hydrogen peroxide. Sodium oxalate is used as the dispersing agent. Puri (1929) proposes the omission of both hydrogen peroxide and acid since in the soils without much organic matter, good dispersion is secured with a sodium clay prepared by leaching with sodium chloride and then with water and adding enough sodium hydroxide to make the suspension alkaline. The method was found unsatisfactory (Novak, 1932) for basaltic soils and for soils containing high proportion of organic matter.

Recently, Puri (1935) found in the course of his studies on the use of ammonium carbonate as a reagent for determining bases that boiling the soil with ammonium carbonate solution followed by heating with sodium hydroxide solution gave a sodium clay having a maximum dispersion even with humus and ferruginous soils. Troell (1931) and Crowther and Troell (1932) advocate the use of cold solutions of sodium hypobromite in which also neither hydrogen peroxide nor hydrochloric acid is used for pretreatmet The method has been found unsatisfactory for laterite soils (Chakraborty and Sen, 1935); besides the use of large quantities of obnoxious and injurious chemicals like bromine and ammonia make it unfit for inclusion in routine practice. Chakrabarty and Sen (1932) find that a direct sodium hydroxide method in which the soil is shaken directly with sodium hydroxide and adjusted to a pH of 10·5 ensures optimum dispersion in lateritic soils and works very satisfactorily. Recently, the same authors (1935) have developed a new method for the mechanical analysis of lateritic soils using alkaline permanganate to destroy the organic matter and state that the method might prove equally suitable for all types of soils. Robinson and Richardson (1933) have examined a large number of representative soils and showed that with substitution of sodium hydroxide for ammonia as the dispersing agent, the International Method gives satisfactory dispersion.

Difficulties due to gypsum may be avoided by removing coarse gypsum after the peroxide treatment by using more concentrated acid and by washing with 10 per cent. ammonium acetate. Oxidation of organic matter by hydrogen peroxide is still considered necessary. Manganese dioxide interferes with this oxidation, but it may be

decomposed by preliminary digestion with water and sodium bisulphite. Certain aluminous soils still present a special difficulty as they are not dispersible in alkaline solutions. They may be dispersed in a slightly acid medium, but the loss on dissolution is then relatively high.

**The Present Position.** The vast amount of literature that has sprung up in recent years dealing with the Methods of mechanical analysis of soils would show that the International method requires modifications in the case of such soils as peats, heavy alkaline soils, laterites, ferruginous soils and *terra rossa*; it is yet to be recognised however that there cannot possibly be a single method of mechanical analysis of soils of which the details will be the same for all types of soils. The results of cooperative work on mechanical analysis reported at the Lenningrad Congress (Novak, *loc. cit.*) would only serve to emphasise this point. This constitution of the soil is so complex and the details of the various procedures that have been developed so empirical that the discrepancies between results from different laboratories are perhaps inevitable to some extent. This is particularly so in the preliminary treatment of the soil which is designed to disperse aggregates of soil crumbs into their constituent soil particles. There is no doubt that the use of Hydrogen Peroxide, acid and the prolonged boiling are somewhat drastic and may result in the decomposition of the inorganic colloids. Preliminary oxidation of organic matter would not appear to be necessary in soils containing under 1% of organic carbon. The suitability of directly dispersing such soils in a medium denser than water (such as a very dilute solution of agar in water)—of known reproducible viscosity and specific gravity—in which the rate of settling of the soil particles will be naturally slow—should also be investigated. It has the advantage that it yields soil fractions suitable for further examination.

In view of these conflicting results given by the existing methods, it is not surprising that there have been many proposals to introduce instead of mechanical composition some characteristic quality which could be more easily measured and which had some relation to the composition, *e. g.*, hygroscopicity (Mitscherlich, 1903) or cohesion and plasticity (Atterberg, 1912, 1914, 1916). None of these alternatives has been very successful because the qualities were neither precisely defined nor could they be brought into definite relation to the mechanical composition (Enrenberg, 1914, 1915; Oden, 1921; Zunker; 1922). It cannot be denied that the ultimate solution of many of the problems in soil physics and chemistry must depend upon information which will come with a greater knowledge of the mechanical states and processes of the soil in their microscopic details. The ideal method that would succeed for all types of soils and of soil scientists may still await discovery, but the time is ripe for a more detailed study of the existing methods and for establishing an agreed International Method even though with modifications at times. In correlating soils and studying

soil genetics, especially over wide areas, the mechanical analysis needs to be supplemented by chemical analysis or other characterisation of the clay fraction and often by mineralogical examination of the coarser ones. For this work, and in research on the interrelationship between different physical and chemical properties of soils, agreed conventions for the mechanical analyses are essential.

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# A NOTE ON THE CULTIVATION OF ELEPHANT YAM (*AMORPHOPHALLUS CAMPANULATUS*) IN CHITTOOR TALUK

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The Chittoor variety of Elephant Yam known as சேனை (*Chenai*) in Tamil and (*Theeyakanda*) in Telugu, has a reputation in the markets of the surrounding districts. The normal area in the taluk is 300 acres, but due to low prices, the area has decreased to 240 acres, in the last season.

The average area grown by a ryot is about ten cents and the maximum area grown by a single individual is about thirty cents. The crop is generally grown pure, though other vegetables like radish, onions, brinjals, *bhendai*, etc. may be found to be grown along the sides of irrigation channels, for sometime during the growth of the crop.

**Details of cultivation :** — *Soil* :- The crop comes up well in all kinds of soils unless they happen to be alkaline. Red loamy soil is considered to give the best yield. High-level irrigable lands are generally chosen, as the crop cannot withstand water-logging.

*Season* :— The months of *Chithirai* and *Vaikasi* (April to June) are considered to be the best season for planting the corm, but it can be planted upto the month of *Adi* (July—August). If a good crop has

to be raised, the planting should not be postponed to later than the middle of August. Later planting affects the size and yield, while planting before the season allows the young crop to be affected by the severe sun.

*Preparatory Cultivation*:— A paddy crop is always raised before Yam, even though there is scarcity of water, because, it is believed, by the ryots that the paddy crop keeps down the soil temperature from rising up very high during the growth of the succeeding crop of Yam, improves the soil texture, suppresses the weeds, rectifies the level of the field and enriches the soil.

Ordinarily, eight ploughings are given. Since the area cultivated by a single individual is small, the number of ploughings given sometimes amounts to twelve. Deep ploughing and fine tilth are considered necessary for raising a good crop. Mouldboard ploughs are able to reduce the number of ploughings by one half.

Furrows for planting are opened one foot six inches apart and irrigation channels are laid out nine feet apart across the furrows.

**Manures and Manuring**:— Cattle manure, shed leaves and flowers of *Pungam* and *Tamarind* trees are applied at fifteen cartloads per acre, just before the final ploughing. Sheep penning is not commonly done round about Chittoor, as herds of sheep are not available. If sheep penning (at the rate of 2000 per acre) is utilised, the quantity of cattle manure applied is correspondingly reduced. Sometimes cattle manure is applied in the furrows either at the time of hoeing or at the time of earthing up. This is done, only if the original application before the final ploughing is considered insufficient.

**Seeds and Sowing**:— When the land is ready, corms of average size each weighing about 2 to 3 lb. with shoots are selected, and cut into seven pieces without affecting the central shoot. The smaller-sized corms are cut into 5 or 3 pieces. Oversized corms when planted delay germination, while the undersized give less yield.

The cut pieces are planted in the furrows one and a half feet apart either way. After planting, the covering is done by hand with loose earth. Generally, the planting is done in the morning, and the field irrigated the same afternoon. One thousand five hundred to one thousand eight hundred pounds of corms is the usual seed rate per acre. Germination starts within a week and prolongs over three months. The shoot from the centre of the corm is the first to germinate and about eighty per cent germinate in a month and a half.

**After cultivation**:— A month after planting, the field is weeded and hoed. The second weeding and hoeing is given a month later, when the plants are earthed up with hand. About three months and a half after planting, when the plants are about one and a half to three feet high, trenches are dug between the lines about six inches

deep, with *mamooties*. After this operation, practically no intercultivation is done.

**Irrigation** :— Till the crop is earthed up with *mamooties*, irrigation is given once a week and afterwards once in four days till it is harvested.

**Growth**:— Secondary shoots generally start in *Maha Karthi* (second fortnight of August) when the corms begin to develop. After the development of the secondary shoot the original shoot (which is about two feet high) stops its growth and withers in the course of the next two months. When the secondary shoot turns yellow, the crop is considered ready for preliminary harvest.

**Harvesting**:— Digging of corms which is done with bent pick-axes commences in the month of *Karthigai* (November—December) when the crop is about eight months old. Practically the harvest lasts from the latter half of November to March. Four hundred and fifty to six hundred maunds (11,250 to 15,000 lb.) of corms per acre are obtained. The corms harvested in March are considered to be the best for future seed material. Some ryots keep a small area in the field for seed purposes till the beginning of April.

**Storing** :— Storing for seed purposes is done by heaping the corms in a corner within the house. The whole heap is covered with paddy straw, over which a plaster of mud and cowdung is given. This facilitates the formation of shoots to a large extent and the preservation of the corms from drying up, both necessary for the seed material. For sale, they are simply stored up and corms that give rise to shoots are sold first. The corms dug out in March keep longer. The loss from a storage of two months is about one-third by weight.

**Marketing**:— The produce is generally sold at Chittoor. Sometimes they are taken to the neighbouring towns of Tirupathi and Vellore in carts for sale either by the grower or by the merchants of those places. The sale price per maund of Yam (25 lbs.) varies from six to twelve annas. The corm weighs about three pounds on an average and the maximum is about seven pounds.

| **Cost of cultivation per acre.** | Rs. As Ps. |
|---|---|
| 1. Ploughing the field ten times (20 pairs of cattle and 20 men at Rs. 0—12—0 per pair and a man) ... ... ... | 15—0—0 |
| 2. The cost of 15 cartloads of cattle manure at Rs. 0-8-0 per cartload) | 7—8—0 |
| 3. Carting the manure to the field (1 pair, 2 men, 2 women at Rs. 0—8—0, 0—4—0, 0—2—0 respectively) ... ... | 1—4—0 |
| 4. Spreading the above in the field (2 women at 0—2—0 each) ... | 0—4—0 |
| 5. Forming plough furrows for planting, irrigation channels, cutting and planting corms. (½ pair, 1 man, 15 women, at Rs 0--8—0, 0—4—0, 0—2—0 respectively) ... ... | 2—8—0 |
| 6. Cost of 60 maunds or 1500 lbs. of corms at Re. 1—0—0 per maund | 60—0—0 |
| 7. Hoeing and weeding twice, (40 women at Rs. 0—2—0 each) ... | 5—0—0 |

| | | |
|---|---|---|
| 8. | Forming ridges and channels with mamooties (10 men at Rs. 0-4-0 each) ... ... ... ... ... ... | 2—8—0 |
| 9. | 30 irrigations. (60 pairs and 120 men at Rs. 0--8—0 and Rs. 0—4—0 respectively) ... ... ... ... ... | 60—0—0 |
| 10. | Digging corms and storing, (10 men and 10 women at Rs. 0—4—0 and Rs 0—2—0 respectively) ... ... ... ... | 3-12—0 |
| 11. | Miscellaneous charges of carting and marketing, loss in weight etc. | 9—4—0 |
| 12. | Kist per acre ... ... ... ... ... ... | 3 —0—0 |
| | Total expenses ... | 170—0—0 |

**Profits per acre.**

| | | |
|---|---|---|
| 1. | Cost of 500 maunds or 12,500 lbs. of produce at nine annas per maund on the average ... ... ... ... | 281—4—0 |
| 2. | Cost of cultivation and marketing ... ... ... | 170—0—0 |
| | Net profit per acre ... | 111—4—0 |

**Acknowledgement**. The writer acknowledges with thanks the suggestions given by M. R. Ry. M. Kanti Raj Garu, Assistant Director of Agriculture, Vellore, in preparing this article.

# Research Notes.

## I

### Feeding of Treacle to Cattle.

At the suggestion of Mr. R. W. Littlewood, Deputy Director Livestock, Madras, we undertook an investigation at Hosur to find out the value of including "Treacle" in the feed of cattle. The following summarises the result of the investigation.

Two groups of six heifers each, from the Kangayam herd, were chosen for the experiment. All the heifers were 2 to 2½ years old. The experiment lasted for 12 weeks. Group i or the *controls* got chopped hay at the rate of 12 lb. per animal and group ii or the *experimentals* had the same amount of hay to which 2 lb. of treacle thinned out with 4 lb. of water was added, the whole being well-mixed and put in the manger. The rations and residues were weighed every morning and the actual intake recorded. The animals were weighed in the morning thrice a week. At the end of 12 weeks, slight increases were noticed in the fodder consumption and live weight of the experiment group, though these were not statistically significant. Therefore so far as the results of this investigation go, the inclusion of treacle in large quantities in a ration is not found to be of any advantage.

Live Stock Research Station, Hosur. } T. Murari. M. P. Kunhi Kutti.

## II

### Milk Yields of Kangayam and Sind Cows.

The Kangayam breed is one of the best in South India for draft purposes, but, unfortunately the Kangayam cows are usually poor milkers. The average milk yield of a Kangayam cow could be taken as 1500 lb. for a lactation period, with a daily average of about 5 to 6 lb. Efforts are being made at the Livestock

Research Station, Hosur, to improve the milk yield of this breed without impairing its draft qualities. The results communicated below are encouraging.

*Performances of Sind cows in milk at the Livestock Research Station, Hosur, September 1935.*

| Cow No. | Date of Calving. | Yield up to 30-9-'35 lb. | Daily average lb. | In milk giving lb. |
|---|---|---|---|---|
| 13 | 17-12-34 | 4354 | 15·1 | 14½* |
| 15 | 18-11-34 | 5896 | 18·6 | 14 |
| 21 | 3-12-34 | 4302 | 14 2 | 12½ |
| 25 | 10-11-34 | 4787 | 14·7 | 12 |
| 33 | 15-10-34 | 5255 | 15·0 | 10½ |
| 40 | 17-11-34 | 5585 | 17·6 | 16 |
| 41 | 21-11-34 | 4358 | 13·9 | 6 |
| 43 | 17-5-35 | 3117 | 22 8 | 22½ |
| 44 | 24-11-34 | 4337 | 13·9 | 1½ |
| 46 | 8-11-34 | 4313 | 14·5 | dry |
| 56 | 29-12-34 | 3994 | 14·5 | 15 |
| 145 | 2-12-34 | 4380 | 14 5 | 12½ |
| 187 | 12-11-34 | 4655 | 14·4 | 9½ |
| 233 | 23-10-34 | 4366 | 13·6 | dry |
| 238 | 26-8-34 | 5513 | 14·3 | dry |

*Performances of Kangayam cows in milk at the Livestock Research Station, Hosur, September 1935.*

| Cow No. | Date of Calving. | Yield up to 30-9-1935 lb. | Daily average lb. | In milk giving lb. |
|---|---|---|---|---|
| 9 | 14-10-34 | 2529 | 7·6 | dry |
| 14 | 23-7-35 | 945 | 13·5 | 15 |
| 17 | 8-1-35 | 3315 | 12·5 | 3½ |
| 35 | 11-12-35 | 2538 | 8·6 | 2 |
| 37 | 11-11-34 | 3615 | 11·3 | dry |
| 51 | 20-3-35 | 2318 | 11·9 | 8 |
| 58 | 13-12-34 | 2809 | 9·6 | 2 |
| 67 | 29-8-35 | 512 | 15·5 | 17½ |
| 70 | 28-12-34 | 2922 | 10·6 | 5 |
| 73 | 6-10-34 | 3254 | 9 5 | dry |
| 119 | 24-12-34 | 2859 | 10·2 | 5½ |
| 155 | 20-1-35 | 2617 | 10·3 | 6½ |
| 163 | 25-6-35 | 1753 | 17·9 | 18 |
| 164 | 27-3-35 | 2276 | 12·1 | 10½ |
| 191 | 9-12-34 | 2849 | 9·6 | 6 |
| 194 | 18-11-34 | 3343 | 10·5 | 8 |
| 209 | 16-4-35 | 2917 | 17·4 | 16 |

Livestock Research Station, Hosur. R. W. Littlewood.

[Though it may not be strictly valid to compare the average yield per animal of the two herds mentioned in the above table in as much as the dates of calving are different for the different animals in the herd, there is no doubt that the average milk yield of the Kangayam herd compares favourably with that of the Sind and is definitely better than the usual average for the herd. *Ed.* M. A. J.]

## THE SOUTH INDIAN AGRICULTURAL BUREAU

We are glad to inform our readers that an association named "The South Indian Agricultural Bureau" has been registered at Coimbatore, seven members, (all of whom are retired officers of the Agricultural Department) constitute the Bureau. Rao Bahadur Mr. C. Tadulingam Mudaliar is its life president. and Rao Sahib Mr V. Muthuswami Iyer is its correspondent. Rao Sahib Dr. T. V. Ramakrishna Iyer, Rao Sahib T. V. Rajagopalachariar and

Messrs A. V. Thirumuruganatham Pillai, P. A. Raghunathaswami Iyangar and I. Raman Menon are the other members.

The objects of the bureau are (1) to bring about improvements in the existing systems of Farming, (2) to advance the interests of agriculture and of the agriculturist and (3) to promote the general welfare of the rural population.

The bureau has issued a memorandum which gives details regarding the methods to be adopted to attain its objects.

The bureau proposes among other things to 'investigate, select and arrange for establishment and development of farming colonies', in suitable localities, such colonies being worked on an individual or co-operative basis as local conditions may determine.

The bureau will be run. as a non-political body and on a non-profiteering basis, but a small fee will be charged to meet necessary expenses, for services done.

We wish the bureau every success—(*Editor*, M. A. J.)

[For further information, please apply to Rao Sahib Mr. V. Muthuswami Iyer correspondent, Agricultural Bureau, R. S. Puram, Coimbatore.]

# Gleanings.

**The Double Function of Genes.** Genes, the invisible units of heredity, do double duty. They determine the expression of the body's thousands of characters, such as colour of hair or eyes, and they also serve a general purpose in merely keeping you alive. If every gene needed for every special purpose were not also present in every cell, even where it is not needed, you just wouldn't be alive at all.

This double function of genes was brought out in discussion by Dr. M. Demeree, of the Carnegie Institution of Washington, speaking at Woods Hole, at the meeting of the Genetic Society of America.

Every cell in the body contains exactly the same set of genes as every other set. The cells in your toes have the same hair-colour genes as the cells on the top of your head. But just because you have no hair on your toes is no indication that those particular genes are lacking there. If they were not present the cells themselves would not exist. There would not be any toes. There would not even be any you. And so for all the rest of the genes everywhere.

The discussion was conducted in an endeavour to find out more about the working of genes—how they operate to make our hair blonde or brunette, our eyes blue or brown, our legs long or short, our dispositions placid or vehement. Genetics thus met embryology.

Genes act like enzymes, which are chemical agents that change things without themselves being changed. The digestive ferment pepsin is an example of an enzyme. But genes are not enzymes, chemically speaking, most of the speakers contend. They are much more complex in their makeup and they increase and multiply themselves which ordinary enzymes are unable to do. It is considered more likely that they create special enzymes and work through them to produce their effects on body development.

Dr. Calvin Bridges, of the Carnegie Institutions of Washington, displayed microscope slides showing the interior of cell nuclei, in illustration of the way in which genes not only reproduce themselves but also may produce entirely new genes. Dr. Bridges has suggested that evolution began with a single gene, and that this, by multiplication and changes in its chemical nature, eventually gave rise to the thousands of diverse genes found in the most advanced animals and

plants. These changes may have come about through the impact of radium rays or other active forces of nature.

Dr. Charles B. Devenport, of the Carnegie Institution of Washington, showed a number of large-scale charts of living cells, showing changes in material lying directly on the outside of the nuclei. These, he suggested, indicate how the genes in the nuclei exert chemical influences on events outside themselves, and thus determine the course of bodily development. (*Science*, Vol. 82, No. 2122 Aug. 30, 1935.)

**Artificial Drying of Rice Improves Quality of Crop.** Artificial drying of harvested rice has practical advantages for growers and handlers of the crop. Except in unusually favourable seasons, rice after threshing, is likely to be too moist for storage or milling. The Bureaus of Agricultural Economics and of Agricultural Engineering have studied the artificial drying of rice and have worked out practical methods. For good milling quality, rice must be dried at lower temperatures than most cereals, and it is better to dry the rice gradually decreasing the moisture content by only about 2 per cent each time it goes through the dryer, unless that content is considerably in excess of 20 percent. A drying-air temperature of about 120° is the upper limit of safety, and if all the moisture must be removed at one drying operation more than 110° is too hot. If 120° is used the rice should be allowed to remain in storage from 12 to 24 hours before it goes through another drying operation.

Engineers have fouud that artificial drying often delays in conditioning rice harvested with binders, the harvesting method most generally followed. Combined harvesting has some advantages, but the combines now available are not well adapted to rice harvesting. Manufacturers are working on models particularly adapted to conditions in rice fields.

Gradual drying of the rice from a 20 percent moisture content, which is common after harvesting, to a 12 or 14 percent content improves both the milling and storage quality of the grain and is likely to be a profitable operation on large rice farms. Commercial drying has possibilities as a service to growers who do not produce rice enough to warrant investing in the equipment. (*Rice, Sugar and Coffee Journal*, Vol. 38, No. 8, August 1935).

**A Cure for Lime-induced Chlorosis of Fruit Trees.** A yellowing of the foliage of apples aad pears, induced by lime, causes a considerable amount of damage in some fruit growing areas. Dr. T. Wallace, of the Long Ashton Research Station, has shown that this state can be remedied by the simple expedient of allowing grass to grow between the trees. This is not always desirable, however, and in a recent paper he gives the results of his experiments with a new method of treatment (J. Pomol. and Hort. Sci. 13, No. 1, March 1935). The method is very simple. Holes are bored in the trunk with a brace and bit, a small quantity of ferrous or ferric citrate is placed within, and each hole is then closed with a cork. Treatment by this method has been quite successful, and has converted failing trees into healthy specimens. It only remains to investigate the duration of the treatment over a period of years. (*Nature* July 20, 1935 Page 111.)

**Effects of Soil Crusts on Cotton Stands.** Soil crusts, which frequently form on many of the soils of the state and seriously affect the stands of cotton, were studied under controlled or measured conditions in the laboratory and field. These studies showed that soil crusts were produced by the infiltration of soil particles under the action of water and subsequent cementation on drying. It was found that the cotton plants could exert sufficient force, when planted under proper conditions, to break all crusts studied. Under conditions, where crusts were commonly formed, the soil beneath the seed was not sufficiently compacted to provide a footing for the young plants to break the crust. Laboratory and field

experiments in which the soil was compacted under the seed indicated that soil crusts were not a serious handicap in getting a stand of cotton, (*Alabama Agri. Exp. Stn.* p. 12. *45th Annual Report* 1934).

**An Experiment on Some of the Factors Affecting Lint Development in Cotton.** In 1933, a study was begun to determine the effect that fertilisers and organic matter might have on the development of seed and lint in cotton.

The results obtained in 1933 may be briefly summarised as follows :

(i) When the soil was kept moist, the fertiliser used had no effect on the length of the lint but a nitrogenous fertiliser appreciably increased the weight per boll and decreased the ginning percentage.

(ii) When the soil was permitted to become dry the cotton that was highly fertilised with a nitrogenous fertiliser produced cotton with a smaller boll, shorter lint, and a higher ginning percentage than cotton that was not fertilised or that received only phosphate and potash.

The results may be explained by the fact that cotton receiving nitrogen made a much larger vegetative growth than the cotton that had not received nitrogen. The large plants used the available soil moisture much faster than the small ones and thus caused a stress for water to be set up earlier in the large plants than in the small ones. Thus, a heavy application of a fertiliser containing nitrogen may result in producing cotton in a dry year that has a shorter lint and smaller boll than unfertilised cotton. In a wet year there would be a marked increase in the size of the boll from the fertiliser application but little or no effect on the length of the lint.

These results, which are for one year only, show that soil moisture is of more importance than the fertiliser used in affecting the length of the lint or the percentage of lint. (*Alabama Agri. Exp. Stn. 45th Annual Report*, p. 17)—1934.

**Packing of Citrus plants.** The experiments on the packing of citrus plants for transport were conducted with the idea to reduce the heavy freight charges involved in the present method of packing. The results obtained this year confirmed the last year's results and which is—a suitable method is to dig up the plants with earth-balls, wash the soil off the roots by immersion in water, dip the roots immediately in mud and pack the plants in a box filling up the interspaces with soil. This is an easy and economic way of packing of citrus plants and there is a saving of 50 per cent. in the freight charges. Also plants so packed are less liable to damage in transit. The plants should be headed back slightly by trimming off the shoots. It was observed that plants completely defoliated but not pruned made stunted growth and it appears that defoliation at the time of plantation is injurious to the vigour of the plants. *(Punjab Agri. Dept. Annual Report* 1934, p. 38 )

**Relationship Between Soil Moisture and Crop Growth.** A field experiment was carried out to investigate the moisture contents of soils that would maintain the maximum rate of growth of sugar cane, making allowances for soil type, variety of cane, and time of planting.

In every case the optimum moisture content was found to be very close to 80 per cent of the water-holding capacity of the soil. Aside from this requirement, the maximum growth rate was found to vary directly with the atmospheric temperature; while the latter remained at 80° or higher, Favorable moisture conditions gave rise to rapid growth. At 75°—80° the maximum rate was reduced by about 50 per cent, and further diminutions were noted when the temperature fell below 75°. The growth rate naturally slackened as maturity was approached.

Varying soil textures did not affect the growth rates, the extreme soil types producing similar growth rates as long as the moisture contents of the soil were

maintained. All varieties maintained a high maximum rate of growth in the hot season, but in the cooler season *Badila* had a much lower rate than H. Q. 426 B. 208 gave similar results, indicating that rate of growth is independent of the class of cane.

The results show generally the need for intensive irrigation in the hot months. In most cases it appears that 10-day intervals would have been none too short, while in the cooler months 4-weekly irrigations would often suffice to maintain what growth does take place. (*Facts About Sugar*, Vol. 30, No. 7, pp. 265.)

# Correspondence.

## I

### Tamarind Seed as Cattle Food in Kadiri Taluk.

*Mr. P. Satyanarayana, Asst. Agricultural Demonstrator*, writes from Kadiri. The area under Tamarind in Kadiri Taluq is about 2,100 acres. In this locality the growth of Tamarind trees is good and the soils are peculiarly suitable to their requirements.

The importance of Tamarind in diet is too well known to need description. Nearly 300 tons of tamarind are annually exported from Kadiri to the North East coast.

There is a special class of people called *Boyas* who collect the seed which is sold at rates varying from 24 to 32 Madras measures per rupee. During dry seasons when there is fodder scarcity and when green grass is not available in plenty, tamarind seed is used as cattle food. The seed is roasted till it gets dark and cooled a bit. After sprinkling some water over the seed to accelerate the process of separating the seed coat from the kernel, the seed is pounded in a mortar with a pestle till the coating is separated. After removing the seed coat, the white kernel inside is soaked in water for 24 hours, by which time, it is softened and rendered palatable. Such soaked kernel is either fed by itself or mixed with boiled horsegram or bengalgram. There is also the practice of mixing salt at the rate of one ounce per one Madras measure of kernel to improve the taste and to aid in digestion. Each work-animal is fed at the rate of 1 to 1½ Madras measures per day in the evening after a day's hard work.

One man can roast 64 Madras measures of tamarind seed in a day of 10 hours and 2 women can pound this quantity in the same period.

This practice wherever similar conditions exist may be advocated. This feed, besides being cheap, is easily accessible and is within reach of every ryot. I shall be glad to answer queries, if any, on this subject.

## II

### Rural Indebtedness—Alienation of Land.

*Mr. P. P. R.* writes:—Mr. Sathianathan in his report to the Government on the above subject is opposed to a Land Alienation Act for Madras and has given some reasons. Many representations made to him during his investigation were to save at least an economic holding of land to the small and medium owner cultivators by some legislation or other. But they do not seem to have appealed to him. In the interests of the many small cultivators whose lands are fast slipping into the hands of the money lenders, I propose to examine a little into the reasons adduced by the Special Officer.

(i) There may not be distinct tribes in this province who can be termed 'Agriculturists' as opposed to 'non-agriculturists'. But is it an insurmountable obstacle in the way of legislature to correctly define the agriculturists who

deserve the protection provided they have a just cause for it at the hands of Government? Even if it is a difficult task, it will have to be done, when the object to be achieved thereby is a real blessing to the small cultivators who count in thousands.

(ii) It will be followed by a marked depression in the value of land, he observes. This may be true as regards the land (small economic holdings) rendered inalienable by law. But the price of the remaining lands, over and above the economic holdings in the possession of the small cultivators, may go up as the land then available for sale will be limited unlike at present. In addition the small cultivators will have their economic holdings undisturbed on which they can bestow real personal interest because it is their own permanently.

(iii) Most of the agriculturists in this province may be landless and cultivate the lands of absentee landlords for lease in kind or coin. There is a great difference between one cultivating another's land temporarily for lease and another cultivating the land which he can call his *own permanently*. The former has only a cooly's interest in the land whereas the latter has a personal interest, improves the land by all means possible and makes his cultivation intensive because the land is permanently his and his children's.

If the proposed Act makes only a limited economic holding inalienable, the landless agriculturists also may purchase some land from those owning land enough and to spare and add it to what little they already have and make their holdings also economic ones. However, the chief objects of the proposed Act or law is not to make the landless agriculturists obtain more land, though this possibility is not precluded, but to make it impossible for the small cultivator losing his farm into the hands of the money lender.

(iv) It will make consolidation of holdings impossible, he adds. Consolidation of holdings is no doubt an ideal scheme in the interests of the ryot but it is not under contemplation by Government at present or in the near future. And when consolidation is undertaken, some legislation in the first place to take over all lands by Government, evaluate them, split them into economic holdings and distribute to the ryots from whom scattered lands were taken will be necessary. When such an ideal measure will be undertaken, the proposed Land Alienation Act may be annulled or suitably modified for consolidation work. Of course this will mean more work for the legislature. But which is more important, the welfare of the ryot or easy work for legislature? And are not Acts and Laws ever changed so many times in the interests of the people? And moreover in the hope of consolidating holdings in the distant future, will it be statesmanlike to abandon a measure which will bestow prosperity on the cultivator at present?

(v) 'It will hamper agricultural progress by weakening those it seeks to protect' is another reason. This is not made very clear. When small holdings are made inalienable by statute, the owners will feel that the holdings will be theirs permanently and will be induced to make permanent improvements to the lands according to the latest methods and cultivate them intensively unlike lands temporarily leased out.

(vi) It is finally observed that some agriculturists by their own fault have forfeited their lands by neglect and extravagance and deserve to lose them

After the present economic depression all the agriculturists have suffered. Their products had no prices as before. Their expenses were doubled whereas their incomes were halved. There might be a few incorrigibles who were responsible for their own plight but it cannot be said to be true in the case of all others. The causes for the present depression and the miserable plight of the agriculturists were beyond their control and they could not be expected to foresee what was to come and be prepared for it.

As Mr. Sathianadhan observes, absentee-land-lordism is steadily on the increase. It is specially increasing among those who lend money to agriculturists—Government Servants, lawyers, retired men, *Komities* and *Marwaries*. And the small and medium land holders are fast losing their holdings. This causes several evils. The land has left the hands of those real agriculturists who could have taken a personal interest in cultivation and improved the land and reaped the maximum harvest by intensive cultivation. This is a loss to the national wealth. It has passed into the hands of absentee landlords or gentlemen farmers who do not and cannot cultivate it themselves. Naturally they have to depend on tenants who will not evince any more interest than coolies, Therefore the land is neglected and they try to obtain the utmost from the land by spending the least without putting any manure or doing any improvements whatsoever. Therefore the lands degenerate and this is again a great loss to the nation at large. The small cultivators who were till now living upon land are turned out and they have to suffer on account of unemployment as most of the educated are now suffering. And it will become a great concern for the Government to find work for this kind of unemployed agricultural class. Now 80% of the people in India depend on agriculture to make both ends meet. Many of them are small cultivators with an economic holding. So, when these people lose their lands into the hands of the greedy money lenders, they naturally swell the army of the unemployed and there will be great agitation for work and bread. Land revenue is the greatest source of Government income and therefore it will be difficult to collect the revenue also. These things deserve serious consideration in the interests of the ryots.

In villages when a *Komiti*, or an agricultural money lender has an eye upon a good piece of land which a small and poor cultivator has and when the latter is found to be reluctant to part with it direct, what the former generally does is to extend a loan of money to him and allow it to swell with compound interest. After a few years, the small cultivator finds it impossible to pay back the loan and must necessarily sell his land however unwilling he might be. And he becomes a cooly. This is what generally happens in villages. We may blame the small cultivator for taking a loan and for not cutting his coat according to his cloth but human nature being what it is, he accepts a loan when it is easily forthcoming and when his domestic circumstances which are too many and too well known are pressing and trouble-some. Therefore if the small cultivator, the back-bone of the country and the chief source of revenue to Government is to be saved from the trap of the greedy money lender, some of his land must be made inalienable by statute. This will be a caution to the money lender not to lend too much. In the case of Government servants, Rs. 40 when their salary is Rs. 80 or below, and half their salary when it is over Rs. 80. is made exempt from attachment by a Civil Court towards a decree pending against him. The Government servant himself might have been extravagant and improvident and incurred the debt and yet the whole of his salary cannot be attached even by a Civil Court (Article 117 of the Madras Financial and Account Code). This is known to the money lenders and they know how far they can safely advance loans to Government servants. When there is such a provision under the law in the case of Government servants, who are better educated than cultivators, why not a similar provision be introduced to protect the poor cultivators too ? This will not make easy credit impossible to the needy cultivators but only prevent the money lenders hereafter to advance loans with the evil object of swallowing up their holdings like a crocodile. This will be in the interests of all concerned. There is no good blaming the cultivator that he is extravagant and improvident and leaving him to the inevitable fate. He must be saved as much as the drunkard or the lunatic. He is not the master of himself. The circumstances of the present

day are such and something must be done to save him. To save him and his holding is to give scope for the flourishing of the Agricultural Department which advocates latest methods of scientific cultivation. The absentee landlord or gentleman farmer will not make use of those methods so much as the actual tiller of the soil can do, far unto him his farm is everything, he is born on it, bred by it and has his living by it and will naturally try to improve it by all means possible. The gentleman farmer is not so poor, has other avocations, and wants to enjoy an easy life with all the amenities of a town life. He might have taken an agricultural degree and might be thoroughly convinced that an agriculturist's life is dignified and noble but the easy life to which he was accustomed from childhood makes him reluctant to put his hand to the plough day in and day out like the poor small cultivator.

Professor N. G. Ranga, M. L. A., Secretary of the Peasant's Group in the Assembly has done excellent service to the small cultivators of the land in getting an unanimous resolution passed recently by 36 M. L. A's of his group to so amend the Civil Procedure Code as to exempt at least 5 acres of wet land or 10 acres of dry land of a peasant from attachment for Civil decrees so as to place him in a position similar to Government servants.

Dewan Bahadur Mr. T. A. Ramalingam Chettiyar will be greatly helping the cultivators by paying due consideration to this subject in his Debt Conciliation Bill now pending consideration.

## THE STUDENTS' TOUR

BY N. RANGANATHACHARI, B.Sc., iii (Student).

The final year students of the College, of whom the author was one, had an exceedingly pleasant agricultural tour during the first half of October. We assembled on the 1st morning at Hagari, and it was a happy augury, that just before our visit, a few welcome rains had been received, leading to the closing of the famine camps in the District. Such a very auspicious start put us in great good humour and we thoroughly enjoyed the tour, and profited greatly by it.

Chief among the items of our enquiry at the Hagari Farm, were particulars regarding the uses of the various implements, the maintenance of bulls and cows, and the several experiments conducted. It was unfortunate that being an off-season, we were unable to witness the actual field operations with many of the implements. A visit to a village near the Farm revealed that the local practices did not differ very much from those on the Farm, except that all kinds of mixtures of crops sown in lines could be seen, in the ryots' fields—evidently a practice adopted to guard against the vagaries of the monsoon.

Hagari is one of the most important centres of the dry farming research in India. Interesting experiments on the chief crops of the locality, viz, cotton and cholam are in progress, and comparative results on different treatments of soil at different stages of crop growth are available. Amongst other interesting bits of information which we gleaned from these experiments and their results, was the fact that cholam tends to increase in yield, in proportion to the amount of rainfall and its distribution, while cotton remains unaffected.

Our stay at the Hagari Farm was made the more enjoyable on account of the kindness and hospitality of the Superintendent and the staff and the, sumptuous dinner served on a lavish scale, which made one almost forget that the district had been in the grips of severe famine, but a short time ago.

Leaving Hagari, we arrived at Bangalore on the 4th, where we visited the Hebbal farm in the morning, and the Imperial Dairy Institute and at Hebbal farm Dr. Bhadami the principal of the Hebbal Agricultural School and an 'old boy' of our college received us and showed us round the farm, where we saw the highly interesting collection of sugarcanes and fruit trees he has made from all over the world. He is trying to effect an improvement on a local cane by X-Ray treatment to suit the locality.

*Lantana* a foreign weed which troubles gardners has been tried as green leaf manure for wet crops and results are encouraging. After a peep into the engineering workshop, the cattle stall, Dairy etc. attached to the school, the staff entertained us at tea and Dr. Bhadami took a snap of the whole group.

On our way back, we paid a hurried visit to the 'Serum institute' where "goat virus" is being manufactured for control of cattle diseases.

The same afternoon we went to the "Imperial Dairy Farm". The Superintendent took us round the cattle stalls, milking shed, laboratory etc. and all the processes starting with the milking, filtering, pasteurising, bottling, sealing etc were carefully watched. Milking machine at work was also noticed. Butter making in churns worked by power, cheese making, etc. did not escape our attention.

Notable among the many breeds of cattle there, are the Ayreshires, and Scindhis.

The next place visited was the extensive 'Mandaya farm' under the Irwin Canal scheme. The chief items observed were the 'cone method' of applying artificials to sugarcane the 'zigzag' way of irrigation and underground and surface drains. The Experimental farm at Mandaya is responsible for the conversion of surrounding lands of once very little value into highly fertile sugarcane tract. Its success is attributed to the immense help rendered by the Mysore Government in opening a sugar factory closeby, the close co-operation that exists between the agricultural department and irrigation and revenue authorities, and lastly the steps taken by the Government to advance capital and cane setts to poor ryots to start the cultivation.

On the 5th night we arrived at Mysore, with no little inconvenience by the overloaded *Dasara* special train.

We availed ourselves of the opportunity to visit the Exhibition and the Zoo on the 6th. The Maharajah's procession on the 7th

evening was full of pomp and splendour and the complete description of the palace and *Dasara* decorations will be a volume by itself. A permanent Agricultural and Horticultural Demonstration plot very close to the Exhibition ground is a special feature.

Hosur was reached on the 8th via. Bangalore, where the biggest cattle farm in this presidency is maintained. Among the types of cows and breeding bulls reared in the farm may be mentioned the Scindhis, Kangayams, Ongoles, Mysore etc.

The poultry section has a collection of birds of all breeds. No effort is spared in trying to get a pure white sheep for wool purposes from the local breed, but the unwanted black defies all research and shows itself prominently in the face.

In addition to the common farm equipment, the scythe, the harvester, the combing machine, the treader etc. in connection with fodder harvest and storage deserved our careful observation.

Hay making, ensilaging, sheep shearing with machine power are the operations worth seeing on the farm.

Our class team met Mr. T. Murari's XI at cricket one afternoon. After a keen fight by the home team the match ended in a draw. [Class team scored 67 for all down against 54 for 7 of the home team.] Our thanks are due to Mr. M. C. Menon of Hosur farm who played for our side and scored 2 easy sixes and a few fours.

We made a journey by bus from Hosur to Salem a distance of a hundred miles before evening. The steep slopes of the road interrupted by sudden twists and turns and hillocks and shrub Jungles following us almost right through the length of the road on either side kept us from the monotony of the journey. A short halt was made at Krishnagiri to study grape vine cultivation. In addition to the Salem Nursery we visited Pagalpatti a village ten miles off Salem town where '*Mitta System*' of collecting revenue is in vogue. The last of the places of our visit was Namakkal from where we proceeded by bus to 'Velur' on the 13th where the water supply is available all through the year. The chief crops of Velur being Betalvine, Sugarcane, plantain and paddy.

Mohanur, a village equally important as Velur on account of a constant supply of water was visited the next day. We had bath in the holy waters of Cauvery both at Velur and Mohanur.

Namakkal School team played a hockey match one evening with our class team. We drew with them by returning their single goal.

On the 14th we played a half a day Cricket match with the school team and won them very easily. [Score being class team 92 for 8 against 66 for all down home team].

On the day of our starting Mr. Moncey defeated the local tennis champion of Namakkal in singles in straight two sets. Rain interfered when doubles was being played and it is difficult to decide which side was saved from defeat.

We packed to Sankaridrug Railway Station by bus from Namakkal and arrived at Coimbatore the same evening—15th of Oct.

Our grateful thanks are due to Mr. R. C. Broadfoot the Principal, Mr. K. Raghavachari, and Mr. S. V. Duraiswami Iyer who accompanied the students on tour. They showed keen interest in the class, the last taking part in games wherever there was an opportunity. Our thanks are also due to the various officers of the Madras and Mysore Agricultural Departments who helped us at the different places and made the tour a success.

# College News and Notes.

**Student's Corner.** Of the three members of our team, Messrs. Ramanatha Rao, Albuquerque and Rajagopalan, who appeared at Madras for the selection of the Madras University Team, for the Inter-Varsity Tournaments, the first two have been selected and played in the first match against the Andhra University. The progress of these two, our best batsmen and one of them our skipper, will be watched with great interest.

In the Inter-tutorial cricket matches, Mr. Narasimha Iyangar's wards defeated Mr. Lakshmipathy's by 147 runs, Ganeshsundara Rao scoring 85 for the victors; Mr. Sundararaman's beat Mr. P. V. Ramiah's by 130 runs, Ramanatha Rao scoring a brilliant 105 not out. In a further round Mr. Narasimha Iyangar's wards advanced a step further beating Dr. Patel's by 83 runs, Ganeshsunder again contributing 44 runs and Kunhiraman Menon scoring 43.

In the Inter-class Tournament for the Victory Cup, the third years beat the second years, in the final match, by 26 runs.

Our College entered for the Inter-Collegiate Tournament conducted by the Cochin Athletic Association. In football we were unlucky to lose the very first match played on our grounds against the Government College team by 3 goals to one. In volley ball we progressed in the first round by beating the Government College, but sustained a defeat in the next round, at the hands of the Victoria College, Palghat.

Our College won their first round against the Coimbatore United Club, in the Coimbatore Hockey Tournament, but for technical reasons our team was scratched from the tournament.

As usual, the College sent a contingent to compete in the Olympic Sports, but due to illness, we were handicapped, and lost the cup which we won last year.

Literary activities were as much in evidence during the month, as athletic events. On 14th November Mr. Raghothamareddy of class ii initiated a discussion on "Going back to the land" under the auspices of the Students' Club with Mr. G. N. Rangaswami Ayyangar in the chair. The Andhra Students' Union had three meetings at which Messrs. Sambasivam, Suryanarayana and Seetharama Raju addressed on "The Servants of India Society", "Venkataparvathasvara Ravulu" (an eminent telugu poet) and 'Some experience in a village' respectively.

**Meetings.** Under the auspices of the Association of Economic Biologists, Mr. H. H. Dodds, Director of Sugar Experimental Stations, South Africa, gave a lecture on 'Some impressions of the Sugar Industries of certain countries' on 28—10—35. At a scientific meeting of the above association on 31—10—35 the following papers were presented. (1) Host range of the Gujerat cotton rot and (2) Stenosis in Gujerat cotton, by Dr. V. N. Likhite. (3) The nature of resistance in cotton plants to stem weevil, by K. D. Rajulu, and (4) Inheritance of multiple pistils in rice by N. Parthasarathy.

**Co-operative Society.** The Annual General Body Meeting of the Agricultural College Public Servants' Co-operative Society was held when the annual report was read and office bearers were elected for the current term.

**Personal.** Our readers will be glad to hear that Rao Bahadur B. Viswanath has been appointed officiating Director of the Pusa Institute. News is to hand that Messrs. K. M. Thomas, Ramanujam and Kochukrishna Pillai, have reached the United Kingdom, and have begun their studies. Dr. C. Narasimhachariar has returned to Coimbatore after completion of his study abroad. Rao Bahadur T. S. Venkatraman, Government Sugarcane Expert returned to headquarters after his overseas trip to Australia. Mr. K. Ramiah, Paddy Specialist left on a month's tour to Burma to study condition of rice cultivation in that country.

**Millets Day.** The staff of the Millets Section celebrated their first 'Millets Day' on the 29th October 1935. The Millets Breeding Station was acquired on the 29th October 1923—12 years ago. Since then the staff has grown. Some have left the section and others are away at outstations. In respone to a general desire to have a definite 'day' to revive the feeling of comradeship animating the members of the section, invitations were issued to all connected with the section for three months and over. Six guests were present. Thirteen messages of felicitations were received. The celebrations commenced with a photograph. Light tea was served. There was music till it was dark, after which about a hundred coolies and menials were fed to a sumptuous meal. There was a variety entertainment. The day ended with a sumptuous dinner. The staff, new and old, spent altogether a happy evening.

**Visitors.** Mr. H. H. Dodds of South Africa, Dr. V. Subramanyam and Mr. A. Srinivasan of the Indian Institute and Mr. K. C. Coomaraswami Chetty, Assistant Marketing Officer, New Delhi visited the estate during the month.

# Crop & Trade Report.

**Madras—1935-36—Cotton—Second Report.** The average of the areas under cotton in the Madras Presidency during the five years ending 1933-34, has represented 9 per cent. of the total area under cotton in India.

2. The area under cotton up to the 25th September 1935 is estimated at 1,152,000 acres. When compared with the area of 733,900 acres estimated for the corresponding period of last year, it reveals an increase of about 57 per cent. The increase in area occurs in most districts and is marked in the Deccan where the area rose from 476.000 acres to 811,500 acres owing to the favourable season.

3. The area in the South and the Central districts relates partly to the last year's crop and partly to the current year's sowings which have commenced in parts.

4. The condition of the standing crop is satisfactory.

5. The wholesale price of cotton lint per imperial maund of 82 and 2/7 lb. as reported from important markets towards the close of September 1935 was about Rs. 17—10—0 for Cocanadas, Rs. 22—10—0 for red northerns, Rs. 24—11—0 for white northerns, Rs. 18—9—0 for (early crop) westerns, Rs. 28—2—0 for Cambodia.

Rs. 26–11–0 for Coimbatore Karunganni, Rs. 24–12–0 for Tinnevelly Karunganni, Rs. 23—7—0 for Tinnevellies and Rs. 24—8—0 for Nadam.

When compared with the prices in the previous month the prices of Northerns, red and white, Cambodia, Coimbatore Karunganni and Nadam are stationery while those of Cocanadas, Tinnevelly Karunganni and Tinnevellies show a slight rise ranging from 1 to 6 per cent. The price of Westerns has fallen by 3 per cent.

# Weather Review (OCTOBER 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 | 5·3 | -2·6 | 42·7 | South | Negapatam | 9·5 | -0·9 | 28·3 |
| | Berhampore* | 1·76 | -9·43 | 34·05 | | Aduthurai* | 5·87 | -2·40 | 21·85 |
| | Calingapatam | 7·3 | +0·2 | 29·2 | | Madura | 5·8 | -2·0 | 21·3 |
| | Vizagapatam | 7·3 | +0·2 | 17·7 | | Pamban | 9·8 | +0·8 | 20·7 |
| | Anakapalli* | 6·40 | -1·61 | 22 11 | | Koilpatti* | 8·35 | +0·68 | 15·25 |
| | Samalkota* | 7·88 | -0 71 | 36·26 | | Palamkottah | 10·8 | +4·0 | 21·3 |
| | Maruteru* | 8·79 | -0·09 | 33·56 | | | | | |
| | Cocanada | 6·9 | -0·8 | 23·9 | West | | | | |
| | Masulipatam | 10·1 | +2·1 | 32·4 | Coast | Trivandrum | 15·5 | +4·9 | 39·9 |
| | Guntur | 2·22 | -3·37 | 29·79 | | Cochin | 17·1 | +3·9 | 78·4 |
| | | | | | | Calicut | 11·9 | +1·7 | 100·8 |
| Ceded Dists. | Kurnool | 1 9 | -1·5 | 26·1 | | Pattambi* | 14·76 | +2·63 | 76·68 |
| | Nandyal* | | | | | Taliparamba* | 14·00 | +2·61 | 127·69 |
| | Hagari* | 4·08 | +0·73 | 21·75 | | Kasargode* | 15·22 | +6·42 | 144·12 |
| | Bellary | 5·0 | +1·2 | 20·0 | | Nileshwar* | 14·59 | +5·22 | 125·36 |
| | Anantapur | 2·7 | ... | 21·0 | | Mangalore | 16·2 | +8·8 | 122·1 |
| | Cuddapah | 5·8 | +0·7 | 33·1 | | | | | |
| | | | | | Mysore | | | | |
| Carnatic | Nellore | 10·1 | +1·8 | 23·0 | and | Chitaldrug | 7·4 | +3·1 | 25·8 |
| | Madras | 15·5 | +3·8 | 31·5 | Coorg | Bangalore | 10·3 | +4·4 | 42·5 |
| | Palur* | | | | | Mysore | 11·3 | +4·8 | 38·9 |
| | Palakuppam* | 10·58 | +0·63 | 25·13 | | Mercara | 8·7 | ... | 120·8 |
| | Cuddalore | 12·2 | +1·1 | 26·7 | | | | | |
| | | | | | Hills. | | | | |
| Central | Vellore | 12·4 | +6·0 | 34·7 | | Kodaikanal | 12·2 | +2·5 | 54·2 |
| | Hosur cattle farm* | | | | | Coonoor | 10·8 | ... | 39·8 |
| | | | | | | Ootacamund* | 6·03 | -2·67 | 31·96 |
| | Salem | 3·0 | -3·8 | 28·5 | | Nanjanad* | 7 01 | -0·57 | 41·34 |
| | Coimbatore | 6·0 | -0·4 | 11·9 | | | | | |
| | Coimbatore Res. Inst.* | 5 42 | -0·3 | 27·32 | | | | | |
| | Trichinopoly | 5·1 | -1·7 | 2/·0 | | | | | |

* Meteorological Stations of the Madras Agricultural Department.

**Summary of Weather Conditions.** Thunderstorms caused nearly general rain in South East Madras in the first half of the month. Conditions became unsettled off the Coromandal coast where a deep depression formed on the 17th. The depression intensified into a storm centred 100 miles South East of Madras on the 18th. The Bay storm crossed the coast on that day and moved over Mysore to the Arabian Sea and finally weakened by the 24th after causing widespread rain in the Peninsula. A second depression formed in the Centre of the Bay on the 21st, and moving in a North Easterly direction, intensified into a storm and entered inland near Chittagong. This storm failed to influence weather to any marked extent except in its early stages.

Dry weather prevailed for the rest of the month. Rainfall was in moderate to large excess in the west coast, Mysore and in the Carnatic and was in defect elsewhere.

Chief falls reported were:—

| | | |
|---|---|---|
| Cuddalore | 7·7″ | on the 18th. |
| Madras | 7·3″ | „ „ |
| Palamcottah | 6·7″ | „ „ |
| Kuttikonam (Travancore) | 7·3″ | „ „ |
| Vandor (Cuddalore) | 5·3″ | „ „ |
| Panrutti „ | 5·4″ | „ „ |
| Kurinjipady „ | 7·4″ | „ „ |
| Mangalore | 5·6″ | on the 20th. |
| Irinjalakuda (Cochin) | 5·8″ | „ „ |
| Kuttikonam (Travancore) | 7·7″ | „ „ |
| Narasapur (West Godavary) | 6·1″ | on the 22nd. |

**Weather Report for the Research Institute Observatory.**

Report No. 10/35.

| | |
|---|---|
| Absolute maximum in shade | 93·5° |
| Absolute minimum in shade | 65·2° |
| Mean maximum in shade | 87·8° |
| Departure from normal | Nil. |
| Mean minimum in shade | 70·9° |
| Departure from normal | + 0·7° |
| Total rainfall | 5·42″ |
| Departure from normal | − 0·33″ |
| Heaviest fall in 24 hours | 1·34 |
| Total No. of rainy days | 9 |
| Mean daily wind velocity | 2·0 M. P. H. |
| Mean humidity at 8 hours | 78·9% |
| Departure from normal | Nil. |
| Total hours of bright sun-shine | 176 5 hours. |
| Mean daily hours of bright sun-shine | 5·7 „ |

**Summary.** Normal weather conditions prevailed during the month. Rainfall was slightly below normal.

# Departmental Notifications.

**Transfers and postings.** Mr. S. Ayyadurai, officiating Assistant in Chemistry section to Oil Seeds section, Mr. P. Abishekanatham Pillai, F. M. Pomological Station, Coonoor to be F. M. Botanic Gardens, Ootacamund. Mr. K. Krishna Hedge, A. F. M. Botanic gardens, Ootacamund to Pomological Station, Coonoor. Mr. Ghulam Ahmed, A. D. Allagada to IV Circle as A D. Saidapet. Mr. R. Anandabhadmanabha Pillai, F. M., A. R. S. Guntur, to III Circle. Mr. A. Mohamad Ali, F. M. Palur, to officiate as Botany Assistant in Sugarcane Station, Gudiyatam vice S. Ramaswami Iyer, granted leave. Mr. P. K. Parameswara Menon, A. D. Coimbatore to Namakkal. Consequent on Mr. C. Narasimhachariar, Assistant lecturer in Chemistry returning from leave Mr. V. J. Varghese to revert as assistant in Chemistry section.

**Leave.** Mr. G. Ranganathaswami, F. M. Samalkota, leave for two years to undergo post graduate training at Pusa. Mr. V. K. Kunhunni Nambiar, F. M., A. R. S. Kasargode extension of l. a. p. on M. C. for one month. Mr. M. Rajagopala Iyer, extension of half average pay on M. C. for six months. Mr. K. Srinivasacharya l. a. p. for three months and 15 days. Mr. S. Ramaswami Iyer, l. a. p. on M. C. for two months.