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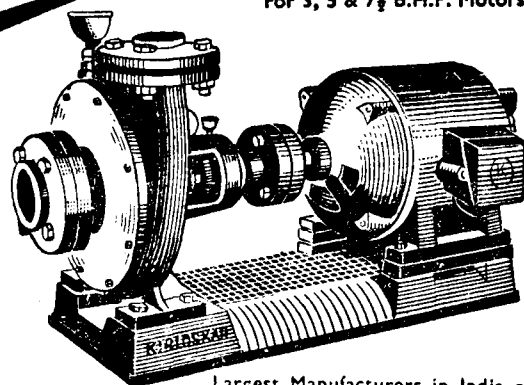


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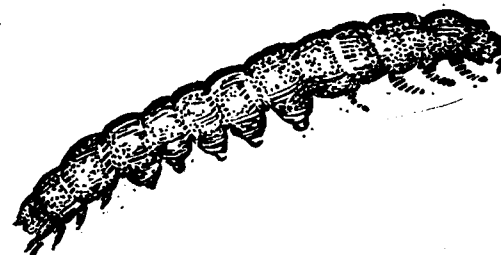
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## The Madras Agricultural Journal

Vol. XLIII

DECEMBER 1956

No. 11

### CONTENTS

|                                                                                                                                                              | PAGE |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Editorial ...                                                                                                                                                | 539  |
| Original Articles:                                                                                                                                           |      |
| 1. Agricultural Science and Technique in New China ...                                                                                                       | 541  |
| 2. The Cultivation of Rainfed Deshi Cotton on the Black Soil Area of the Central and Southern Districts of Madras State with Suggestions for Improvement ... | 549  |
| — P. V. Marappan & L. Neelakantan                                                                                                                            |      |
| 3. Australian Sugar Industry ...                                                                                                                             | 554  |
| — C. L. Sundararajan                                                                                                                                         |      |
| Research Notes ...                                                                                                                                           | 565  |
| Gleanings ...                                                                                                                                                | 570  |
| Students' Corner ...                                                                                                                                         | 572  |
| Weather Review ...                                                                                                                                           | 574  |
| Departmental Notification ...                                                                                                                                | 576  |
| Market Committees' Chronicle ...                                                                                                                             | 577  |

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## The Madras Agricultural Journal

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*Editorial* 360

The Planning Commission has now revised the targets for agricultural production for the Second Five Year Plan period at an overall increase of 28 per cent as against an earlier figure of 40 per cent. Production of food grains is to be stepped up by 25 per cent and commercial crops by 34 per cent. It is vital that these targets are achieved to make for the existing shortages, to meet the needs of a growing population with increasing purchasing power and also to provide a small surplus for export. The Planning Commission is of the view that 'only a programme aimed at doubling agricultural production in the course of the next ten years or thereabouts could meet the requirements of the national economy, bring about a substantial rise in agricultural incomes and reduce the gap between these and non-agricultural incomes'.

The attainment of these targets would involve putting in the maximum effort by all concerned. Broadly, the increase in production is to be brought about by adopting sound farming techniques like the use of high yielding strains, by fuller utilisation of manurial resources including fertilisers, irrigation, soil conservation and adoption of modern plant protection methods; these are expected to yield the greatest possible benefits in the shortest possible time. In short, the main feature of the plan is to increase production in every crop without much increase in the crop areas themselves.

In any discussion of maximising crop production, manures and fertilisers occupy the pride of place as contributing to the highest yield increases. Judicious manuring can, in many cases even double the yields, especially over vast tracts of marginal lands, where no manure is used for many centuries. When better irrigational facilities and

improved seeds are provided an increased demand would arise for plant nutrients from the soil. The fertiliser industry is making great progress during the last ten years, as also the pace of fertiliser consumption, specially in Madras. Even so, recent international developments have been disquieting and dependance on foreign supplies of plant nutrients particularly of phosphorus, may become hazardous. It is gathered that there is already a squeeze for superphosphate, as all imports into our country are from North African ports. This is a warning to us that we should not neglect to utilise our indigenous phosphate resources.

When chemical fertilisers are available in plenty, the farmer is apt to be complacent about native organic manure sources. Cattle manure has been the backbone of Indian Agriculture from time immemorial. It is imperative that the farmer is constantly reminded of the need to actively conserve this source. It must be brought home to him that chemical fertilisers yield good results only when they are used along with organics like cattle manure or green manure. Recent concepts of the importance of chelating agents have led to a reassessment of the significance of organic matter in affecting nutrient availability. Chelating agents derived from the breakdown of organic matter as a result of microbial activity chelate iron, aluminum and calcium, thereby reducing phosphate fixation. Further they play a useful role in improving trace element availabilities; that of iron, manganese etc. Organic matter, thus, has an added role in a manuring programme.

It needs no argument to convince anyone that the future well-being of India's millions is vitally linked up with the attainment of all the targets of the Second Five Year Plan; and given a well-balanced and co-ordinated effort, utilising all the technological potentialities towards increasing agricultural production, we can look forward with confidence to its successful achievement.

## Agricultural Science and Technique in New China \*

China is a country of vast territories and bountiful products. She has a long history in agriculture. The Chinese peasants have accumulated a very rich experience and cultured many good quality varieties over the centuries. These precious bequests had not been well studied but under the leadership of the Central People's Government, the Chinese people have accomplished land reforms, rehabilitated and developed agricultural production and started the agricultural co-operative movement, all of which have created a favourable condition for the further development of the Chinese agriculture.

At the time of the founding of the People's Republic of China, the Central People's Government explicitly proposed the principle that agricultural science and technique must serve the development of agricultural production by increasing the yield of unit area, and that the creation and dissemination of scientific knowledge shall be encouraged and rewarded. Because of Governmental efforts agricultural science has been and is being advanced rapidly. By the end of the year 1955, we have established seven regional agricultural science research institutes, five specialised research institutes, 153 provincial agricultural research institutes and experimental stations, 7,997 extension centres of agriculture technique, 1,500 veterinary and animal husbandry stations and 782 artificial insemination centres. There are 29 agricultural Universities and Colleges with 1,550 professors, associate and assistant professors, and 16,698 undergraduate students; 94 secondary agricultural technique schools with 3,447 teachers and 44,708 students. The number of students graduated from these Universities and Colleges within the past five years was 16,900 which is 13,189 more than the students graduated during the period of over 20 years under the old regime. Under the leadership of the people's Government, agricultural scientific workers study the advanced agricultural scientific theories and techniques of the Soviet Union and other nations, going down to the villages to summarise the peasants' producing experience, studying the methods of increasing production for various crops in different areas in order to solve the main problems now existing in agricultural production. As a result, they have enlarged the function of agricultural science in ensuring the increase of agricultural production.

\* Speech delivered by His Excellency Chiang Chi Hsien, Vice-Minister and Leader of the Agricultural Scientific Study Mission of the Peoples Republic of China on the occasion of the reception held in honour of the Mission at the Agricultural College and Research Institute, Coimbatore, on 3rd November 1956.

The work of our agricultural scientists and technicians is carried out in the following ways:

**Improvement of varieties of crops:** In accordance with the advanced theories on genetics, selection, propagation and breeding of good quality seeds and taking into consideration the main crops in China our institutions of agricultural research have carried out the work for improvement of varieties. At the same time, a campaign of selecting seed has been widely developed among the masses of the peoples in order to produce the good quality seeds from peasant households by all possible effort. Upto 1954, there were 1,300 good quality varieties which have so far been discovered, selected and bred out. The good quality grains have been planted on an area of 300 million mou of land (20 million hectares), the area of cotton fields planted to good quality seeds has reached more than 50 million mou of land (3.6 million hectares). For instance, both the 'Pi Ma No. 1' wheat, bred out by the Northwest Agricultural College in Wu Kaun County, Shensi Province and the good quality spring wheat No. 96% selected by Kansu Province have the features of high yield and rust resistance, and generally their production is 20 to 30 percent more than the local varieties. The 'Pi Ma No. 1' alone has been planted on an area of more than 7 million mou of land in Shensi province. The good quality paddy rice, Sun Li Sian and Van Li Sian, selected by the Hunan Experimental Farm of paddy rice have the characteristics of high output, good quality, and high rate of milling rice, and these have been planted on an area of our 13 million mou of land (860,000 hectares) in provinces of Hunan, Hupeh, Szechwan and Anwei. With a view to meet the needs of double and treble crop areas in China, the Nanking Agricultural College has bred out a good quality wheat 'Nan Da 2419' which is suitable to be sown late in the double crop areas (one paddy rice and one wheat). The Kiangsi Agricultural Experimental Farm has selected an early rice 'Nan Te' which possesses the characteristics of early ripening, bumper harvest and suitable to double crop areas.

In the field of culture and breeding of good quality cotton, the Gin Wei Farm in Shensi province has selected out 'Gin Sze' and 'No. 517'. In both of them the period of maturity is advanced by five days and the output raised 10 percent. As to the miscellaneous cereals, by using the method of interspecific cross breeding the Feng Tze Farm in Shantung province has bred out the good quality maize variety, 'Feng Taz No. 2', 'Feng Taz No. 4' and 'Ge Yu No. 25'. Their output is 30 percent to 100 percent higher than those of the

local varieties. The multi-blade tobacco selected by Ke Yuan Farm in Yuan Province has 150 leaf blades as the highest and the yield is twice as much as that of the local tobacco. There are also many model seed selectors coming out from the masses. For example Yu Chin Shou and his wife of Shantung Province have selected out a 'Bean Swe' (flat head) wheat and a Japonic type late variety rice 'Lau Lei Chin' is selected by Chen Young Kang, Kiangsu Province. These two varieties have the features of bumper harvest, good quality, as well as higher resistance to adverse conditions.

**Improving the method of cultivation:** To meet the demand of the organized peasants for improving the technique of cultivation, the method of summarizing experience of the masses in connection with popularization of the advanced science and technique has been adopted. The masses of the people are mobilized to develop a patriotic emulation campaign for increased production and organized to contrast and demonstrate among themselves those with higher yield and better farming methods. The experiences which have proved effective in increasing production through practice are actively given publicity and popularized.

According to a typical survey, other conditions being equal, by employing improved plough the output is remarkably increased over that by using old-type plough. The quality of cultivation done by two-wheel and two-blade plough is even better and the output can be increased about 15 percent than by the old-type plough. Up to 1954, the number of various types of improved ploughs sold to the peasants has reached over 500,000 pieces. Some peasants often overcome the limitation imposed by the old type farm implements by deepening the furrow and extra ploughing. Some peasants plough the land deeply every three or four years. As a result, the deep-ploughed area is expanded year after year. In the dry farming area of North China, to prevent drought and retain moisture in the soil, the experiences of early and deep ploughing, harrowing side by side with ploughing and raking in the early spring have been popularized. In south China, the method of deep ploughing, culture of vigorous and healthy seedlings, transplanting and irrigation in time and intercultivating have been extended. In areas where the temperature and rainfall conditions are favourable, the peasants are suggested to change their habits of cultivation from one crop to two crops a year, from interplanted double crops to continuous double crops and from planting indica-type rice to Japonica-type rice in co-ordination with applying more fertilizer and reasonable irrigation. These improvements have

Its weight is 45 to 65 percent heavier than the local strain. The quantity of wool sheared increased six to eight times and the length of wool staple is over seven centimeters which is good for spinning fine yarn of 60 counts. The East China Agricultural Research Institute has experimented with success with a purple crystal vaccine for hog cholera. Evidence shows that vaccine is safe and effective, both its term for immunity and preservation are above one year. The cost of vaccination for each hog is only one twentieth as much as the past method of inoculation of blood serum. It is now being popularized in large quantities. The vaccine for rinderpest improved by the North China Agricultural Research Institute is effective both for ox and water buffalo. Furthermore a kind of vaccine special for rinderpest of yak in provinces of Chinghai and Sikiang has been invented. In the past five years after liberation, 300 million litres of various biochemical drugs were manufactured and more than 58 million head of livestock were protected and cured. Rinderpest has been virtually wiped out upto 1952. After prevention and control, the spread of foot and mouth diseases and anthrax has been stopped, the rampancy of erysipelas, *Emphysematus gangrene* and new castle of chicken have declined.

During the development of the patriotic campaign for increased production, many records of increasing production on large area are created, and many model peasants with bumper harvests to their credit have come into the national limelight. For instance in the Cahyoyan county of Helungkiang Province, the experience of bumper harvest which already existed in the area has been widely introduced. As a result, the grain production of the whole country in 1952 was twice that of 1951.

In area of Chao Shan, Kwangtung Province the local experiences on increased production of paddy rice have been extended. To the early rice, the measures are: Soaking seed for preliminary sprouting, culture for vigorous seedling, early sowing and transplanting, application of more fertilizer, hoeing and intercultivating in proper time and control of pests. The methods for planting late rice are adopted as follows: Selecting good quality seed, fostering large seedling, deep ploughing and fine raking, applying green manure, advancing the time of transplanting, applying fertilizer in different stages, drainage and exposing the field to the sun. As a result in 1953 an average of 1,000 catties of paddy rice per mou was harvested over 500,000 mou of double crop rice land in countries of Chao An and Chen Hai. The national model worker for bumper harvest of

paddy rice, Chen Yun Kang who has created the method of sparsely sowing for vigorous seedling in nursery, and few seedlings in each hole and close square planting secured a high record of 1,433 catties of paddy rice per mou for one crop. In 1953, about 75 to 80 percent of the peasants of Sunkiang County adopted the advanced experience of Chen Yun Kang after a series of demonstrations were held in interlocked way. The paddy rice yield per mou of that county was increased from 400 to 500 catties.

As to wheat, Senshi Province has summarized and popularised the measures of reasonable rotation, applying more fertilizer, selecting good quality seeds, even sowing and close-planting, early and deep ploughing, raking and harrowing in time, sowing in time and irrigating in proper stages. An average yield of more than 300 catties per mou was harvested in five countries embracing over 1.5 million mou of land in that province. As far as back in 1952, the national model worker Li Shun Ta responded to the call of the people's government and organized for developing production. In 1952, grain production of the agricultural co-operatives surpassed the pre-war level by 143 percent and two times over the average yield of Shansi Province. The national model worker of bumper harvest for cotton, Chou Yao Li adopted such cultivated techniques as: preventing drought and keeping moisture in soil, close planting and protecting young plants, frequent irrigating with small quantity of water each time, applying more fertilizer, selecting seeds every year, pruning with care and controlling pests. In 1951, he gained an average of 716 catties of raw cotton per mou on all his cotton land in which 912 catties per mou was registered on two mou of land. Sze An Fou the model worker for wheat bumper harvest obtained 810 catties of wheat per mou, because he applied the methods of deep ploughing, applying more fertilizer and selecting good quality seed. In 1952, the Farm of Lai Wu county, Shantung Province created a record of 915 catties of wheat per mou. There were other records for the highest yield per unit-area, such as: 10,200 catties of sweet potato per mou in Lu Chow Farm Szechwan Province 661 catties of Soybean per mou produced by Kuo Chi Fou of Honan Province, 1,250 catties of groundnut per mou harvested by Shang Chen Kia agricultural producers' co-operative in Shantung Province, 22,000 catties of tomato per mou produced by Lu Chan Kia and 24,000 catties of cabbage per mou by Sun Tou of Peking.

\* 1 cattie = 1.1 lb.

already gained some primary results. Regarding the popularizing of reasonable close planting, the number of plants of paddy rice, wheat, cotton and others on unit area are properly increased and production raised in many places. According to 207 experiments carried out in Hopeh Province on wheat, close planting together with other technical measures, the average yield per mou has been increased by 27 percent. The experiments on close planting of paddy rice done in 471 units in Hunan Province show that proper close planting of paddy rice can at least increase production by 17 percent. As to crops like maize, millet, sorghum the space between rows and between plants has been properly adjusted on their original basis; the method of thinning out of young plants and cultivating in due time and the centralized application of fertilizer have been extended. In addition, the methods of cotton pruning, artificial auxilliary pollination of maize and applying the auxin 2—4D' to promote the early ripening and big crop of tomato have been put to use. The results of increased production are very significant.

**Culture of the fertility of land:** To use large quantity of suitable manure and human excretions which contain rich organic matter, or to plant green manure crops are the important methods used by our peasants in fostering the fertility of land and promoting the output of crop. In paddy rice area of South China, the fallow land is utilized to plant *Astragalus sinises* and vetch (*Vicia sativa*) so that the area of green manure has reached over 48 million mou (3,200,000 hectares). In north China, the area of green manure crop also has been expanded year by year because many fallow and waste lands have been used in planting alfalfa and *Amorpha fruticosa*. To open up the resources of fertilizer in all ways, the method of cutting grasses and mixing with river mud to make composts is being brought into use in many places. The institution of agricultural research have given particular attention to study measures of cultivating green manure, popularizing bacterial fertilizer, out-root top dressing and reasonable application of fertilizer for various crops.

In the field of amelioration of soil, the Chinese Academy of Science together with all institutions of agricultural science and research have carried out soil, survey, studying the utilization and improvement of alkaline and saline land, and the red soil. For instance, in Shiao Tsen area of Tienstsin, the average yield per mou on over 500,000 mou of alkaline land is 730 catties as the result of applying the method of drainage and washing alkalis and by other

agricultural improvements. In some places where the water conservancy and irrigation works are available, the survey on soil and agricultural technique has been carried out. In irrigation, we are promoting to use ditches and to build ridges in dividing the field into small plots and to supply water in fixed quantity in order to change gradually the method of overflowing and minimize alkali areas step by step. Besides, the effective method of conservation of soil already used among the masses has been popularized so that signs of serious erosion have decreased considerably and production of crop raised.

**Protection of Crops:** In accordance with the principle that prevention is better than control, our departments of agriculture at all levels organize all units concerned to carry out an over-all research work for preventing and controlling various crop pests. In history, the plague of locust is the most serious. Locust outbreaks were recorded in history as far back as 707 B. C. Eight hundred outbreaks of locust occurred in the past 2,600 years. With the establishment of the system of prediction and forecast, supply of huge quantity of insecticide and insect control equipment and preparing the control work in advance therefore, the locust plague has been effectively checked. Paddy stem borer is a common scourge in paddy rice area. But since we have mastered their habit and their outbreak, a campaign for controlling paddy stem borer has been developed so much so their damage has decreased year by year. As to wheat midges, apart from a midge-resistant wheat variety '6028' bred by the Northwest Agricultural College, many effective controlling methods have also been created in different places. In areas where wheat smut is serious the work for treatment of seeds, such as soaking seeds in lukewarm water and mixing seeds with insecticide are applied. For instance the average rate of infection for the wheat in the Western part of the Inner Mangolia Autonomy has been reduced from 10 per cent to one percent. In Shantung Province, wheat smut is also practically wiped out due to the popularization of the method of sowing disinfected seed and well fermented stable manure and sowing the seed separately with manure. In co-ordination with the work of control of pest, our country has manufactured large quantities of sprayers, dusters, benzene hexachloride and other insecticides and insect-control equipment. From 1949 to 1954, 76,100 tons of agricultural chemicals, 940,000 sets of liquid sprayers and 44,000 sets of dust sprayers have been supplied by the Government.

**Animal Husbandry and Veterinary:** A strain of fine wool sheep of dual purposes for wool and meat is bred out in Sinkang Province.

Following the development of agricultural producers' Co-operatives, many changes have taken place in agricultural labour organization and management, technical measures as well as operation of field work. As the advancement of socialist industrialization of our country progresses, large number of tractors and other new equipment will be supplied to agriculture. Mechanization in our agriculture will be realised step by step on the basis of cooperation. Upto that time, we not only can produce more from the cultivated land now existed, but also the large-scale reclamation and cultivation on the broad area of waste land will be possible.

With a view to make agricultural science and technique to cope with the requirement of the development of agricultural production, we are now readjusting the institutions of agricultural science, strengthening the research work in order to fully bring out the function of agricultural science and technique in the socialist reconstruction.

We are now going to build a prosperous and happy country of socialism. We need peaceful circumstances for the rapid development of our production to satisfy the ever-growing demand for material and cultural life of our people. Under the leadership of Chairman Mao Tze Tung, the great leader of the Chinese people, the future for the development of our agricultural science will be boundless.

#### AWARD OF MASTER OF SCIENCE DEGREES

1. Sri S. Gopalakrishnan, B. Sc. (Ag.) has been declared qualified for the M. Sc. degree by the university of Madras, the subject of his thesis is being studies on copper in cereals.

2. Sri S. Venugopal B. Sc. (Zool), B. Sc. (Bot) has been declared qualified for the M. Sc. degree by the university of Madras, the subject of thesis being Bionomics and Control of the Chief Pests of the common green Manure Crops of S. India.

## The Cultivation of Rainfed Deshi Cotton on the Black Soil Area of the Central and Southern Districts of Madras State with Suggestions for Improvement

by

P. V. MARAPPAN, B. Sc. (Ag.) & L. NEELAKANTAN, M. A.

**Introduction:** Nearly five lakh acres of black soils in the Southern and Central districts of the Madras are annually cropped with rainfed deshi cotton, comprising more than one variety, known in trade as "Uppam", "Tinnies" and "Karungannies" (1). Uppam is short stapled (22/32" and below), low ginning, coarse linted cotton, spinning only upto 14's warp counts and belongs to the species *Gossypium herbaceum* race *acerifolium*. It is grown in parts of Central districts and coastal taluks of the Southern districts. Karunganni — *Gossypium arboreum* race *indicum* is a superior medium stapled (26/32" to 27/32"), higher ginning variety, spinning up to 24's and of higher market value than Uppam and is grown in parts of Central and Southern districts. Tinnies on the other hand is a variable mixture of the types and their hybrid derivatives and is intermediate in staple (23/32" to 25/32"). From the point of climate and agriculture the unirrigated deshi cotton tract can be classified into two distinct zones, namely the districts of Tirunelveli, Ramanathapuram and part of Madurai forming a Southern zone and distinct from the Central zone comprising the districts of Coimbatore, part of Tiruchirapalli and Palani taluk of Madurai district. Cotton is raised as a rainfed crop and is sown mostly broadcast with the help of North-East Monsoon rains, though the variety grown and rotational practices differ widely. Improved methods like drill sowing and intercultivation with labour saving implements advocated by the department are yet to become popular in these zones. This paper aims to describe the distribution of the several varieties of unirrigated deshi cottons in the black soil area of the "Tinnies" tract comprising the Southern and Central zone, cultivation practices and suggest ways and means for stepping up the production of the quality cottons evolved by improved agronomic practices.

**Existing practices:** (i) *Southern zone:* The normal area under cotton in this zone is about four lakhs of acres. The tract receives an average annual rainfall of about 25" during the growth phase of the crop. The rainfall and the black soil conditions obtaining on

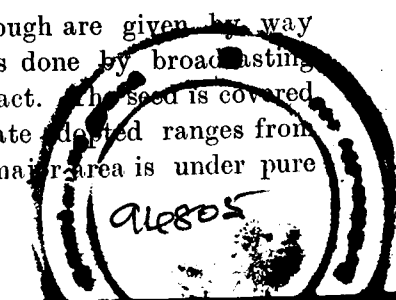
the Agricultural Research Station, Koilpatti, the northern-most taluq of Tirunelveli district, may be considered to represent the typical conditions obtaining in the zone. On the western side of the tract however, the soil is comparatively richer and is more favourably placed with reference to amount and distribution of rainfall. The black soils in the coastal area abutting on the Gulf of Mannar are deeper and stiffer. They crack more deeply and extensively than the soil in the hinterland. From the topography, it is seen that the general tilt of the land lies towards the gulf in a south easterly direction. Waters from the elevated western ridges drain over this area. Partly due to this and partly due to this being heavy soils, it takes a longer time for the soil to get into condition for sowing. Besides, the North-East Monsoon commences here two to three weeks later than on the western fringe. Cotton sowing therefore begins late, a little in advance of the closing phase of the rainy season. The time of sowing in the southern zone generally depends on the amount and distribution of precipitation of the North-East Monsoon during the prevalence of which nearly half the total annual rainfall may be expected normally. Sowing period extends from September in the west and north west areas of the zone to November in the east and south east. The variety that is cultivated in the western regions is usually *Karunganni*. From long experience the farmer in the eastern areas finds that *Uppam* is able to do better than *Karunganni* which being earlier runs the risk of exposing its bud and bolls to the untimely rains in February resulting in their shedding. *Uppam* is able to escape this contingency by its late habit and is better adapted than *Karunganni* to withstand the distress conditions associated with heavy black soils due to its relatively deeper root system. A mixture of these two varieties and their hybrid segregates is also cultivated in certain areas within these two regions. Ramaswamy Mudaliar and Balasubramaiam (5) surmise that *Uppam* is not indigenous and has been introduced more than a hundred years ago.

Preparatory cultivation all over this zone consists of two to four ploughings with the country plough. Cotton is generally sown broadcast. Drill sowing is adopted to a limited extent by a few enlightened farmers in parts of Kovilpatti Taluq. This is done with a country seed drill (the 'gorru') with three or four tynes and the seed is later covered with the 'guntaka' (blade harrow). A seed rate of fifteen to twenty pounds per acre is used in when boardcasting. The ordinary rotation is 'cumbu' (*Pennisetum typhoides* S. & H.) or 'irungu cholam'; a variety of cholam (*Sorghum dochna*) sown thick

to provide fodder for work animals, followed by cotton. In a few places cotton is raised year after year without any rotation. In parts of Madurai District cotton is preceded by *samai* (*Panicum millare Lamk*) or *tenai* (*Setaria italica - Beauv*) and followed by cholam. In most of the talqus the major area is under a pure crop of cotton. In the case of mixed cropping, coriander, black gram, ground nut, tenai, and horsegram form the subsidiary crops in the mixtures. These are sown behind the country plough in rows six to eight feet apart. Generally cotton does not receive any manure. The previous cumbu crop in the rotation receives farmyard manure at 20 to 25 cart loads per acre. If the previous crop is *irungu cholam*, it is sheep penned occasionally. One hand weeding is given when the crop is about a month old. By way of after cultivation the field is hand-hoed twice at intervals of 15 to 20 days. Harvest commences in February and is usually over by the end of April. Payment to labourer is usually given in kind. The average yield for this zone varies between 250 and 280 lb. of kapas per acre. If good and timely summer showers are received in April, a second flush is also obtained during which a quantity of kapas ranging between a tenth to a third of season harvest is gathered.

(ii) *Central Zone*: The black soil areas of Coimbatore constitute the major part of the zone. The soil is fairly deep. Stretches of undulating land lie unbunded resulting in soil erosion to a great extent by the monsoon rains and by the strong westerly wind that prevails for nearly four months from June. As a result, the fine particles of soil are carried away by the wind from the fields. Generally, sowings of dry cotton commence with the onset of North-East Monsoon rains received in October and are over within the third week of the month. The average rainfall in this area during the crop period varies from 12" to 18", received mostly in the North-East Monsoon season. The variety cultivated is mainly *Karunganni*. In insolated pockets the ryots prefer to grow *Uppam* either in pure form or mixed with *Karunganni*. The major portion of the crop is raised under rainfed conditions though some ryots grow *Karunganni* under irrigation. In such cases two to three irrigations only are given during the driest part of the season, December and January.

Two to four ploughings by country plough are given by way of preparatory cultivation. Cotton sowing is done by broadcasting the seed, the only method followed in this tract. The seed is covered by working the country plough. The seed rate adopted ranges from 15 to 20 lb. per acre. In all the places the major area is under pure



crop while in a few places coriander, bengalgram and tenai are grown as mixtures. In this tract also the rainfed cotton is not generally manured. 'After cultivation' consists of one hand weeding given when the crop is nearly a month old and one to two hand hoeings given at an interval of 15 to 20 days. Pickings commence in February, and are generally over by the end of May. The average yield for this tract varies from 200 to 250 lb. of seed cotton per acre.

**Improved strains under distribution and further trials:** Depending upon the suitability of the tract two strains, viz, K. 2 and K. 5 obtained from inter-arboreum crosses and evolved at the Agricultural Research Station, Kovilpatti and the Cotton Breeding Station, Coimbatore respectively, are now in general cultivation in the Southern and Central districts of the State respectively. It was found desirable to grow one cosmopolitan strain of arboreum cotton for the entire area to maintain purity and prevent the malpractice of mixing. The objectives set forth for the evolution of such a cosmopolitan strain were that it should be able to (1) withstand the ill effects of untimely rains of February–March in the south (2) possess a ginning outturn of 34% or more, (3) have a staple length of over 15/16" (4) spin 40's standard warp counts and (5) give an average lint yield of about 150 lb. per acre as detailed by Kalyanaraman and Radhakrishnan (2). To achieve these objects work is progressing at the Agricultural Research Station, Kovilpatti. It was found that four long linted cultures, namely 6186-9, 6188-8, and 6312-A gave consistent and encouraging results in the trials conducted at the breeding stations in Kovilpatti and Coimbatore. These were tested for the first time during 1952-53 on representative cotton areas in the central and southern districts to ascertain their adaptability levels. Results from these trials for three consecutive seasons indicated that all the cultures were found to be as adaptable as the local. Besides, the ginning percentage and halo-length of these long linted types were significantly higher than those of the locals (3). Of these, culture 6186-9 was finally found to be the best cosmopolitan strain to replace the existing strains of K. 2 and K. 5.

**Further scope for improvement in cotton cultivation:** A review of the cultivation practices followed in these tracts reveals that there is great scope for improving the yields of the crop, besides the use of seeds of improved strains. Improvement in the method of sowing, nature of preparatory cultivation, manuring practices, after cultivation practices are important considerations. The improved practices of working 'guntaka' for levelling lands after ploughing and

covering the furrows after sowing, using seed drill (Gorru) for sowing and using 'danthi' for intercultivation are not in vogue anywhere in the State. In these years of successive droughts and abnormal weather conditions the practices adopted by the dry land cotton farmers of the tract would seem to be far behind the requirements of the times and needs. Neither climatic nor local conditions could be impediments in the way of the cultivators for the adoption of improved practices for improving the crop. Their use is economical, efficient and simple. The following methods are recommended to improve the yield of the unirrigated cotton crop.

(1) Bringing the field under plough soon after the harvest of the previous crop, and breaking clods by the use of 'guntaka' to settle the soil and conserve much of the rain water.

(2) Putting temporary bunds across the slope and along contour for checking soil erosion, conserving the rain water and prevent 'runoff'.

(3) Working 'guntaka' prior to sowing to form a good seed bed and securing a good initial stand of the crop.

(4) Using chemical nitrogenous manure like ammonium sulphate at the rate of 100 lb per acre to supply 20 lb of nitrogen just prior to sowing. An increase of 37% has been obtained at the Agricultural Research Station, Kovilpatti by applying 40 lb of Nitrogen per acre in the form of ammonium sulphate.

(5) By the adoption of drill sowing with the help of 'gorru' which enables the use of 'danthi' for intercultivation when the crop is in the land.

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## Australian Sugar Industry

by

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Sugarcane was first grown in Australia in the year 1817 though the first commercial plantation commenced only in 1865 in New South Wales. As soil and climatic conditions in Queensland were more favourable for the successful cultivation of cane, the industry gradually extended northwards till at the present time 80% of the entire cane is produced in the tropical regions of Queensland. In 1953 - '54 the total area under cane in Australia was 481,602 acres. There are 34 mills, 14 of which are co-operatively owned by the growers and the rest proprietary. The following table gives the various sugar districts with their rainfall and the number of mills in each of them :

| Districts                  | No. of mills | Rainfall   |
|----------------------------|--------------|------------|
| 1. Mossman to Ingham       | 10           | 80 to 180" |
| 2. Lower Burdekin          | 4            | 43"        |
| 3. Mackay - Proserpine     | 8            | 65 to 70"  |
| 4. Bundaberg - Maryborough | 7            | 44"        |
| 5. Nambour - Beenleigh     | 2            | 48 to 63"  |
| 6. Narwood in N. S. W.     | 3            | "          |

Mossman and Mackay are in the high rainfall tropics, while the Lower Burdekin is in dry tropical belt and is essentially an irrigated area. The others are sub-tropical and most of the crops are grown with rainfall only, though irrigation is being used on considerable acreage in Bundaberg.

Cultivation of cane is confined to the narrow eastern coastal strip, about 30 miles wide, of Queensland and New South Wales, and it extends to a length of about 1,300 miles from Mossman (16½ Latitude S) to Clarence river in N. S. W. (29.5 Latitude S). Climatic and soil conditions vary. The areas receive their heavy rains during summer (December to February) though fair to heavy rains are received in the other seasons also. The soils are of volcanic origin in many of the areas except in Lower Burdekin Delta and extensive irrigation is practised with the aid of pumps working in shallow bores.

## AUSTRALIAN BANANA INDUSTRY



The New South Wales banana industry is valued at between £A 4,000,000 and £A 5,000,000 annually, producing 1,750,000 cases a year. Average production to the acre in New South Wales is calculated at 72 cases on non-irrigated land, 300 cases under irrigation. A case weighs about 80 lbs.

Experts regard the use of plastic bags to cover young fruit as the most important innovation in the banana-growing industry. Used to protect growing bananas in winter and spring months and intensify sunlight, they produced a larger and more mature banana.

As with the sugar industry obtainable in all parts of the world, Australian Sugar Industry also was formerly organised on Plantation basis, with 166 inefficient plantation mills. Indentured labour from South Sea islands was extensively employed. But with the coming in of federation in 1901, employment of coloured labour in all the industries, specially in sugar industry was prohibited, the coloured labour repatriated and various inducements given to encourage European settlement in the area. The result is that at present the entire sugarcane cultivation is based on the typical Australian pattern of one man ownership and operation. In place of 166 inefficient mills there are only 34 mills which mill 7 million tons of cane per annum. The entire work is carried on with white labour. All the operations are highly mechanised. The labour employed even in factories is surprisingly small. A factory with a crushing capacity of 2,400 tons per day employs about 30 persons per shift on the manufacturing side with 12 persons in the Loco section.

Australian Sugar Industry is a protected industry. Import of foreign sugar is not allowed and the industry itself, through the Queensland Government, has taken up on itself the responsibility of supplying the entire Australian requirements of refined sugar at a fixed price (the present price is 10 pence per lb. in retail) and providing the Australian manufacturers of jams and other preserved food stuffs with enough sugar at such prices as would be obtained in the free world market. This sugar industry supports directly or indirectly 200,000 persons in Queensland alone — almost one-fifth of that State's population. Apart from the need to make the country self-sufficient in sugar and earn a substantial exchange by exports (valued at £ 21·7 millions in 1952 - '53), it is considered as of paramount importance to the Nation to develop the northern areas of the country and habitate them with white population in the interests of security and military strategy. The need for this development has been felt specially since the World War II.

Possibilities of expansion of sugar industry in the country are great. Given sufficient export markets at attractive prices for sugar, the industry can increase its production manyfold, as enormous stretches of land suitable for cane cultivation are available. But since the export quota of Australia as per the International Sugar Agreement and the Empire Sugar Agreement is restricted to 600,000 tons of sugar per annum, a number of restrictions have been placed on the industry to balance the production against anticipated demand at economic price level. Each mill is allotted a maximum

more than one variety is a sort of insurance against total loss due to possible damage to a variety by disease or by adverse climatic conditions. They also aid in spreading over the harvest programme over a longer season without any deterioration to cane. A few farmers who placed all their reliance on only one variety Pinder, suffered heavily this year in Queensland on account of the tops breaking off at the time of heavy cyclones this January. Trojan and Badisla varieties of cane in the nearby fields were entirely unaffected by the cyclone.

Each mill area has a list of approved varieties prescribed every year by the Bureau of Sugar Experiment Stations, a quasi-government body in charge of sugarcane work. It is an offence to grow any variety other than those approved.

At one time Co. 290 and P. O. J. 2878 reigned supreme in the area, but on account of their susceptibility to many of the diseases, they have been discarded in favour of other superior varieties. Farmers have a wide choice of suitable varieties to choose from and they do not hesitate to take up to new ones.

At the present time 35% of the entire cane area is covered by varieties bred by the Bureau of Sugar Experiment stations, 42.6% by varieties from the Creeping Stations of the Colonial Sugar Refining Company and 22.4% of the area is covered by canes imported from foreign countries. The performance of a few varieties is outstanding and there is no doubt that the higher efficiency and higher sugar recovery of the Australian industry are, to a very great extent, due to these varieties. Some of these varieties can be imported and their performance tested in typical sugarcane farms in India.

**Aftercultivation:** During adverse seasonal conditions when tractor cannot gain entrance to the fields pre-emergence sprays of 2—4D are used in certain localities to prevent germination of weeds and for giving the seedlings a good start. But in the majority of the areas weeding is done with the help of a "cotton king" with spring tyne attachments. The implement consists of two sets of 3 reversible discs of 16" diameter on either side with 5 or 6 spring tynes in the centre. The disc cultivates the interspaces between the rows of cane and the spring tynes weed and stir the soil right in the row of cane without damaging the germinating buds or the shoots. A single row "cotton king" is worked by a light tractor (20 H. P.) and covers an area of 10 acres

in 8 hours. In irrigated areas (12½% of the entire area) cultivation is done as and when necessary and in times of extreme dry weather, the soil is thrown a bit inside the rows with the use of 'cotton king' to conserve the available moisture. In all cases soil is thrown into the rows of crop bit by bit as the crop grows till the entire furrow is closed and a small ridge is formed along the rows of cane. Final weeding and earthing up is done by a tractor drawn implements. No cultivation is done once the crop has grown out of hand. Hand weeding or chipping as is done in India, is unknown. Even in a 70 ton crop (with canes 6 ft. long) in the irrigated farms, the ridges formed along the rows of cane are not more than 6 to 9" high from the bottom of the adjacent furrow and the canes do not seem to lodge on account of the low ridges.

The ratoon crops, usually two or more, are treated the same way except that at the beginning the stubble is 'shaved' or cut to the ground level by disc harrows or shubble shavers to allow new shoots to come up from the ground level and not from the crown of the ridge.

In Burdekin area, irrigation is given at three-weekly intervals, the maximum number of irrigations being 10 to 12 per year. The cost of lift irrigation varies from £ 12 to £ 15 per acre per annum.

Sugarcane arrows in almost all the tracts in April – May, the intensity depending upon the variety and the locality of the farm.

**Fertilizers:** Payment for cane in Australia is based on the quality of cane and every endeavour is made to obtain a crop of high sugar value. The farmer is interested in the tons of sugar produced rather than in the tonnage of cane alone. Since exorbitant rates are to be paid for the harvest of lodged canes and since the sugar content goes low in a lodged crop of cane, farmers always prefer to have a crop of erect cane of normal tonnage and of high sugar content to a heavy lodged crop of luxuriant growth but of low sugar value. All fertilizer practices have this in view. The bureau has an elaborate advisory service which enables every farmer to have his soils analysed every fourth year free of cost. Nitrogen is always assumed to be deficient and hence determinations for phosphorous and potash status of the soil alone are made. Based on the results of analysis proper fertilizer recommendations are made to the farmers.

quota of sugar (Peak) it can produce each year and this quota is distributed among the registered suppliers of cane on the basis of supply in a specified year.

The average size of the farm is about 60 acres with an average production of 1100 tons of cane per year, though there are farmers owning very large blocks under cane. Each farm is self-contained with dwellings and all machineries and quarters for cane cutters. Each farm is allotted a net assigned area, the maximum area of cane in any one year and a peak (the maximum tons of cane that it can supply to the mill in any one year). Usually three-fourths of the gross area of a farm is the net area, and it is this area which is to be under cane every year, the rest being fallowed and/or green manured. In the case of a farm of 60 acres gross, 15 acres under first ratoon, 15 acres under second ratoon and the rest fallowed. Steps are taken to see that a farmer does not plant an area in excess of the farm's net area and the millers are prohibited from accepting cane from any area other than that allotted. This system of gross and net assignment allows the fields to rest once in four years and enables the farmer to enrich the soil by growing a green manure crop. In general, cane farmers specialise only in cane and do not have any other crop. The allotment and revision, whenever necessary, of the peaks and the net assigned areas are determined by the Central Cane Prices Board and local Cane Prices Board constituted under an Act of the Queensland Parliament.

**Preliminary Cultivation:** The stubbles of the preceding crops are uprooted in June and the crop residues cut into pieces and incorporated into the soil by working disc harrows, rotary hoes, disc plough or their implements drawn by tractors of different sizes. The land is further worked by grubbers or disc harrows to prepare a suitable seed bed for sowing legumes in September. The type of green manure chosen depends upon the locality and the time available between now and the time of planting cane. Velvet beans (*Stizolobium* Sp.) have a long growth period, are drought resistance, wilt resistant and produce heavy mulch of dead leaves on the soil surface while the vine is still growing. Cow peas are preferred where a short duration crop is required. The seeds are usually grown in lines 4' 6" apart to reduce the seed rate and facilitate intercultivation when the vines are yet to cover the entire field. These green manure crops make rapid growth with the onset of summer in November and give a final yield of 10 to 16 tons of green matter per acre, when they are

ploughed in January. The land is disced with harrows to disintegrate the green matter and the soil is compacted well with rollers. The green matter decomposes entirely in about 2 weeks' time. Further working is done with grubbers (rigid tyne cultivators) until a good seed bed to a depth of one foot free from clods is obtained.

**Planting:** Time of planting varies with latitude to allow of sufficient soil moisture and high soil temperature during germination of setts. In North Queensland planting is usually done during April — May after the heavy summer showers. In South Queensland and N. S. W. planting is done either during autumn (February — March) or during spring (August — November). Since all after-cultivation is carried out with tractors, it is found essential to have a spacing of 4' 9" to 5' 3" between rows of cane. Planting is done by planting machines which cut the cane into setts of suitable size, dip them in or spray them with a solution of Aretan (organo-mercurial compound) and plant them in furrows opened by the machine, cover the setts with soil and compact the soil above the setts. In certain localities where application of fertilizers is done at the planting time a fertilizer box is attached to the machine. A single row planter requires one man to feed the canes to the chute and a double row planter requires two men to feed the cane. In either case, there is, in addition, a driver to drive the tractor. A single row planter worked by a 22 H. P. tractor will plant 4 to 6 acres per day and a double row planter worked a 40 H. P. tractor will cover an area of 12 acres per day of 8 hours. A single row cutter-planter will cost £ 133 while a planter with a dipper or spray attachment for Aretan will cost £ 250/-

Only whole canes of 10 to 12 months old are used for seed purposes. Great care is taken to discard diseased and unthrifty canes and canes with prominent eyes. Each sett is of 3 buds, 14" long and are planted singly end to end 4" apart at a depth of 9". Two tons of cane or 10,000 setts are required to plant an acre. There are 6 to 8 buds for each yard-length of furrow. Use of 'Aretan' to prevent the onset of pineapple disease, protect the canes against adverse conditions of soil and to hasten germination of buds is universally practised. The cost of the treatment is 10 to 15 shillings per acre.

**Varieties:** Considering the total area of cane, the number of varieties of cane one comes across in any one area is remarkable. Each mill area uses a couple of varieties and each individual farmer has more than two to three varieties growing in his farm. Having

As already stated, a majority of the farmers grow a green manure crop which is estimated to add 200 to 300 pounds of nitrogen per acre. In addition, many farmers have begun applying molasses at the rate of 4 to 8 tons per acre and/or filter press mud at the rate of 10 tons per acre as a basal dressing. In fact as much as 28% of the production of molasses is utilised as fertilizers to cane field. These mill waste products are made available to farmers either free (mostly by co-operative mills) or at a nominal rate (£ 2 to 3 per ton of molasses) by proprietary mills. These products are reputed to improve the texture of the soils besides being of some manurial value. In certain mills a mixture is made of molasses and press mud in the proportion 2 parts of molasses and one part of mud and supplied to the farmers at £ 2 per ton. This mixture is easy to handle.

In irrigated Burdekin area, where no green manuring is practised, a suitable planting mixture (17%  $P_2O_5$  and 7.5%  $K_2O$  or 8%  $P_2O_5$  and 25%  $K_2O$  according as the soil is deficient in P or K) is drilled into the soil at 3 cwts. per acre during planting time. In addition, a top dressing of 2 to 3 cwts. of ammonium sulphate is applied close to the crop rows when the crop is about 7 months old. In dry areas a suitable of mixture (12 — 5.5 — 7.5) is drilled in at the time of planting at the rate 3 to 6 cwts. per acre and no further fertilizer is applied. Experiments carried out by the Bureau indicate that all the fertilizer requirements of the crop can be applied in a single dose and that no advantage is gained by applying the fertilizers in two instalments.

**Harvest:** Cane is harvested when the crop is 12 to 14 months old. In certain areas of Southern Queensland and in New South Wales where stand - over crops are found, cane is harvested only when they are 22 to 24 months old. The universal practice in the country is to burn the crop prior to harvest. This involves the burning of all dry leaves before cutters enter the yield. The quality of cane does not suffer appreciably by the pre-harvest burning, provided the canes are delivered within 48 hrs. Harvesting is usually done by manual labour by gangs who are specialists in this work, and they are paid for at the awarded rate of 13 to 15 shillings per ton. A gang consists of 3 to 4 cutters and a cook who also shares their wages. An average cutters will cut 6 to 8 tons of cane per day of 8 hours. Cane cutters have a 40 hour week and labour laws regulating hours of work, rates and methods of payment, provision of quarters and of equipment to be provided in the house and settlement of disputes are elaborate and are strictly observed. All cane

cutters, in fact all labourers, should be members of the Australian Workers' Union.

The canes are loaded in trucks of 2 to 2½ tons capacity on temporary tram lines of 2 feet gauge laid on the farm and the loaded trucks handed over to the mills at fixed delivery points near the farm. The Australian mills maintain 2000 miles of tram lines and it is the responsibility of the mills to have the loaded trucks hauled up to the mill. A very small percentage of the crop is delivered to the mills by other means of transport like motor truck, railway and boats.

There are a few sugarcane harvesting machines in operation in some of the larger plantations. These machines cut the canes, top them, and throw them in convenient bundles to be loaded into trucks by front-end loaders worked by light tractors of 22 H. P. A two-row machine harvests about 60 tons of cane per hour and a one-row harvests about 25 tons of cane per hour. The cost of machine varies from £ 3000 to £ 5000. Attempts are being made to perfect the machine and make them available to all the farmers at a reasonable cost, as the manual harvesting of cane is cumbersome and costly; and accounts for the major portion of the costs of production.

Handling of cane, while cane is transferred from one truck to another or from trucks to railway wagons, is mechanised with the aid of "derricks". The yield of cane varies from 25 to 30 tons per acre in dry areas and 50 to 60 tons per acre in the irrigated districts. The cost of production of a ton of cane is about £ 2—6—0 in irrigated districts and slightly less in dry areas. The average C. C. S. (Commercial Cane Sugar) content of cane varies favour 12% to 16%.

**Payment:** Payment of cane supplied to a factory is made not only on the basis of tonnage of cane supplied but also on the basis of commercial cane sugar contained in it. Arrangements exist in all mills to take either a continuous sampling of the first expressed juice as a particular consignment of cane is being crushed or to mark out every fourth wagon in a consignment and take samples from the first expressed juice from those canes. In either case the juice is analysed and with reference to the figures of analysis and the fibre content of the particular variety of cane, the commercial cane sugar content (C. C. S. %) is determined. This CCS figure is not identical with the actual sugar content but is a measure of the recoverable sugar at a certain prescribed standard of factory efficiency. The grower is paid as per scale which provides a premium for high CCS%. Qualified

cane testers are appointed by the Central Cane Prices Board, in each mill to ensure that rules and regulations governing the weighment of cane and taking of samples, are strictly adhered to and the procedure adopted in the laboratories for analysis of juice is in conformity with standard methods. Canes with a CCS percentage less than seven is return to the grower.

One unique feature is that the price of cane paid to the grower is linked to the price of sugar realised by mills. All sugar produced within the peak is termed as *Pool 1* and this includes sugar meant for domestic consumption and for export to the United Kingdom as per agreed prices. All sugar produced in excess of the peak is termed as *Pool 2* and is sold in the free world market at the owners' risk often at a price lower than *Pool 1*. The price realised by a particular mill in 1954 is as follows and is given as an example :

| Pool | Destination                                                         | % of the total production | Price realised per ton. |                                      |
|------|---------------------------------------------------------------------|---------------------------|-------------------------|--------------------------------------|
| 1    | Domestic consumption                                                | 44.6                      | £ 47-16-0               | Pool 1<br>average price<br>£ 42-16-0 |
|      | Export under agreed prices                                          | 55.4                      | £ 38-16-0               |                                      |
| 2    | Export to the free world market. (Production in excess of the peak) | 1124 tons                 | £ 31- 1-0               |                                      |

The price thus realised per ton of raw sugar is divided among the growers and the miller in a definite proportion. The price obtained by the grower can be calculated from the formula

$$x = 0.009y(z-4) \pm \text{adjustment}$$

where  $x$  is the price to be paid to the grower per ton of cane supplied  $y$  is the price per ton of sugar obtained in the relative pool and  $z$  is % CCS of the cane. Adjustment is the adjustment to be made in case the price of sugar goes above or below the price £ 3 35/- per ton (at which figure this formula is held to be true). The figures of adjustment is given in a table. In practice the division of the raw sugar money between the grower and the mill is done in the proportion of 7% (to the grower) and 30% (to the miller). The amount thus realised is distributed among the growers according to the total tonnage and the CCS of the cane. As the whole calculation is based on a certain specified efficiency of the mill, the grower does not suffer on account of the inefficiency of the mill.

Though final payments are made and accounts settled only at the close of the season, interim payments are made to the farmers immediately cane is delivered to the mill as per proclamation (announcing the anticipated price of raw sugar for the season and interim payments to be made to the grower) issued by the Queensland Government at the beginning of each season. The marketing of all sugar whether for refining and home consumption or for export is controlled by the Queensland Sugarcane Board under the Sugar Association Act. A ton of cane analysing 13% CCS is paid at the rate of £ 3-13-0 when the average pool price of raw sugar is £ 42-16-0 per ton. Sugar refining is carried on in separate refineries located in the big metropolitan cities. The sugar mills confine their activities to the production of raw sugar. Except for one refinery in Bundaberg all other refineries are owned by the Colonial Sugar Refining Company, who act as agents to the Queensland Govt. in all matters pertaining to the control and marketing of sugar.

It is evident, therefore, that the farmer stands to gain by supply of quality canes to the mill and the farmer always tries to produce canes with high CCS by the adopting proper manurial and cultural practices. He is always on the lookout for better varieties of cane and demands of the Bureau for supply of suitable varieties to his farm.

**Pests and Diseases :** Australia is now singularly free from many of the major pests and diseases, due mainly to a system of strict quarantine and regulatory measures adopted over the course of many years. Red rot has been controlled by the use of resistant varieties. A few of the major diseases like the Fiji disease and Mosaic have been almost completely eradicated. Sugarcane grubs, once the major pest, have been controlled by the extensive use of B. H. C. preparations. Movements of cane from one district to another cannot be done except under the authority of the Pest Control Officers, and import of cane materials from abroad by persons other than the Bureau is not allowed. A few minor diseases like ratoon stunting disease, chlorotic streak (both believed to be virus diseases) and sun leaf scald (a bacterial infection) are present and they are kept under control by proper preventive and curative measures. Hot water treatment plants for the treatment of sets against ratoon stunting disease are present in all the mills.

**Organisations :** The Bureau of Sugar Experiment Stations, a quasi government body responsible for research into all spheres of

sugarcane development in Queensland was constituted under the Bureau of Sugar Experiment Stations Act of Queensland Parliament. The Bureau maintains a number of breeding and experiment stations in typical areas of the state. The activities are financed by a levy of 3 pence each on the grower and miller for every ton of sugarcane crushed. The growers and millers have effective voice in the formulation of the policies and drawing up programmes of research.

The Queensland Cane Growers' Council is purely a growers' association. All cane farmers are *ipso facto* members of the council and contribute to its finance by a levy of three quarter penny per ton of cane supplied to the factory. The council is the watchdog of the interests of the growers vis-a-vis the millers. It has on its staff qualified personnel who can speak authoritatively on matters pertaining to the culture of cane and technology of manufacture. The official organ of the council is *The Producers' Review*; a monthly journal of great interest to farmers.

The Australian Sugar producers' Council is an association of the growers and millers and is the mouthpiece of the entire industry. In addition, each mill area has its own district executive and pest control board to attend to local affairs. With better varieties of cane, better cultural practices, control of pests and diseases and the effective organisation of the industry, the yield of sugar per acre has risen from 1.81 tons in 1901 to 3.39 tons in 1952-53. 6.8 tons of cane are required to produce one ton of sugar in the Burdein area, the over-all average in Australia being 7.34 tons of cane to a ton of sugar. The Australian cane is the sweetest cane in the world and the yield of sugar per acre compares well with any other sugar producing country.

#### Research Notes

#### A note on some responses of *Eupatorium glandulosum* H. B. & K., to spraying of 2, 4, 5—Trichlorophenoxy-acetic acid as a weedicide.

**Introduction:** *Eupatorium glandulosum* H. B. & K., native to Mexico, is a branched shrub growing to a height of 3 to 6 feet and as recorded by Fyson (1915) it is commonly seen as an escape along roadsides in Ootacamund and surrounding areas in the Nilgris. The plant is very glandular on all the young parts and scented, with a peculiar acrid odour. Leaves are opposite, petiolate, the lamina being almost triangular with a broadly wedge shaped base, crenate-dentate, except on the basal margins. White flower heads are produced in terminal glandular masses. In the course of weedicide experiments on some important weeds on the hills, isopropyl ester of 2, 4, 5—Trichlorophenoxy acetic acid was sprayed as a weedicide on this species at 5 lb. acid equivalent per acre in a spray volume of 100 gallons. The responses of this weed to the spray, with reference to some of its morphological features, are described in this note.

**Observations:** The sprayed plants did not exhibit any scorching on the next day of treatment but the tender shoots showed epinasty. The plants did not dry up even after a month's time but fresh axillary growths were noticed. The leaves were also fresh and green, but for a few scorched spots here and there. The petioles of the leaves were coiled up like a spring. The stems were swollen and distorted in many ways, showing profuse growth of roots throughout the internodal regions. These adventitious roots were thin, light brown in colour, varying from one to a few centimeters in length. Initiation and development of roots along the stems and the coiled up petioles are shown in Fig. 1. The roots have actually forced their way through the epidermis. Barring these abnormal growths, the plants were quite healthy and continued to put forth fresh shoots from the axils of leaves.

**Discussion:** Root initiation on stems of plants is caused by most of the hormone type chemicals and this is utilised in inducing quick rooting of stem cuttings intended for vegetative propagation of many garden plants. Zimmerman and Wilcoxon (1935) mention eight chemicals, inclusive of  $\alpha$ -Naphthalene-acetic acid,  $\beta$ -Indole butyric acid and Phenylacetic acid that definitely caused local initiation of roots on growing plants of tomato, sunflower, marigold, artichoke, buck wheat, dahlia and tobacco. It is further stated that Alpha Naphthalene acetic acid and Indole Butyric acid were specially effective for initiating roots on both stems and leaves. Avery and Johnson (1947) observed that amongst the promising new hormones, trichlorophenoxy acetic and trichlorophenoxy propionic acids were extremely active in inducing root

formation and when used at low concentrations have an advantage over the phenoxy compounds in that they do not affect the normal growth of roots and shoots. These chemicals have been said to be successfully used in rooting roses, apple etc., at concentrations of 50 to 1000 ppm. in talc. On *Eupatorium glandulosum*, the ester of 2, 4, 5-T had no killing effect even though the chemical was sprayed at a weedicide concentration, but on the other hand there was root initiation along the stems. The stems did not dry up but exhibited only slight distortion.

EUPATORIUM GLANDULOSUM, H. B. &amp; K.



FIG. 1  
Sprayed | Control.

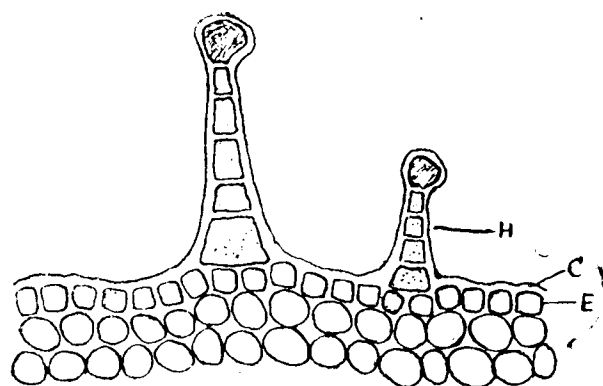


FIG. 2

Stem epidermis showing glandular hairs:  $\times 75$ .

H — Epidermal hair with a unicellular glandular head.  
C — Thick cuticle.  
E — Epidermis.

Thus it is clear that wetting, penetration and translocation of the chemical have been much retarded and the chemical had entered the tissues only in such a small dose as to act as a growth-promoting agent. In other words, the plant has been able to resist the action of the weedicide and this is mainly because of the presence of a dense, covering of glandular hairs on the plant body. These hairs are present all over the stems and leaves. On the leaves these hairs are found to be more concentrated on the midrib and veins. Each hair, on detailed examination, is found to have a uniseriate stalk of a few cells with a unicellular glandular head as shown in Fig. 2. Robbins et al (1952) while dealing with the relative resistance of weed species to hormone sprays state that a dense covering of hairs is one of the many plant characteristics that contribute to the resistance of weeds. In this species of *Eupatorium*, apart from the hairy covering of the plant body, there is additional protection because of the glandular secretion. Thus the glandular hairs have prevented intimate contact of the spray with the epidermis. The stem anatomy also showed a thick cuticle on the epidermis, which acts as an effective mechanical barrier against penetration of the chemical.

**Summary:** The responses of *Eupatorium glandulosum*, a shrubby weed common in the Nilgris, to a spray of isopropyl ester of 2, 4, 5-Trichlorophenoxy acetic acid have been described.

This weed, though a broad-leaved one, is found to be very resistant to the weedicide, mainly because of the presence of glandular hairs all over the plant.

The observations, also indicate clearly that 2, 4, 5-Trichlorophenoxy acetic acid is very active at low concentrations, in initiating root growth in plants.

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D. MEENAKSISUNDARAM

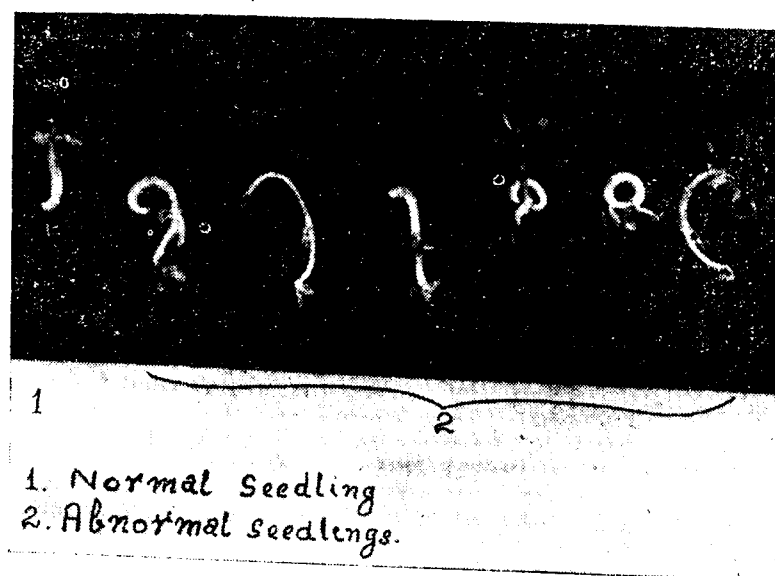
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### Abnormal Seedlings of Groundnut, *Arachis hypogaea* Linn.

The groundnut seed germinates on the fifth day in the case of bunch types and on the seventh day in the case of spreading types, under optimum moisture conditions. The period required for germination varies under different conditions. Bouffil (1951)<sup>2</sup> reported that the radicle appears within two days after sowing under Senegal (African) conditions and germination was complete within a week. In America and Germany, 8 to 10 days were required for germination. Ali Muhammed *et al* (1933)<sup>1</sup> reported that germination was complete in the early sown crop within a week and in the late sown crop within ten days at Lyallpur. Under pot culture, germination was noticed to be slightly earlier than under field conditions. Similarly water soaked seeds germinated earlier.

During the course of germination studies on different varieties, forms and cultures of groundnut at the Agricultural Research Station, Tindivanam a few abnormal seedlings were noticed. The abnormal seedlings along with a normal one are shown below in PLATE I.



In these abnormal seedlings, the hypocotyl instead of growing straight and up-ward exhibited a tendency to loop with the epicotyl or portion of the hypocotyl and epicotyl buried in the soil. In some cases the hypocotyl makes a complete loop and again the shoot emerges straight. In other cases, the hypocotyl is unable to lift the epicotyl which is deeply buried in the soil. Under such circumstances, the cotyledonary laterals begin to develop if they happen to be above ground. The plant

is otherwise normal, only with two laterals developing instead of the terminal main stem.

In most of the cases of such abnormal seedlings, the cotyledons are also found underneath the surface of the soil and further development does not take place. The main apical shoot is found to decay after some days.

The occurrence of such abnormal seedlings are rare being 10 or 12 in a field with a population of 60 to 80 thousand plants. The occurrence of such seedlings was slightly more common in fields where the seeds were sown by punching a hole in the ground, putting a seed in it and covering it with moist soil by hand, than in fields where sowing was done by dibbling seeds behind country plough.

Whether the depth of sowing was responsible for such abnormal behaviour of the seedlings was considered. Pot culture experiment was carried out with sowing seeds at four different depths, viz., 1" 3" 6" and 9". It was found that the germination was delayed as the depth of sowing increased but the seedlings were normal. On pulling out, it was seen that the collar was situated approximately at the point of placement of seed and the hypocotyl elongated until the cotyledons were pushed to the surface of the soil. Thus the length the hypocotyl varied according to the depth of sowing. This is in agreement with the findings of Bouffil (1951)<sup>2</sup>.

Such abnormal seedlings were reported by Krishnamurthy and Srinivasan (1953)<sup>3</sup> in *Dolichos lab-lab* due to toxicity of 2, 4 Dichlorophenoxyacetic acid when the weedicide was sprayed as a pre-emergence control. Whether such toxic action may be the cause of such abnormalities, was determined by conducting pot culture experiments where pre-emergence spraying of 2, 4 D in herbicidal concentration (i. e. 2½ lb. of Ferenoxone in 100 gallons of water) and no treatment were compared. It was seen that germination was inhibited by the weedicide and that abnormal seedlings were also found. But there is not sufficient reason to infer that the occurrence in the fields is due to any such toxic action.

Agricultural  
Research Station,  
Tindivanam. }

N. SRINIVASALU.  
P. KRISHNASWAMY.

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## Gleanings

**Agriculture in the World Economy:** Agriculture is the world's largest primary industry. Approximately three-fifths of the world's population, or more than 1,400 million people, live on farms. Of the total farm population of 913 millions, or 65 per cent live in Asia and 153 million or 10 per cent in Africa. In most countries, there has been a sharp decline in the percentage of farmers during the last 150 years. Only 9 to 10 per cent of the world's land resource (29,345 millions acres) consists of cultivated land! 17 per cent are meadows and pasture and 29 per cent forests. Nearly half the land, 43.5 percent is not used for production. From the point of production, grain yields have increased by 5 per cent with the help of scientific development, while in the U. S. A. alone, the increase has been 26.5 per cent. The largest number of cattle are found in Asia, where they serve as draught animals and as producers of milk. The highest number of horses are in Latin America and Europe. The study forecasts that 50 to 60 million tons of fish could be caught each year instead of the present 25 or 30 million tons without endangering exhaustion of stocks and future yields.

The world's forest resources seem abundant enough to meet foreseeable needs, taking into account both population growth and accelerated demand caused by increasing literacy. Excluding the U. S. S. R., the world produced 640 million tons of grains (wheat, rice and maize etc.), 37 million tons of sugar, nearly 155 million tons of potatoes, 40 million tons of meat, about 30 million bales of cotton and one million ton of wool in 1952. Among farm products, milk ranks first in value followed by meat and high calorie foods such as cereals and sugar. In regard to farm machinery, the use of tractors has doubled since the end of the war and in 1952, there were 6.3 million tractors in use. Agricultural production has to be stepped up to provide an additional plate of food for every five plates now provided by 1957. In order, to improve the sub-normal nutritional levels of Asiatic countries, a seventh plate will be necessary. (FAO review)

**All Synthetic Diet:** A major step forward towards the development of the long fictionalised synthetic food, which will provide an entire nourishing meal in one pill or capsule, has been made in the United States. Four biochemists of the U. S. National Cancer Institute Laboratory reported their development of an all synthetic, complete diet. Tested on rats, they showed greedy enthusiasm for the food and flourished on it. Even though, no chewing was needed for the synthetic food, the rats developed fine, healthy teeth. The diet was developed as an emergency measure to assist doctors faced with the problems of feeding premature infants. The synthetic food is made up of powdered amino acids, organically bound phosphate, crystalline vitamins, glucose and salts. About forty ingredients go into the final product, which is a white powder that is completely soluble in water. The food is given in liquid form. Essential fats and fat soluble vitamins are supplied as a separate liquid. Male rats on this diet proved fertile and female rats bore and suckled their young as competently as sister rats who ate conventional foods. The results indicate, that the new synthetic diet may be an important step towards the development of hearty sustaining meals in convenient capsule form. (A H S)

**Cashew Shell Oil Uses:** (Farmer, May 1956). In recent years close attention has been directed to the production of moulded clutch and brake facings, consisting essentially of asbestos fibres and various fillers. These are bonded under heat and pressure with a powdered thermo-setting resin. Modifications of this process has comprised in the use of binder resin in the form of a solution and the extension of the resultant mixture. The most successful of these dusts have been based on resins produced from cashew shell oil. It is a corrosive poison similar to

carbolic acid and is used in a variety of processes, including the manufacture of insulating materials, plastics, varnishes and insecticides. Friction dust for brake and clutch facings are usually obtained by grinding the fully cured product of cashew shell oil polymer with an aldehyde. Marked increase in performance particularly in reducing wear at higher temperature is obtained when 5-15 per cent of cashew shell oil friction dust is included. Binder resins of both solid and liquid types have been produced from the reaction of cashew shell oil phenol mixtures with formaldehyde and these give compositions which mould excellently and have high frictional values. They are now in wide use, although the manufacturers of facing materials are still reticent about them.

Cashew resins in solution are used for impregnating woven asbestos facings, and as binders in the wet mix process. In powder form, cashew resins are employed as binders and as friction dusts in the making of moulded brake facings and smooths out irregularity in friction coefficients. As the cashew shell oil resin is a naturally occurring phenolic body, it is particularly useful in termite attack. Vehicle manufacturers use cashew resin for protective coverings for metal components as well as for clutch and brake facings. Other miscellaneous applications are also being considered. These include wetting agents, antisludge agents for lubricating oils petroleum antioxidants, and non-bituminous coatings for underground structure exposed to corrosive soils. (S. V. R.)

**Atomic Preservation of Food:** (Indian Express): The remarkable benefits that atomic energy may give the world are in respect of food preservation. Potatoes may not sprout or rot for years; meat and milk may be preserved for weeks without refrigeration; bread, cheese, eggs, cooked and uncooked vegetables and fruits may remain fresh for months; all these are now possible with the help of atomic energy. Of the many uses of atomic energy, therefore, food preservation may prove the most beneficial. Its world wide results are expected to be as revolutionary as the discovery, 150 years ago that food could be preserved by heat. Food is sterilised and preserved by exposing it briefly to atomic radiation given off by waste materials from atomic reactors or by radio isotopes or by specially designed machines. One method is to place the food in cans, freeze it and then expose the cans to radio-active materials placed at the bottom of a deep water pool. Another is to place food wrapped in cellophane on a conveyor belt that travels under a stream of atomic rays manufactured by an electron generator. Several different methods are being explored, each has its advantages for sterilising certain types of food.

The preservation of food by atomic radiation is not very different from preservation by heat. Both destroy bacteria and halt chemical changes that cause deterioration. Atomic preservation, however has some striking advantages. Heat sterilisation involves the use of high temperatures for at least an hour which alters the texture, taste and often the nutritive value of the food. Atomic sterilisation is a cold process completed in less than a minute, and does not alter the texture, taste or the nutritive value of the food. When perfected, atomic preservation will increase by at least tenfold the length of time that foods can be safely stored without refrigeration. Tests have been conducted both on animals and man and the tests have been highly successful and promising, and have further shown that the foods maintain their full nutritive value. Many of the foods did not change colour, taste or odour, though a few were made less pleasing; it is expected to correct these difficulties. Atomic preservation will certainly benefit the world by saving millions of tons of food a year now lost by spoilage. It will reduce the need for fast transportation and refrigeration, thus permitting shipment of food to longer distances at lower cost. More food at lower cost, equally distributed throughout all nations is possible. (A. H. S.)

## Students' Corner

**Tour of the second year Students:** On the completion of the first terminal Examination, the students of the second year class proceeded on a short tour. The spirit and joy knew no bounds when they left the College Hostel on the 15th of September in two batches under the leadership of their lecturers. The wandering lust and the longing to learn outside the class rooms made every one of them eager and enthusiastic. The palm-fringed West Coast appealed to them and their visit to Mangalore, Pattambi, Taliparamba etc. gave them ample opportunity to learn a great deal about the cultivation of "dollar earning" crops as well as about the people and their way of living. They returned back to the College after a week's ramble, refreshed both in mind and body.

**Meetings etc.:** A General Body meeting of the students was held on 4th September with Dr. A. Mariakulandai, Vice President Students club in the chair. After briefly narrating the various activities of the club, the office bearers were introduced to the freshmen. After completing the business the meeting terminated with the vote of thanks by the acting Club Secretary Sri V. Rajaguru.

**Sri R. R. Panjes' Address:** Sri R. R. Panje, Sugarcane Botanist, Sugarcane Breeding Institute delivered an address under the auspices of the Students' Club on 6th October 1956. The topic was on his "Impression of Africa and some South East Asian Countries" and was illustrated with colour photographs and transparencies. Being an accomplished photographer himself, his illustrated lecture virtually transported the audience, to the banks of the Nile, to the pyramids of Egypt, to the dark thick jungles of Africa and to the temples of Thailand to behold the famous 150 foot long Buddha in repose. The speaker was introduced to the gathering by Dr. A. Mariakulandai, Vice-President of the Club who also took the chair.

Sri V. Rajaguru proposed the vote of thanks.

**Debate in Tamil:** Under the auspices of the Club a debate in tamil was held on the 19th October 1956. The proposition was "Construction for destruction". There were several participants among whom Sri C. Gopal was adjudged as the best speaker. Sri Velu and Sri T. S. Theetharappan were ranked second and third respectively. Sri C. Balasubramaniam, Sri Anandapadmanaban, and Sri Thandavarayan acted as judges. Sri G. Ramanathan proposed the vote of thanks.

**Wild Life Week:** A meeting was held on 8th October to celebrate the wild life week in the Freeman Hall, when Sri K. A. Boja Shetti, Conservator of Forests delivered an address. Sri Basheer Mohamad, Government Entomologist, presided over the function. The learned lecturer in the course of his address said that the valuable wild life is gradually becoming extinct on account of the changing conditions in the country, the encroachment of forest lands for agricultural purposes, cutting of forests for laying roads etc. At the close of his speech, the learned lecturer emphasised that wild animals should be given more protection and conserved. The meeting concluded with the proposal of a vote of thanks by the Secretary Sri V. Rajaguru.

**Intercollegiate Debate:** An Intercollegiate debate on the subject "Egypt is within her rights to take over Suez Canal and running it" was conducted by the Rotary club in the Mill Owners' Association Building. Sri S. Lakshminarayan and Sri G. Ramanathan represented our College.

In the Madras University debate conducted at the P. S. G. College of Technology Sri G. Ramanathan and Sri R. Krishnamurthy represented the college. The subject for the debate was "English should continue as the medium of instruction".

In an essay competition conducted by the local branch of the S. P. C. A. Sri U. S. Sriramulu won the first prize. This was organised in connection with the 3rd animal show.

A debate in all Regional languages, Viz. Tamil, Malayalam, and Kannadam was conducted in order to select a team of two to represent our college in the Madras University Debate. The subject for the debate was "English should continue as the medium of instruction". Sri A. H. Subramania Sarma presided over the function.

The President in his concluding remarks said that over 50% of the scientific journals of the world are published in the English language and added that a scientist has to know the English language if he has to contribute anything to the good of mankind.

The meeting came to an end with the vote of thanks by the Debating Society Secretary, Sri C. Gopal.

**Inter Collegiate Drama:** The drama "Sahati" was enacted in the Inter-collegiate Drama competition conducted at the P. S. G. College of Technology on 9th November. Our College knocked off two coveted prizes in the intercollegiate drama. Among all the actors of the six Colleges who have participated in the drama, Mr. S. Sunderesan of the Second year class was awarded a cup for his performance as the best main actor and Mr. G. Ramanathan was adjudged as the best supporting actor for his performance as 'Greto' a friend of Sanatis and a cup was awarded to him. Sri Thangavelu, the Dramatic Society Secretary was congratulated by one and all on the success which was in no small measure due to his untiring efforts. (G. RAMANATHAN)

## ERRATA

Vol. XLIII No. 10

- Page 531 In the last sentence in the Paragraph following the Table 90% for 9%.
- Page 521 In the last sentence of the Page, the words "C. C." to be omitted  
Read: No. 8, 1954 for No. 8, 194
- Page 515 line 9 from the bottom  
Read: Resin, Hard water — Resin, Soft water

**Departmental Notifications**  
**Gazetted Officers—Postings and Transfers.**

| Name and present post                                                         | Posted as                                                    |
|-------------------------------------------------------------------------------|--------------------------------------------------------------|
| Sambandam, R., Asst. Cotton Specialist., Tirupur.                             | Gazetted Asst. to Cotton Certification Officer, Rajapalayam. |
| Krishnan, C. S., Gazetted Asst. to Cotton Certification Officer, Rajapalayam. | Reverted.                                                    |
| Murthy, P. A., Agrl. Eng. Supervisor, CBE.                                    | Asst. Agrl. Engineer (Soil Cons. Scheme) Coonoor.            |
| Sanjeeva Shetty, K. P., Asst. Agrl. Engineer, (Soil Cons. Scheme) Coonoor.    | Asst. Agrl. Engineer, Kodaikanal.                            |
| Nagaraja Rao, K. R., Asst. Lect. in Entomology,                               | Asst. Entomologist, Coimbatore.                              |

**Upper Subordinates.**

| Name and present post                                                 | Posted as                                              |
|-----------------------------------------------------------------------|--------------------------------------------------------|
| Damodara Prabhu, M. (On leave)                                        | Asst. Lect. in Agriculture, CBE.                       |
| Ganapathy, T. Instructor, Agrl. Exten. Training Centre, Bhavanisagar. | A. D. Ariyalur.                                        |
| Jayaraj, M. V., A. D. Sivaganga                                       | F. M. State Seed Farm, Sivakasi.                       |
| Narayana, K. M., (On leave)                                           | F. M. State Seed Farm, Anayampatty and Ethapur.        |
| Parthasarathy, K., Pongalur.                                          | Asst. in Chemistry, Coimbatore.                        |
| Ramachandara Marar, P., A. D. Ariyalur.                               | Instructor, Agrl. Exten. Trading Centre, Bhavanisagar. |
| Radhakrishna Reddy, A., A. D. Vegetables, Madras.                     | P. A. to D. A. O. Guindy.                              |
| Ramanathan, R., F. M. Central Farm, CBE.                              | A. D. Vegetables, Madras.                              |
| Rangaswami, N. V., G. T. Madras.                                      | A. D. Cheyyur.                                         |

**DISTRICTS**

S. ARCOT, COIMBATORE  
MALABAR, S KANARA  
RAMANATHAPURAM  
TIRUNELVELI  
NORTH ARCOT



**CROPS**

COTTON, GINGELLY  
GROUNDNUT  
COCONUT  
ARECANUT  
TOBACCO

**Review of Market Conditions of Commercial Crops  
in the areas of Market Committees for the  
Month of September 1956**

**I Cotton:** (In this section: candy=784 lb.; pothi=280 lb.)

**Cotton Stocks: Tirupur: Lint:** The market had an opening balance of 6862 candies of Cambodia lint and 1554 candies of Karunganni lint. Arrivals totalled 5651 candies of Cambodia and 132 candies of Karunganni lint including that from ginneries. Despatches in the month accounted for 3805 candies of Cambodia and 648 candies of Karunganni lint which include 553 candies of lint sent to Tirunelvely, Orissa and T. C. State, leaving a closing stock of 8708 candies of Cambodia and 1038 candies of Karunganni lint at the end of the month.

**Kapas:** The kapas market opened with a stock of 12,593 pothis of Cambodia and 408 pothis of Karunganni kapas. Arrivals in the month amounted to 15,824 pothis of Cambodia and 1763 pothis of Karunganni kapas into this market, which include 4241 pothis of kapas received from Salem, Madurai, Villupuram, Tiruchirapalli and Tanjore. Disposals during the month amounted to 20,599 pothis of Cambodia and 1684 pothis of Karunganni kapas leaving a closing stock of 7818 pothis of Cambodia and 487 pothis of Karunganni kapas at the close of the month.

**Koilpatti: Lint:** The opening stock was poor at 73 candies of Karunganni lint. Arrivals amounted to 375 candies of lint from the surroundings areas of which 398 candies of Karunganni lint were disposed leaving a closing stock of 50 candies of lint at the end of the month. The Uganda market opened with a stock of 250 candies and 200 candies were received. A quantity of 350 candies were moved to Ramnad district for pressing, leaving a closing stock of 100 candies at the end of the month.

## Weather Review — For October, 1956

## RAINFALL DATA (IN INCHES)

| Division   | Station                | Total rainfall for the month | Departure from normal | Total since 1st January | Division   | Station        | Total rainfall for the month | Departure from normal | Total since 1st January |
|------------|------------------------|------------------------------|-----------------------|-------------------------|------------|----------------|------------------------------|-----------------------|-------------------------|
| North      | Madras (Meenam-bakkam) | 6.1                          | - 5.9                 | 34.0                    | South      | Madurai        | 16.4                         | + 9.0                 | 34.6                    |
|            | Tirur-kuppam*          | 6.3                          | - 1.9                 | 32.7                    |            | Pamban         | 3.8                          | - 4.7                 | 6.1                     |
|            | Vellore                | 7.1                          | + 0.3                 | 34.5                    |            | Koilpatti*     | 11.5                         | + 5.8                 | 22.5                    |
|            | Gudiyatham*            | 8.2                          | + 2.1                 | 30.8                    |            | Palayam-cottai | 3.9                          | - 3.2                 | 10.8                    |
|            |                        |                              |                       |                         |            | Amba-samudram* | 1.5                          | - 4.3                 | 9.6                     |
| East Coast | Palur*                 | 10.8                         | + 2.6                 | 37.7                    | West Coast | Trivandrum*    | 5.6                          | - 5.1                 | 41.4                    |
|            | Tindivanam*            | 8.2                          | - 1.7                 | 33.0                    |            | Fort Cochin    | 19.9                         | + 6.5                 | 121.8                   |
|            | Cuddalore              | 11.8                         | + 0.3                 | 32.5                    |            | Pattambi*      | 11.0                         | + 1.8                 | 82.9                    |
|            | Naga-pattinam          | 7.4                          | - 3.2                 | 21.6                    |            | Kozhikode      | 16.8                         | + 5.7                 | 121.7                   |
|            | Aduthurai*             | 6.4                          | - 0.5                 | 31.2                    |            | Taliparamba*   | 8.9                          | + 0.1                 | 131.5                   |
| Central    | Pattukottai*           | 6.6                          | + 0.5                 | 28.2                    |            | Wynaad*        | 10.6                         | + 1.2                 | 75.5                    |
|            |                        |                              |                       |                         |            | Nileshwar*     | £                            |                       |                         |
|            |                        |                              |                       |                         |            | Pilicode*      | £                            |                       |                         |
|            | Salem                  | 14.3                         | + 7.9                 | 36.5                    |            | Mangalore      | 9.9                          | + 2.7                 | 140.0                   |
|            | Coimbatore (A.M.O.)*   | 4.9                          | + 0.8                 | 14.2                    | Hills      | Kankanady*     | 10.6                         | + 3.7                 | 143.5                   |
|            | Coimbatore             | 3.7                          | + 2.6                 | 12.9                    |            | Kotekar*       | 11.2                         | + 4.6                 | @                       |
|            | Tiruchirappalli        | 12.3                         | + 6.0                 | 27.9                    |            | Kodaikanal     | 13.5                         | + 3.3                 | 43.0                    |
|            |                        |                              |                       |                         |            | Coonoor*       | 13.2                         | + 5.3                 | 32.1                    |
|            |                        |                              |                       |                         |            | Ootacamund*    | 15.7                         | + 6.5                 | 39.2                    |
|            |                        |                              |                       |                         |            | Nanjanad*      | 10.9                         | + 2.3                 | 43.2                    |

- Note:— 1. \* Meteorological Stations of the Madras Agric. Dept.  
 2. @ = It is a new station. The rain gauge was installed in March 1956.  
 3. £ Data are not received.

In the first three days of the month rains were fairly widespread in Tamilnad and in the West Coast. On 4-10-1956 the monsoon became active in the South East Arabian Sea and strengthened further the next day over the Laccadives and also over the South Bay of Bengal. Rainfall on these two days were fairly widespread in the West Coast and somewhat localised in Tamilnad. For six days from 6-10-1956 rainfall was fairly widespread in the West Coast and slightly localised in Tamilnad. The monsoon became active over the Comorin area on 11-10-1956. For two days from 12-10-1956 Tamilnad had localised showers while the West Coast had dry weather. But on 13-10-1956 conditions became favourable for the setting in of the North-east Monsoon over the east coast of the Peninsula and Tamilnad. On 14-10-1956 rainfall was widespread in Malabar and South Kanara while it was localised in Travancore-Cochin and at a few places in Tamilnad. For two days from 15-10-1956 rainfall was localised in the entire region. On 17-10-1956 the monsoon withdrew from north Hyderabad with the result that the weather was mainly dry with the exception of a few highly localised showers in Tamilnad. The South-west Monsoon withdrew from the country outside North-east India and the south Peninsula on 18-10-1956, while the conditions became favourable on the same day for the setting in of the North-east Monsoon along the east coast of the Peninsula. Only localised showers were received on 18-10-1956 and on the next day as well in Tamilnad and Malabar and South-Kanara while the weather elsewhere was mainly dry. The South-west monsoon withdrew from north Tamilnad on 20-10-1956, on which day thunder-showers were widespread in south Tamilnad and Malabar and South Kanara and fairly widespread in Travancore-Cochin and scattered in North Tamilnad. On 21-10-1956 the monsoon withdrew from

Malabar and South Kanara, as a result of which only Travancore-Cochin had fairly widespread rains while south Tamilnad had only localised showers. On 22-10-1956 only a few places in Travancore-Cochin had some showers while the weather was mainly dry elsewhere. The weather over the entire region was mainly dry on 23-10-1956, as the South-west monsoon withdrew completely from the region. For two days from 24-10-1956 showers were scattered at a few places in Tamilnad, while the rest of the region had only dry weather. On 26-10-1956 the North-east monsoon became active along the coastal Tamilnad, as a result of which showers were localised in Tamilnad and scattered in Travancore-Cochin while Malabar and South Kanara had only dry weather. The North-east monsoon extended into the interior districts of Tamilnad on 27-10-1956 and the rainfall was fairly widespread throughout. Rather a severe cyclonic storm formed in the South-west and adjoining south-east Bay of Bengal on 28-10-1956 and under its influence thunder showers were widespread in Malabar and South Kanara and localised in Tamilnad and elsewhere. It developed a small core of hurricane winds at 08-30 hours I. S. T. on 29-10-1956, about 200 miles South-east of Masulipatam and under its influence rains were widespread in Travancore-Cochin and localised in other places. In the subsequent two days this depression weakened and there were no large changes in the weather conditions.

Considering the month as a whole for Tamilnad, Salem, Tiruchirappalli, Mathurai, Nilgiris and to some extent North Arcot and Coimbatore districts had fairly good rains. Conditions did not improve in Ramanathapuram district.

The noteworthy rainfall and the zonal rainfall in inches are furnished below:—

| Noteworthy Rainfalls |                     |                     | Zonal Rainfall |                        |                       |                   |
|----------------------|---------------------|---------------------|----------------|------------------------|-----------------------|-------------------|
| Date                 | Place               | Rain-fall in inches | Name of Zone   | Rainfall for the month | Departure from normal | Remarks           |
| 4/10/56              | Punalur             | 4.0                 | North          | 6.9                    | - 1.4                 | Below normal      |
| 5/10/56 & 15/10/56   | Alleppey (Each day) | 4.0                 | East Coast     | 8.5                    | - 0.3                 | Just below normal |
| 12/10/56             | Kallakurichi        | 4.0                 | Central        | 8.8                    | + 4.3                 | Above normal      |
| 18/10/56             | Tiruchirappalli     | 4.0                 | South          | 7.4                    | + 0.5                 | Just above normal |
| 26/10/56             | Cuddalore           | 4.0                 | West Coast     | 11.6                   | + 2.4                 | Above normal      |
| 29/10/56             | Kozhikode           | 5.0                 | Hills          | 13.3                   | + 4.4                 | do                |

Note: \* Data from nine stations only are considered.

Agricultural Meteorology Section,  
 Lawley Road P. O.,  
 Coimbatore, 15-11-1956

C. B. M. & M. V. J.

578

*The Madras Agricultural Journal*

**Kapas:** There was no stock of Karunganni kapas here at the beginning of this month. The Uganda kapas market opened with a stock of 2500 pothis and 3000 pothis were received. Disposals totalled 4000 pothis leaving a closing stock of 1500 pothis at the end of the month.

In spite of the very low price offered by the mills as a result of the enhancement of excise duties announced by the Government of India, the prices continued to maintain a steady tone owing to limited stocks and also due to the reluctance of the producers to part with their produce.

**Ramanathapuram: Lint:** The three markets of this district Virudhunagar, Rajapalayam and Sathur opened with a stock of 1364 candies. Arrivals amounted to 2715 candies of lint while disposals accounted for 1370 candies leaving a closing stock of 2710 candies of lint.

**Kapas:** The kapas market in all these three places had an opening stock of 1950 pothis and 24300 pothis were received. Disposals amounted to 19800 pothis leaving a closing stock of 6450 pothis.

The trading in both lint and kapas in these markets was dull during the month on account of restricted arrivals. The harvests of Uganda cotton in Srivilliputhur area were restricted due to inclement weather.

**South Arcot: Kapas:** This market started with a stock of 9 pothis during the month. A quantity of 824 pothis was received during the month of which 783 pothis were despatched to Tirupur. The market closed with a stock of 50 pothis.

**Prices: Tirupur: Lint:** The market continued to be active during the month and the prices maintained a steady tone with quotations ranging from Rs. 920—970 per candy.

**Kapas:** The prices of Cambodia and Karunganni kapas were quoted at Rs. 131—135 and Rs. 111—121 respectively per pothi during the month.

**Koilpatti Lint:** The prices of Karunganni lint remained more or less steady during the month. The Market opened at Rs. 875—886 for the best quality and gradually advanced to Rs. 880—890 in the second week of the month. The prices remained steady for the rest of the month.

Uganda lint continued to be firm at Rs. 1025 for uncertified quality and at Rs. 1126 for the certified quality.

**Kapas:** The price of Uganda kapas remained steady at Rs. 130 to 140 per pothi of 280 lb. No transaction in Karunganni kapas took place during the month.

**Ramanathapuram: Lint:** The prices per candy for different varieties of lint at Viruthunagar Market were as follows:

|                           | Opening     | Closing   |
|---------------------------|-------------|-----------|
| Karunganni                | ... 860/865 | 950       |
| Tinny Karunganni          | ... ..      | ...       |
| Tinny                     | ... 770/820 | 777/830   |
| M. U. 2. Uganda Certified | ... ..      | 1152      |
| M. U. 1. "                | ... 1101    | 1052/1086 |
| Uncertified Uganda        | ... 1006    | 986       |

**Kapas:** The prices per pothi at Viruthunagar market are furnished below:

|            | Opening         | Closing     |
|------------|-----------------|-------------|
| Karunganni | ... 112½ - 117½ | 112½ - 113½ |
| Tinny "    | ... 91½ - 107½  | 91½ - 110½  |
| Tinny      | ... 77½ - 90½   | 83½ - 90    |
| Uganda     | ... 112½ - 235½ | 116½ - 136½ |
| Cambodia   | ... 75 - 109    | 75 - 115    |

There was a slight decline in the prices of kapas in general as a result of the inferior varieties of cotton moving into the market.

**South Arcot: Kapas:** The price of kapas in this district ranged higher during the month compared to the previous month and also to the corresponding month of previous year. The average prices ranged between Rs. 109/6 to Rs. 110/2 per pothi.

## II. Groundnuts: (In this section: Candy = 531 lb. Bag = 80 lb.)

**South Arcot District: Stocks:** All the markets of South Arcot District opened with a stock of 2891 tons of kernels at the beginning of the month. Local arrivals amounted to 3612 tons and a quantity of 2090 tons was received from Coimbatore and Tiruchirapalli districts. Imports from Andhra State came to 372 tons. Consumption by power mills and country chekkus amounted to 4666 tons and 231 tons respectively. A quantity of 547 tons was moved to Madras, Tanjore, North Arcot, Chinglepet, Tiruchirapalli, Salem, Madurai and Ramnad while 18 tons were despatched to Pondichery and Andhra States. Wastage amounted to 589 tons. There was a closing stock of 2914 tons at the end of the month in this district.

With the conclusion of the harvest of summer crop, arrivals went down appreciably.

*Prices:* Larger arrivals of kernels and oil from other districts and low prices prevailing in Pollachi market had its repercussions in the markets of South Arcot district. The average prices for kernels ranged from Rs. 166/13 to 140/2 per candy in all the markets of the district.

*North Arcot: Stocks:* The market of this district had an opening stock of 818 tons of pods and 750 tons of kernels. Arrivals during the month amounted to 40 tons of pods and 98 tons of kernels while the off-take was 743 tons of pods and 693 tons of kernels leaving a closing stock of 105 tons of pods and 155 tons of kernels at the end of the month.

There has been an unsteady tone in the market of this district consequent on the reluctance of the big merchants and mill owners to trade in ground nut in the absence of any export quota and awaiting new winter crop arrivals. Imposition of additional cess also has caused the merchants to leave their transactions to the petty crushers.

*Prices:* The Prices of groundnut kernels as well as oils ruled steady during the first 2 or 3 weeks in the month. During the second fortnight the prices showed slight decline. The prices of kernels ranged at Rs. 143 to Rs. 170 per candy as against Rs. 95 to 105 that prevailed during the corresponding period of last year. The prices may change on receipts of new crop of groundnut.

*Ramanathapuram District: Stocks:* The market at Viruthunagar started with a stock of 500 tons of groundnut kernels at the commencement of the month. Arrivals amounted to 4100 tons during the month while 4600 tons of kernels were disposed off, leaving no stock.

The arrivals are largely from Pollachi area where the new crop season has commenced and crushing also is in progress in sizeable quantities.

*Prices:* The opening and closing prices of groundnut kernels during the month in this district are extracted below:

|                   | Opening | Closing |
|-------------------|---------|---------|
| Groundnut kernels | 160/165 | 158/160 |

### III. Gingelly: (In this section bag=168 lb.)

*South Arcot district: Stocks:* With the harvest of gingelly in progress arrivals improved considerably in Vridhachalam market. The market had an opening balance of 202 bags of Gingelly and arrivals totalled 3100 bags. Consumption by rotaries and chekkus amounted to 20 bags and 1054 bags respectively. Despatches during the month amounted to 1450 bags mostly to Tanjore, Tiruchirapalli and Ramnad districts leaving a closing stock of 778 bags at the end of the month.

*Prices:* The price of gingelly declined mildly in sympathy with the fall in the prices of groundnut seeds and oil coupled with the increased arrivals. The average prices in the several markets ranged from 65 — 71/8 per bag.

### IV. Coconuts and its products: (In this section: candy=700 lbs.)

*Coconut Stocks:* Manufacturing of copra was scarce and arrivals of coconut continued to be heavy due to the prevalence of monsoonic conditions in Malabar markets. In South Kanara, the coconut transactions continued to be weak throughout the period, with good stocks in the market. The arrivals and transactions in the market of Malabar and South Kanara districts are extracted below: (in 1000 nuts).

| Centres                 | Opening Stock | Arrivals | Despatches | Closing Stock |
|-------------------------|---------------|----------|------------|---------------|
| <i>Malabar:</i>         |               |          |            |               |
| Kozhikode               | 7109          | 3400     | 3300       | 7209          |
| Badagara                | 192           | 5500     | 4705       | 1687          |
| Ponnani                 | 330           | 675      | 685        | 320           |
| Tellicherry & Dharmadam | 449           | 1009     | 997        | 511           |
| <i>South Kanara:</i>    |               |          |            |               |
| Mangalore               | 60            | 175      | 175        | 60            |

*Prices:* The prices of Coconuts in the above markets are quoted below:

| <i>Malabar:</i> (Prices per 1000 husked nuts) | Maximum | Minimum |
|-----------------------------------------------|---------|---------|
| Kozhikode                                     | 115     | 102     |
| Ponnani                                       | 128     | 115     |
| Badagara                                      | 136     | 80      |
| Tellicherry & Dharmadam                       | 98      | 90      |
| <i>South Kanara District</i> (per 1000 nuts)  |         |         |
| Mangalore—Dry                                 | 180     | 135     |
| Raw                                           | 140     | 145     |

*Copra: Stocks:* The arrivals of copra were poor during the month due to unfavorable weather for copra making. The transactions in the markets of Malabar and South Kanara Districts are detailed below:

| Markets                             | Opening Stock | Arrivals | Disposals | Closing Stock |
|-------------------------------------|---------------|----------|-----------|---------------|
| <i>Malabar District: (in candy)</i> |               |          |           |               |
| Kozhikode                           | 4123          | 5600     | 5750      | 4573          |
| Badagara                            | 995           | 1900     | 1795      | 1100          |
| <i>South Kanara: (in tons)</i>      |               |          |           |               |
| Mangalore                           | 107           | 425      | 425       | 107           |

*Prices:* The prices of copra per candy in Malabar District were as follows: (in Rs.)

| Variety | Kozhikode |          | Badagara |          |
|---------|-----------|----------|----------|----------|
|         | Maximum.  | Minimum. | Maximum. | Minimum. |
| Office  | 295       | 290      | 315      | 300      |
| Edible  | 312       | 310      | No Stock |          |
| Madras  | 305       | 302      | 325      | 318      |
| Rajapur | 335       | 330      | 345      | 320      |

The prices of copra in Mangalore market ranged between Rs. 300 to 325/-

#### V. Arecanuts: (in this section Bag=100 lbs.)

*Stocks:* The arrivals and transactions of arecanut in Malabar and South Kanara Districts are extracted below:

|                               | Opening Stock | Arrivals | Disposals | Closing Stock |
|-------------------------------|---------------|----------|-----------|---------------|
| <i>Malabar District:</i>      |               |          |           |               |
| Kozhikode (in bags)           | 816           | 5447     | 4003      | 2260          |
| <i>South Kanara District:</i> |               |          |           |               |
| Mangalore (in cwt.)           | 5412          | 9200     | 9200      | 5412          |

*Prices:* There was a slight fall in the price in the beginning of the month which remained steady during the latter part of the month in South Kanara District. Prices showed an upward trend in Malabar District.

The prices of arecanuts in the markets of Malabar and South Kanara Districts are extracted below:

|                                          | Maximum.<br>in Rs. | Minimum.<br>in Rs. |
|------------------------------------------|--------------------|--------------------|
| <i>Malabar District:</i>                 |                    |                    |
| Kozhikode (per bag)                      | 200                | 185                |
| <i>South Kanara District: (per cwt.)</i> |                    |                    |
| Koka                                     | 125                | 95                 |
| Choll                                    | 189                | 165                |
| Malabar Supari                           | No Stock           | —                  |
| Mangalore Supari                         | do.                | —                  |

#### VI. Tobacco: (In this section Candy=500 lbs.)

*Stocks:* (Coimbatore) The Tirupur market started with an opening stock of 23,340 candies of chewing and 2200 candies of cheroot tobacco at the commencement of the month. About 6050 candies of chewing and 1880 candies of cheroot tobacco were despatched during the month to places in Palghat, Illupur, Elayangudi, Pandukudi, Alleppy, Trichur, Malabar, Tiruchirappalli, Tanjore, Salem, Dindigul, Pudukottai, Chinglepet, Madras, Mysore and Andhra. About 25 candies of chewing tobacco from Madura and 50 candies of beedi tobacco are reported to have been obtained in the district. At the end of the month there was a closing stock of 20,055 candies of chewing and 1180 candies of cheroot tobacco.

*Prices:* The prices of different varieties of Tobacco per candy in Tirupur market are given below. A general decline in the prices was noticed due to lack of demand.

| Variety                                       | I Grade<br>Rs. | II Grade<br>Rs. | III Grade<br>Rs. |
|-----------------------------------------------|----------------|-----------------|------------------|
| 1. Chewing tobacco—Sun cured.                 |                |                 |                  |
| a. Meenampalayam                              | 300 — 400      | 200 — 300       | 100 — 180        |
| b. Other varieties                            | 200 — 250      | 115 — 160       | 70 — 90          |
| 2. Cheroot varieties:                         |                |                 |                  |
| Sun cured (grown in Erode and Bhavani)        | 210 — 310      | 155 — 205       | 100 — 145        |
| 3. Chewing varieties:                         |                |                 |                  |
| Pit cured (grown in Palladam and Sular areas) | 250 — 340      | 125 — 200       | 90 — 125         |

### Review of the administrative activities of the Market Committees for September 1956

**General :** All the Market Committees continued to function under Section 6 (A) of the Madras Commercial Crops Markets Act except Coimbatore Market Committee and Malabar Market Committee which are functioning under an elected body. The stalemate caused in the Market Committees of Tirunelveli and Ramanathapuram still continues awaiting the judgment of the Supreme Court.

The following is the progress made in the issue of licences by the Market Committees in the State :

|                                    | Section 5 (1) |      | Section 5 (3) |      | Weighmen |      |
|------------------------------------|---------------|------|---------------|------|----------|------|
|                                    | A             | B    | A             | B    | A        | B    |
| North Arcot Market Committee       | 129           | 1188 | 44            | 685  | 36       | 421  |
| South Arcot Market Committee       | 166           | 1892 | 134           | 1597 | 119      | 1472 |
| Coimbatore Market Committee        | 47            | 841  | 49            | 892  | 23       | 596  |
| Tirunelveli Market Committee       | Nil           | 13   | Nil           | 16   | Nil      | 7    |
| Ramanathapuram<br>Market Committee | Nil           | 29   | Nil           | 28   | Nil      | 5    |
| South Kanara Market Committee      | 35            | 181  | 7             | 69   | —        | 57   |
| Malabar Market Committee           | 33            | 399  | 105           | 1498 | 49       | 367  |

A : During the month.

B : Upto end of the month from January 1956.

**Meetings :** A Meeting of the Malabar Market Committee was held on 29-9-56. The Committee decided to celebrate the Regulated Markets Service Week at Kozhikode and Thalakkadathur for 4 days in February 1957. The Committee also decided to investigate the possibilities of opening of Regulated Markets at Changaramkulam and Parapuzha in Ponnani Taluk.

**Quality Appraisal :** The South Arcot Market Committee continued its work on the quality analysis of Groundnut kernels marketed in that district. During the month 127 samples were drawn and analysed from out of 2577 lots comprised of 15,362 bags of kernels. Total common refraction was below 4% in 99 samples, 5 to 8% in 28 samples and above 8% in no samples. All the samples at Vridhachalam contained moisture below 4% while most of the samples at Cuddalore and Panruti contained moisture between 6 and 10% respectively. Thus the crop marketed at Cuddalore was bad and that marketed at Panruti worse during the month.

**Quality Competition :** The South Arcot Market Committee secured 203 entries during the month for the summer crop quality competition.

**General:** The Regulated Markets Service Week was celebrated at Villupuram from 10th to 15th September 1956. An exhibition depicting the activities of the regulated market was put up at the Villupuram Market Yard on the occasion. A meeting was convened on every day when lectures on various marketing aspects were delivered. On the last day the Director of Agriculture awarded prizes to the winners in the quality competition.



The inauguration of the Regulated Market at Arni by the Hon'ble Minister for Revenue Sri M. A. Manickavelu.

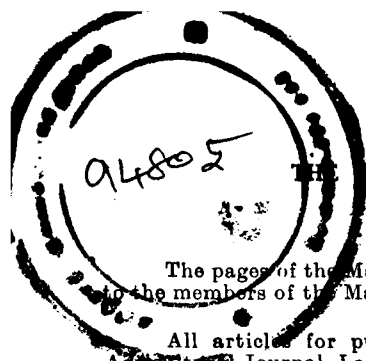
### North Arcot Market Committee

Two new Regulated Markets were opened during October 1956 in the North Arcot district, the first at Arni and the second at Arcot. The first at Arni was inaugurated on the 2nd October by the Revenue Minister Sri. M. A. Manickavelu, B. A. B. L. in a delightful function which was largely attended. The Hon'ble Minister in the course of his address stressed on the useful role of the Regulated Markets and emphasised that these markets are for the mutual benefit of both growers and traders. He exhorted them therefore, to make full use of the markets opened by the North Arcot Market Committee.

The Regulated Market at Arcot was inaugurated on 8th October, 1956, in another pleasant function by the Hon'ble Minister for Agriculture, Sri. M. Bhakthavatsalam, B. A. B. L. A large gathering of officials, growers and traders was present. In his address, the Hon'ble Minister outlined the benefits conferred on growers and traders by the Regulated markets. He added that these markets helped the growers to get the best prices for their agricultural produce and if they do not get that, the growers would not, in many cases meet even their cost of cultivation and thereby they would loose interest in growing commercial crops. The Minister went on to say that the growers should be encouraged by the traders to get their due share which in turn meant that they would grow more and more for the benefit of both. In concluding, he wished the market all success and then declared the Regulated market open. The function was presided by Sri. S. Panchaksharam Chettiar, M. L. A., President of the District Congress Committee.



The inauguration of the Regulated Market at Arcot by the Hon'ble Minister for Agriculture Sri M. Bhakthavatsalam.



## THE MADRAS AGRICULTURAL JOURNAL

### Hints to Contributors

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In view of the high cost of printing, contributions should be as concise as possible and should conform to the best usage in the leading Journals published in India and abroad.

Manuscripts should be typed with double spacing on one side of the paper only and with wide margin. They should not ordinarily exceed 5,000 words or 12 pages of printed matter including tables and illustrations in the Journal. Manuscripts should be carefully revised; numerical data and calculation checked. Main headings in the text should be typed in capitals with paragraph indentations and followed by a period and two hyphens. Sub-heads should be lower case and be underlined to indicate italics. Latin nomenclature and local terms etc., should be in italics. Original papers must conclude with a summary of not more than 300 words, drawing attention to the main facts and conclusions.

**Tables:** The number of tables should be restricted to those absolutely necessary, as numerous tables detract from the readability of the article. Each table should be numbered consecutively from 1 up and must have a heading stating its contents clearly and concisely. The tables are to be typed on separate sheets with their positions marked in the text.

**Illustrations:** Wherever possible illustrations should be made with pen and Indian ink for reproduction as line blocks. The name of the author, title of the article and figure number should be written on the back of each figure in blacklead pencil. Each figure should have a legend typed on a separate sheet.

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**Line drawings:** Line drawings, and charts should be prepared in twice the scale desired in the printed form. All letterings, figure numbers and explanatory notes in graphs should be light face and large enough to be 1/16" high in the finished illustrations.

**Graphs:** Graphs should be drawn in Indian ink on co-ordinate paper ruled with blue lines. Any portion which is desired to appear in the reproduction should be drawn over with Indian ink.

**References:** References and reviews of literature should relate only to closely pertinent papers. The list of references should come at the end of the article, after the summary and should be arranged in alphabetical order of authors' names followed by the year of publication in brackets, and then the title of the paper, name of periodical, volume number in bold face type and then the page number, e. g. Darlington C. D., (1944) Heredity, development and infections *Nature*, 154; 164-9. Abbreviations for names of journals are to be in the approved form as given in the World List of Periodicals.

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