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Editorial

The Agrarian Reforms Committee: The Agrarian Reforms Committee appointed by the Congress to make recommendations for the reform of the Agricultural system in this country has before it an exceedingly difficult and delicate task to perform Representing as it does, the premier political organisation of the country the proposals formulated by the Committee after completing its enquiry will have potentialities of a far reaching character and therefore the responsibility of the Committee in the matter is very great. In the din of conflicting voices of rooted vested interests on the one hand and doctrinaire shibboleths on the other to sift the evidence before them without bias and formulate proposals in the larger interest of the country as a whole the members of the Committee will have to bring to bear on the questions before them a proper sense of perspective and a spirit of objective and detached disinterestedness which alone will make their recommendations acceptable. Fortunately, the present Committee is composed of very able and tried men who have no axe of their own to grind and who can be expected to do the right thing. We have no doubt that they will discharge their duties exceedingly well.

It is obvious that as the bulk of the population in India is dependent for its living either directly or indirectly on the Agricultural industry, all measures of reform should be judged by how far they are helpful in increasing the national wealth and improving the standard of life of the population as a whole irrespective of how particular groups are affected thereby. But the obvious is often missed and there is the danger of missing the wood for the trees when political passion clouds the vision.

During the last few decades a number of Committees and Commissions were set up to study the agrarian question and make recommendations for Agricultural improvements Notwithstanding the limitations imposed on them in the scope of their enquiry, the Famine Commissions of 1880, 1898, 1900, the Irrigation Commission of 1903, the Committee of Co-operation of 1915 and the Royal Commission of Agriculture of 1928 were undoubtedly responsible for initiating many reforms which have helped the progress of Indian Agriculture, by stabilising the industry and directing it in channels of increased

productivity. The series of legislative enactments which were placed on the statute from time to time have helped to infuse a sense of security among the cultivating classes and the value of land which was at a low level in pre-British days has increased at a tremendous pace.

The Royal Commission of Agriculture, left the thorny question of land tenures severely alone; nor did it engage itself on the question of Agricultural Taxation These two questions have in the recent times loomed large in the public eye, and are considered of utmost importance in the present context of agrarian reforms. We submit that these two questions, however important they may be in themselves, are but a part of the larger question of how best to increase the Agricultural production of the country as a whole and accordingly they should be viewed in that background. There is no doubt that certain measures of agrarian reform which were introduced by the British from time to time had for their objective the tiding over of immediate difficulties in times of stress and famine and therefore have now become obsolete and should be overhauled in the light of recent trends.

The time has come when the agricultural policy of the country should be directed, not merely towards the fulfillment of a self sufficiency programme in the matter of food production, but also towards increased production of raw materials needed for the growing industries of the country and for meeting our export obligations. Such a policy alone will be conducive to a balanced economy in the modern world. In order to attain this end the development of large scale farming is very essential. The causes that have mitigated against large scale farming so far have to be carefully looked into and steps taken to remedy this defect in our agricultural economy. The example of foreign joint stock companies who have been successful in raising coffee, tea and to some extent sugarcane on a profitable basis shows that if organised on sound lines, it is possible to develop agriculture as a profitable commercial enterprise.

As unlike other official committees that went before, the Congress Agrarian Reforms Committee is untrammelled by any restricted terms of reference to limit its activities it has a unique opportunity of going into all aspects of the problem before it, and formulate its proposals in the sole interest of the country without fear or favour

The Madras Agricultural Journal wishes the Committee all success in its high endeavour.

The Role of Millets in Increasing the Food Production in Madras

By

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Introduction. Millets are a group of small grained cereals which are found to thrive in areas of low rainfall. They are food crops which are complementary to paddy and between paddy and millets, the people and the cattle of this province are fed.

There are eight individual crops under the collective name of millets in Madras. They are, *Cholam, Cumbu, Ragi* and *Tenai* which are the more important millets and there are four more millets which are of lesser importance, that is *Varagu, Samai, Panivaragu* and *Kuthiravali.*

Area. In the Madras Presidency, the millets occupy a total area of 12·7 million acres. Out of this area 4·8 millions are occupied by *Cholam,* 2·6 millions by *Cumbu,* 1·8 by *Ragi* and 1·5 by *Korra.* The remaining 2 million acres are occupied by the 4 minor millets mentioned above.

Distribution. Millets are grown, mostly as dry crops, in practically all the districts of the province, except in the very high rainfall districts of Nilgiris, Malabar and South Kanara where they are not of much importance. The distribution of the various millets in the several districts of the province, presents certain interesting features. *Cholam* is an important crop in the Ceded Districts, Coimbatore, Guntur, Nellore, Madura, Salem, Tiruchirappalli and Kistna. *Cumbu* is an important crop in the districts of Coimbatore, Salem, Trichinopoly, Vizagapatam, Guntur, Tinnevelly and Anantapur. *Ragi* is important, in the districts of Salem, Vizagapatam, Coimbatore and Chittoor. *Tenai* or *Korra* is important in the Ceded Districts and Guntur The order of districts enumerated under each crop is in their descending order of their importance. It will be seen that each millet appears to prefer certain areas to others and there is a difference in the preference shown by the different millets with regard to their distribution in the presidency. These preferences are directly related to the distribution of the rainfall in the province. The rainfall varies from 20″ to 50″ excluding the three very heavy rainfall districts mentioned above Grouping the districts into three rainfall zones of (1) less than 30″ of annual rainfall, (2) between 30″ and 40″ of rainfall, and (3) between 40″ and 50″ and relating the same with the distribution of the the various millets, the following interesting features have been brought out: *Cholam* grows mostly in the lowest rainfall area, and its area comes

down steadily as the higher rainfall zone is reached. Within this range there are, of course, different physiological types of *Cholam* which make them fit to the environment in which they grow. The millet *Cumbu*, has a major area, in the second rainfall group i. e., 30" to 40" rainfall. It has sufficient adaptability to make it stand much less rain, and also much more rain. *Ragi* is somewhat like *Cumbu*. The millet *Tenai*, has a peculiar distribution. Nearly 85% of its area is in the lowest rainfall zone. The area comes down steeply, as the rainfall increases. As the third rainfall group is reached going upto 50" of rainfall, the millets in general become scarce.

Special features of Millets. Millets are dry crops, that is, crops mostly grown in dry lands. Ninety percent of *Cholam* area and 87% of *Cumbu* area, is rainfed. In the case of *Ragi* 47% of area is rainfed. Millets however, respond very well to manure and irrigation. Under good management, the irrigated yields of millets are 3 to 4 times those of dry lands. Millets grow even on the poorest soils.

The food value of millets is intermediate between wheat and rice. *Cumbu* is particularly good food, rich in protein and fat. The fodder of millets is superior to that of paddy The straw of *Cholam* is more valuable than the rest.

Millets are highly local in their behaviour. They are conservative and less cosmopolitan than the other crops. They are more susceptible to the conditions of the soil and climate. This increases the difficulty with regard to their improvement by breeding. A strain evolved, in a particular place has a possibility of only a limited spread. There are several local varieties of millets in each tract and sub-tract, which have adapted themselves to the environment. The variety of one tract does not suit another tract. It has therefore been found necessary to open regional stations to deal with each of these main tracts.

Methods of increasing Millet Production. It is well known that the quantity of millets and paddy produced in the province, is not sufficient to meet the requirements of the province, and large imports are being made to maintain sufficient supply. The population of our province is now in the neighbourhood of 50 millions. The food requirement of this population per annum is about 8·15 million tons. The food production in the province, for example in 1946—47, has been 4·40 million tons of rice and 2·56 million tons of millets making a total of 6·96 million tons. This leaves a deficit of 1·19 million tons which is about 12% of our total production. The deficit is not very much and appears to be within our power of making good. The well known methods of increasing the production of crops are (1) Extension of existing area, (2) Improved

cultivation including land development, (3) Manuring and irrigation, and (4) The use of improved strain seeds. With regard to the extension of the existing area though there are 11 million acres of cultivable waste land, it was seen that much of this land was marginal land, not quite fit for cultivation and unremunerative. The scope of increasing millet production by this method, deserves further examination. Improved cultivation, including land development, aids in producing larger crops and there are several schemes under the consideration of the Government. So is the case with regard to irrigation. The problem of manuring deserves special attention. Millets are mostly grown in dry lands. Though dry lands occupy 75% of the total cultivated area of the province, very little of dry land is manured This is due to lack of manure, as available manure is mostly diverted to irrigated and wet lands. The application of manure to dry lands that are situated in low rainfall areas, does not result in proportionate increased yield, because owing to lack of rainfall, the manure does not become wholly available to the plants. The problem of manuring dry lands deserves further study, and increasing the production from dry lands by intensive manuring is somewhat remote at the present stage.

A sure way of increasing the yields of crops in dry lands is by the use of seed of improved strains. They do not involve additional cost to the cultivator. Improved strains are improved machines, that are able to turn out more from the available material by greater efficiency in metabolism.

The study of millets is one of the latest additions to the plant breeding side of the agricultural science of the province. Cotton, sugarcane, paddy and other world crops have received attention from a very long time dating back to the previous century. The work on millets started in the year 1922. The millets are now being studied intensively. The knowledge obtained from these studies is being utilised in the evolution of high yielding strains

Achievements. During the course of study on millets it soon became evident that strains suitable to large areas in the province could not be evolved by working only at the Central Millet Station at Coimbatore. Work on a regional basis was therefore undertaken by strengthening the staff at the Regional Agricultural Research Stations, Anakapalle, Guntur, Nandyal, Hagari, Palur and Koilpatti by the addition of Staff, trained in Millet Breeding. As a result of the combined work the following high yielding strains have been evolved. In *Cholam* 24 strains have been released, 11 from the Coimbatore Station, 2 from the Anakapalle Station, 4 from Guntur, 5 from Nandyal, 1 from Hagari and 1 from Koilpatti. They represent the parental varieties of *Periamanjal*,

Talaivirichan, irrigated *Sencholam*, *Chitrai vellai cholam* and *Chinna-manjal cholam* of Coimbatore, the *Patcha jonna* and *Tella jonna* of Vizagapatam, the *Mudda jonna* and *Gidda jonna* of Guntur, the *Cheruku patcha jonna* and *Gundu patcha jonna* of Kurnool, the *Tella jonna* of Bellary and the *Irungu cholam* of Koilpatti.

In *Cumbu* 8 strains have been released, 3 from Coimbatore, 3 from Anakapalle and 2 from Koilpatti, representing the parental varieties of *Kottapuli cumbu* of Coimbatore, the *Pedda ganti* of Vizagapatam and certain African varieties. In *Ragi* 12 strains have been released, 4 from Coimbatore and 7 from out stations, representing the varieties *Gidda aryam* of Salem, *Burada chodi* and *Pairu chodi* of Vizagapatam, and a genetic mutant at Hagari. In *tenai* 7 strains have been released, 3 from Coimbatore and 4 from out stations, representing the varieties *Mosu tenai*, *Sadai tenai* and *Perum tenai* of Coimbatore, *Punasa korra* and *Sena korra* of the Guntur and Ceded Districts. The total number of strains so far released in all the millets put together is 51. A detailed statement is enclosed.

Work that remains to be done. The consolidation of the gains from plant breeding work on millets has now been taken on hand So far the strains have been tried as isolated items of district work, to appreciate their worth in the regions to which they belong. It was found on the average, that the strains have yielded about 10% more than the local varieties calculated on a conservative basis. It is now proposed to consolidate this gain by spreading it out on as large an area as possible. This is now being done as a specific item of work in the Grow More Food Campaign. Target areas have been fixed for each district and by sustained effort it is expected that the targets would be reached in the course of 4 or 5 years. It is seen from the figures that have been worked out, that an increased Millet Production amounting to about 3 lakhs of tons at the end of 1952—53 would be achieved, the value of which is nearly 6 crores of rupees.

As has already been explained, millets are very local in their disposition For example a *cholam* strain evolved at Nandyal in the Kurnool District could not spread throughout the district because the district contained late black soils and early red soils and a strain bred for the one type was not good for the other. This shows the necessity for working at more centres than one in a district, if the full benefit of the plant breeding work is to be derived. In addition to this, there are certain large areas in the presidency for which work has yet to be taken up. In this connection regional millet breeding stations have already been proposed to be established for the tracts of Narsipatam and Ongole in the Circars and Ariyalur and Periakulam in the South. These proposals are under the consideration of the Government.

In *Cumbu* a new technique is being adapted to evolve high yielding plants It is well known that hybrids are more vigorous than pure bred plants generally In maize the hybrid vigour has been utilised on a commercial scale by breeding high yielding hybrids. The work is easy in maize because hybridisation on a mass scale is simple and is obtained by de-tasselling the male parent. The male panicles at the top are cut off and the (female cobs below can be fertilised only by the) neighbouring lines of the other parents. The male and female elements in maize are located in different parts of the plant. Hybrid vigour is sought to be introduced in *Cumbu*. But the situation is different and more difficult. The male and female elements are in the same flower. So it is difficult to eliminate one of them and prevent self fertilisation. One favourable feature however, is protogyny. The female elements, the stigmas, protrude 3 to 4 days earlier than the anthers. So it becomes possible to effect mass cross-fertilisation to a certain extent by sowing the parents with an interval of a few days, so that the anthesis in one will synchronise with the protrusion of the stigmas in the other. It has been reported by an American worker that seed treated by heat in a particular way results in male sterility. This is being tried at the Millet Breeding Station. The isolation of pure lines that go to produce vigorous hybrids is being done. This work has been taken up as a special scheme in the Millet Section and work on it is in progress.

Lastly a new line of attack to achieve increased millet production has now been launched by the appointment of two Cytogeneticists to the Research Institute. With hard work and a certain amount of luck favouring, it is possible that new forms of plants which are better than the existing ones may be obtained by a shake-up in their genetic composition which is sought to be induced by deep X-rays, colchicine and other violent stimulants. This work has just been taken up. By providing the necessary facilities for their work in this Institute, useful results from this new line of work can be expected.

GLOSSARY.

Tamil Name.	English Name.	Scientific Name.
Cholam ...	Great Millet ...	Sorghum vulgare
Cumbu ...	Bulrush or Spiked Millet...	Pennisetum typhoides
Ragi ...	Finger Millet ...	Eleusine coracana
Korra ...	Italian Millet ...	Setaria italica
Varagu ...	Kodo Millet ...	Paspalum scrobiculatum
Samai ...	Little Millet ...	Panicum miliare
Panivaragu ...	Common Millet ...	Panicum miliaceum
Kuthiraivali ...	Sanwa Millet or Barnyard	Echinochloa frumentacea

STRAINS SO FAR EVOLVED IN MILLETS (upto 1948)

Crop.	Strain Nos.	Names of varieties from which selected.	Evolved from Station.	Popular in.
I Cholam	Co. 1	Periamanjal cholam	Coimbatore	Coimbatore Dt.
	2, 3	Talaivirichan cholam	Coimbatore	Salem, N. Arcot Chittoor.
	4 to 9	Irrigated Sencholam, Chittrai vellai cholam and Chinnamanjal cholam	Coimbatore	Irrigated areas of Coimbatore, Salem, and N. Arcot.
	10 and 11	Juicy stalked fodder varieties	Coimbatore	Coimbatore
	A. K P. 1	Patcha jonna	Anakapalle	Vizagapatam.
	2	Tella jonna	,,	,,
	Guntur strains	From Mudda jonna, Budda gidda jonna and yerra jonna	Guntur	Guntur.
	4			
	Nandyal 5 Strains	From Cheruku patcha jonna and Gundu patcha jonna	Nandyal	Kurnool and Anantapur.
	Hagari H. 1	Tella jonna	Bellary	Bellary.
	Irungu K. 1	Irungu cholam	Koilpatti	Tinnevelly.
	24 Strains	— suited to different localities.		
II Cumbu	3 strains	From African variety Bombay Bajri and Kottapuli cumbu	Coimbatore	Coimbatore, Salem, N. Arcot.
	3 strains	From Anakapalle	Anakapalle	Vizagapatam Dt.
	2 strains	Kattu cumbu and Punjab cumbu	Koilpatti	Tinnevelly.
	8 strains			
III Ragi	4 strains	From Gidda aryam and other varieties	Coimbatore	Popular throughout ragi areas in the South.
	7 strains	From Burada chodi, Pairu chodi and other varieties of vizagapatam of different durations from 90 days to 110 days	Anakapalle	Vizagapatam Dt.
	H. 1 (R. 42)	A mutant obtained at Hagari	Hagari	Bellary, Anantapur, Kurnool and Guntur.
	12 strains			
IV Tenai or Korra	3 strains	Mosu tenai, Sadai tenai and Perum tenai	Coimbatore	Coimbatore
	1 strain	Punasa korra	Guntur	Guntur.
	1 strain	Sena korra	Nandyal	Kurnool and Guntur.
	2 strains	Hagari	Hagari	Bellary, Anantapur.
	7 strains			
	(Total 51 strains)			

Increase in Pulses - an imperative necessity*

By

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Among the different kinds of food, it need hardly be emphasised, that pulses have an important role. For, in the diet of every Indian, Pulses constitute one of the important sources of protein food, supplying the necessary materials for building the body and repairing the waste tissues. Therefore, our Province can ill-afford to be in deficit of the required quantities of different pulses for consumption, nor can it look to other Provinces for help. The immensity of the problem is indicated by the fact that for a consumption of 5,83,450 tons of pulses, the average production has been 2,70,600 tons per annum leaving thereby a deficit of 3,12,850 tons. In other words, the production is only 46·4% of the requirements of the population and so more than half the quantity of pulses required has to be imported from outside. Against such a huge shortage, the coastwise import of pulses during 1946—47 was 30,228 tons, while no pulse of any kind was received from foreign countries. To be more specific, it might be stressed, that the deficit in production of the three chief pulses, Redgram, Blackgram and Bengalgram should be made up quickly in all possible ways.

TABLE I.

Showing the annual consumption and production of pulses in the Province.

Names of Pulses.	Consumption in tons. (In round figures)	Production in tons. (In round figures)	Deficit in tons.
1. Redgram	1,22,500	39,300	83,700
2. Blackgram	63,100	34,350	28,750
3. Bengalgram	1,84,000	12,200	1,71,800
4. Greengram	60,400	44,900	15,500
5 Horsegram	1,25,000	1,15,400	9,600
6. Other pulses	28,450	24,450	4,000
Total	5,83,450	2,70,600	3,12,850

TABLE II.

Area under pulses and production per acre.

Name of pulses.	Area in acres. Normal	Area in acres. 1946—47.	Yield per acre in lb. Normal	Yield per acre in lb. 1946—47.
1. Redgram	3,37,080	3,63,021	339	257
2. Blackgram	2,91,510	2,96,592	305	255
3. Greengram	5,06,250	4,72,739	240	192
4. Bengalgram	65,300	1,00,432	377	164
5. Horsegram	15,48,870	14,42,995	170	160
6. Other Pulses	2,55,910	2,59,744	—	—
Total	30,04,920	29,35,523		

*A Paper read at the 31st College Day and Conference, July 1948.

A glance at the table will convince any one, that the yield figures both normal and actual are not high and are capable of improvement. Also, the area under each of the pulses is small except in the case of Horsegram, which occupied a little more than half the area under pulses in the Province. Any improvement brought about, in either of the above directions, would raise the stock of pulses and aid in solving the food shortage. In this paper an attempt will be made to place before you, some of the lines of work, that could be pursued to improve the stock of pulses.

Since the increase of the stock of pulses is associated with (a) yield per acre (b) area grown with each kind of pulse and (c) cropping practices, the problem will be reviewed from each of these aspects.

(a) Yield of pulses per acre. The yield of any pulse could be enhanced by the growing of a high yielding strain of the particular pulse, in the place of local seed. But, such an increase in yield cannot be brought about overnight, as it requires years of patient work and testing under conditions of growth pertaining in each tract or zone. Foreseeing the time and labour required, the Madras Government started the scheme of Improvement of Pulses five years ago, with the main station at Coimbatore and two small Sub-stations at Salem and Vizianagaram. As a result of the work of these stations for five years, cultures, which yield more than the early released strains in Redgram, Horsegram and Lab-lab, are in their final stages of yield trials on the Research Stations. They will be issued for general cultivation in a couple of years, after testing them for their suitability under ryots' conditions in the different districts. In addition, the cultures of second and third batch of selections are in various stages of trial.

Alongside, the three strains of Redgram 1,723, 2,900 and 3,009 released by the Cotton Specialist are being multiplied and issued for general cultivation. In Salem District, strain 2,900 was grown last year over 40 acres and this year, the seed farm area has been raised to 400 acres to reach the target figure for seed in the shortest time possible. The use of this Redgram strain is bound to increase the yield per acre by 100 lb. at least. Again, the three strains of Bengalgram from Cotton Specialist are multiplied and issued to cultivators. Last year 3,200 lb. of Bengalgram strain 482 was sent to the District Agricultural Officer, Anantapur, and this was multiplied over 100 acres round about Anantapur town. The seed gathered is programmed to be grown in seed farms in the districts of Bellary, Cuddapah and Anantapur over 130 acres this year for the production of seed, with the kind co-operation of the Deputy Director of Agriculture, Cuddapah and the three District Agricultural Officers of the districts.

(b) Area grown under each of the pulses. *Blackgram:* Blackgram is grown in drylands and also in wetlands after paddy, as a catch crop between two paddy crops. The average area under this crop is 2·96 lakhs of acres with an yield of 34,340 tons, leaving a deficit of 28·75 thousand tons. This shortage could be made up to a large extent, by increasing the area under Blackgram in districts, where wetlands are in abundance, by inducing the ryots to put more area under Blackgram after paddy than before. If the wetland cultivators of Vizagapatam, East Godavari, Kistna, Tanjore, Tiruchirappalli, Tinnevelly and South Canara could be made to sow in wetlands, two acres of Blackgram, where there was only a single acre before, the shortage of Blackgram, could be made up to a great extent. Out of a total area of 46 lakhs of acres of wetlands in these 7 districts, it should be possible to have at least 4 lakhs of acres under Blackgram after paddy. What is required is the desire on the part of the cultivators to grow more area under Blackgram than before.

Greengram: Compared to Blackgram, the shortage of Greengram is not much. The deficit of 15,500 tons could easily be made up by getting more area under this crop, as it is also grown as a catch crop in wetlands like Blackgram.

(c) Change in cropping practices. *Redgram* · The Ceded Districts, East Godavari, North Arcot, South Arcot, Tinnevelly, Salem and Coimbatore grow large areas under Redgram. Various mixtures are adapted in these districts, but the most common one is to grow Redgram with Groundnut as a mixture. In South Arcot and Salem, the rows of Redgram are spaced 5 to 6 feet apart, while in other districts, the lines of Redgram are put 10 to 12 feet from each other. Usually the ryots use the creeping variety of Groundnut of 4½ months duration, in between the lines. But where the rows are closer, an erect variety of Groundnut is used. When the cultivators in North Arcot were advised to have lines of Redgram closer and replace the creeping variety of Groundnut, with bunch variety, they said, that bunch variety not only yields less but has a lower oil content than the creeping Groundnut. The answer to these objections is that the low yield of bunch variety will be made up in money value by the extra yield of lines of Redgram, which get doubled in number, when bunch Groundnut comes in. Further, the bunch variety, which takes 3 months to mature, can be removed from the ground by the end of September and the inter-spaces between Redgram, could again, be utilised for growing a crop of Horsegram. This crop and the extra lines of Redgram are sure to make up and even outweigh the loss entailed in growing the creeping variety of Groundnut. The difference in oil contents between the two varieties of Groundnut is only 1 to 2% which is negligible.

Fortunately, the recent trials of the spacing of Redgram lines in a mixture with creeping variety of Groundnut by the Oil Seeds Specialist,

Coimbatore, have shown that the utmost monetary return could be had only when Redgram lines are put 6 feet apart with this variety also. Considering all these, it may safely be recommended (i) that the cultivators be encouraged to use bunch Groundnut with lines of Redgram 6 feet apart and grow a crop of Horsegram as a second catch crop after Groundnut and (ii) that in places where creeping variety is used, the Redgram lines have to be spaced 6 feet apart for high return and not to put them 10 to 12 feet as is being done now. Such a spacing of Redgram will considerably increase the area under the crop and thereby the output of Redgram stock also, as over 3·3 lakhs on an average are put under this mixture of Redgram and Groundnut in the Province.

Another method of increasing Redgram stock is to induce ryots, especially garden and wetland ryots, to grow Redgram along water courses and channel bunds, in addition to field bunds, as is done in Anantapur and North Arcot Districts. The short duration variety of Redgram from Tenkasi of 4 month's duration will fit into this programme well.

Bengalgram: Bengalgram is generally grown in Black Cotton Soils, where dew could be had in plenty during the growing period of the crop. So, its cultivation is confined mainly to the five districts of Guntur, Kurnool, Bellary, Cuddapah and Anantapur, where the crop commands normally 46,500 acres out of the total 65,000 acres for the whole Province. In 1946—47 the area went up to 70,000 acres, as against 1,00,432 acres for the Presidency. Though the acreage under Bengalgram has gone up by 32,523 acres, there appears to be scope for further increase under this crop. The *hingari* crop of cotton is generally grown mixed with *Tenai* or *Korra* in lines over 8,74,100 acres on an average, in all the above districts. Let each ryot, reserve, a fourth of the *Korra* area and sow Bengalgram by the close of the North East Monsoon i. e., the end of October or even by the beginning of November. Then it is certain, we have another lakh of acres under Bengalgram. The area under *Korra* in these five districts is on an average 14·2 lakhs and taking away a slice of one lakh for such an important pulse as Bengalgram will not alter or disturb the stock of *Korra* very much. Further, let each ryot sow one or two lines of Bengalgram at the headlands of his fields cropped with cotton in the Ceded Districts and the aggregate area would be enormous. It is also necessary, in view of the huge deficit of Bengalgram, to make every ryot in Ceded Districts and Guntur to have one acre of Bengalgram after Cumbu or another early sown crop in his holdings.

In brief, the possibilities of increasing the area under pulses and thereby improve the total stock, have been indicated in a general way. The exact working of each of the innovations suggested, should be designed on the spot to suit particular conditions of growth.

Legumes and Increased Crop Production

By

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It is well realized that nitrogen is one of the essential elements required for plant growth. The necessity of replacing the loss of this element from the soil due to removal by crops or by leaching is, therefore, well understood in all systems of agriculture. No doubt, nitrogen is also the most expensive of plant food elements. The lack of sufficient available nitrogen in the soil to meet the needs of the growing crop is therefore, the most common limiting factor in crop production.

By raising crops, however, all soil nitrogen is not lost. A large part of it is replaced in the form of cattle manure, compost, oil-cakes etc. The application of inorganic fertilizers with a view to increasing crop yields is also resorted to. This idea of applying inorganic fertilizers, especially nitrogenous, with a view to increasing crop yields may be said to have originated from India. It may be interesting to note that India was for centuries the sole source of nitrates both in times of peace and in times of war. Potassium nitrate was obtained from the nitre beds of Bihar, Bengal and the Punjab, long before the nitre deposits of Chile were discovered and exploited in 1830.

As has been pointed out by Karunakar P. D. and Rajagopalan T. "Manuring in relation to maintenance of soil fertility and increased crop production", M. A. J. Vol. No. XXXV Sept 1948, the amount of organic manures, such as oil-cakes, farm manure, compost etc., are not sufficient for all the cultivated areas of our province. The need for manuring the area under paddy alone is great and is not adequately met to achieve the target production of 3,000 pounds. Even supposing the 10·9 million acres under paddy is properly manured, we have still to think of maintaining the fertility of the soil of the rest of the 25·5 million acres out of the total 36·4 million acres under cultivation at present. Hence, the present need for nitrogenous manure is really great.

It is gratifying to note that proposals are under way to build factories to manufacture nitrogenous fertilizers in our country and already factories have been established at Sindhri in Bihar, and Alwaye in Travancore State. But nitrogen is available from the inexhaustible supply of nitrogen in the atmosphere, as 4/5ths of the air contains it. But it is in utilising this nitrogen as a fertilizer that we are concerned within this paper. Here come the bacteria with their role in maintaining soil fertility. There are two classes of bacteria that toil incessantly in maintaining soil fertility. They are (1) the non-symbiotic nitrogen fixers of the Azoto-bacter type and (2) the symbiotic nitrogen fixing bacteria as are found in legumes.

The non-symbiotic nitrogen-fixing bacteria are certainly more important, but since the subject chosen is legumes for increased crop production, only the role of the symbiotic nitrogen fixers is presented in this paper.

Nature has established a relationship between legumes and the nodule-forming bacteria. The ability of this partnership between the two to fix the atmospheric nitrogen is important to us and warrants unlimited efforts for the harnessing of this natural source of nitrogen for the improvement of crop yields. In fact, in growing legumes, nitrogen can be said to be actually "home grown." It may not be out of place to remark here, that the legumes are so numerous upon the earth that of the total number of flowering plants of 1,30,000 species known to-day 10,782 species in some 487 genera are legumes.

The ability of these plants to enrich the soil and its nitrogen was known to the early Chinese, Greek and Roman farmers who knew that they could go on cropping the same piece of land, if they rotated the crops with legumes.

The legumes with the aid of certain bacteria which live on the roots and cause small nodules to form thereon are capable of fixing the atmospheric nitrogen, thereby converting the nitrogen into a form in which it can be utilized by the leguminous plants upon which they are growing. If the nitrogen thus fixed is later converted into soluble compounds by the decay of legumes in the soil, it can be utilized by non-legumes as well. The amount of nitrogen fixed by the legumes are naturally dependent on moisture, temperature, reaction of the soil, the presence of lime and phosphorus etc. It can be modestly put at from 50 to 200 lbs. per acre.

If a legume crop is returned to the land there will be an actual increase of soil nitrogen. Not only is the total amount of nitrogen important but the form in which that occurs is even more so. The nitrogen of legumes is in a form which is very readily available to other plants.

The legumes occupy nearly 7 million acres or 19·4% of the cultivated area under crops in our Province. The total amount of nitrogen fixed may be reckoned at 350 million pounds or 1·50 lakhs of tons on the presumption that the bacteria associated with the legumes are efficient in fixing nitrogen. But in actual practice this may not be obtained in most cases due to various causes such as the soil condition and the nature of the organism in association with the legumes. Naturally the question resolves itself to two factors namely (1) selection of suitable types suited to the variety of plants and favourable to soil and other environmental conditions and (2) the maintenance of a proper culture medium, that is the soil, for the organism to fix nitrogen efficiently.

It has been well established that although the bacteria associated with the various types of leguminous plants are all very closely related and cannot be definitely distinguished by ordinary laboratory procedure yet through the course of time different varieties or strains have become so adapted to certain legumes or groups of legumes that they are unable to cause nodules on plants outside their particular group. The lucerne nodule bacteria for example is not capable of producing nodules on groundnut. The cowpea organism cannot infect Dhaincha. The soya bean organism is capable of nodulating soya bean roots only. Thus, one more factor is introduced in the problem and that is the specificity of the bacteria to inoculate or cross-inoculate other legumes other than the one on which they normally grow.

Granting that in the 10 million and odd acres under paddy, green manure crops are raised, which will, not only add soil nitrogen but also the much needed organic matter, still there is the problem of adequately manuring the 19 million acres of land out of the total cultivated area of 36 and odd million acres. This can be solved to a great extent by growing a legume crop in rotation, wherever possible. The importance of rotating cereals with legumes can be seen from the method adopted in Italy where in a seven-year rotation, wheat is followed by two years meadow land and four years rice, only a portion of the land is occupied by rice at a time, the rest of the area being devoted to legumes, invariably a dual purpose crop, which enables the farmer to maintain work animals and milch cows. This practice certainly enriches the soil fertility and increases the crop yield to nearly double of what could be had by continuous cultivation of rice alone. This is only an illustration. This may not be suited to our condition. (The present need is for more grains for food.)

The legumes being so important from the point of view of the nitrogen economy of our agriculture, the proper rotation for every crop may have to be studied in relation to them. Here, it may be observed, that in parts of Tiruchirappalli District groundnut is cropped before a crop of paddy. So also, in all most all delta areas a pulse crop is sometimes raised after the first crop of paddy. Such a rotation may be beneficial to the succeeding crop of paddy as the legume enriches the soil both in organic matter and nitrogen.

In our effort to encourage cultivation of legumes on a large scale it must not be forgotton that they are voracious feeders of lime and phosphorus. It is essential from the point of view of nitrogen fixation and soil fertility that a dressing of phosphate in the form of super be given to the legume crop.

Apart from the nitrogen fixation, there are also attendant benefits due to legume cultivation such as release of plant food in an available form from the soil, especially by the deep-rooted crop like lucerne.

In designing therefore our pattern of agriculture, it is evident from the facts presented in this paper that an all-out effort should be made ere long to encourage extensive and intensive cultivation of legumes to serve as a potent source of renovating our much depleted fertility of soils and thereby increasing our crop production to the maximum possible extent.

Acknowledgements. My grateful thanks are due to Sri P. D. Karunakar, M. Sc., (Rutgers), A. R. I. C., Govt. Agricultural Chemist and Sri M. Sanyasi Raju, M. Sc., (Wis) Agricultural Bacteriologist and Sri T. R Ayyangar, M. Sc., for their valuable suggestions and help in preparing this paper.

LITTLE THINGS OF GREAT UTILITY.

1. Visiting card from palm leaf.
2. Plant labels from palm leaf for breeders' use in field studies.
3. Pith lengths for making fancy toys like houses, furniture and model implements.
4. Periderm of cholam internodes peeled and sized into convenient lengths or broomstick tips sterilized, as tooth pick.
5. Lengths of ripe flower stalks of *irungu* cholam (a variety of cholam grown for fodder in the black soils of Tinnevelly) as dissecting needles for use in biological laboratories.
6. Lengths of flower stalks and internodes of *irungu* as holders for steel nibs.
7. Pith of cholam internodes to hold plant material for sectioning in histological studies.
8. Thorns of Acacia and *odai* trees as substitutes for pins; carefully selected thorn tips can be used as substitutes for soft tone gramaphone needles in cinema theatres with pick up equipment.
9. Assorted bits of cholam piths as cork for test tubes and bottles.

— *Contributed by L. Neelakantan.*

Soil and Water Conservation*

By

N. SANKARANARAYANAN, B. E. A. M. I. E. M. A. S. A. I.

Soil conservation is good land husbandry — proper use of soil and maintenance of fertility or productivity. The conservation of soil and water resources is of utmost importance in India. There is no political economic, social or scientific disagreement about this fact. Fertile soil is a matter of national concern, and the food problem can be solved only in terms of soil and water.

Soil Depletion. Improper cultural practises, added to the financial distress of the Indian cultivators made them virtually exploit the soil. Excessive cultivation without putting any thing in the soil result in our soil being exhausted. The soil fertility was tapped at a rate more than it can build naturally. The deplete and move on policy was extended and enforced by the preference of immediate yield. As a result of such long neglect our soils have become exhausted and probably this accounts for the low yield in all food crops.

Remedies. It is well known that soil fertility can be maintained by proper manuring and the organic content can be increased by the application of green manure judiciously combined with chemical fertilisers.

Farm yard manure viz., cattle urine and cowdung go along way to improve the organic content and fertility of the soil, but it is a sad sight to see that the resource is not being fully utilised by our ryots. It is worth while for us to educate our ryots regarding the potentialities of farm yard manure. Besides our rural cattle stalls are such that the urine is allowed to waste. Cheap type of cattle stalls to suit our economic condition should be evolved. The research on these lines will be a step in the right direction.

The proper utilisation of our sewage and sullage water in our cities and towns will greatly add to the fertility of our fodder. Though here and there we hear of these being utilised as manure after composting or by other processes such as activated sludge plant or septic tanks, most of our town sewers are allowed to discharge into rivers or sea and go to waste. There is unlimited scope and potentialities and it will be worth while to explore the possibilities as to how best we can utilise the town refuse, sewage and sullage.

The following improved farming practices may be adopted and advocated for conserving soil :—

(a) Crop rotations, where possible to conserve soil and fertility.

(b) Contour farming in all cultivated fields except where extremely irregular topography makes contouring impractical.

*A paper read at College Day and Conference, July 1948.

(c) Contour strip cropping on clean cultivated land.

(d) Terracing on cultivated lands of reasonable slope when proper water disposal is practical.

(e) Systematic pasture management including controlled grazing, contour furrowing or ridging and weed control.

(f) Retirement from cultivation areas that are subject to several erosion and use of such areas for pasture, meadow and wood land.

(g) Location and construction of farm ponds and reservoirs to impound surplus water from fields, pastures and wood lands.

A co-ordinated use of these measures each being applied to that portion of the land adapted for its use, should result in the maximum conservation of both the soil and its fertility.

Erosion. Perhaps erosion is more contributory to soil depletion than anything else. Erosion in short is soil drifting or the process of soil removal by natural agencies like wind and rain. Top soil so essential for plant growth is lost by erosion. Periodical rainfall on natural slope of the cultivated land is partly absorbed and a major portion lost as surface flow or run off. This apparently calm looking run off, carries with it the necessary and important plant food namely, humus which the nature had supplied to the land after long periods of biological changes. Not only the humus, but also the soil and sometimes the sub-soil are transported by the moving water. Not only there is loss of soil but there is no supply of water to the sub-soil which is the reservoir for plant life and other uses of mankind. These contribute to the failure of crop for want of fertility of the land and the drinking water and other supplies from the wells fall low and even get dried up. Thus soil erosion is a menace to agriculture and therefore must be successfully tackled at all costs. It is generally thought that erosion is not a problem in our province. Though it is not pronounced in the whole of province it is a serious menace in the Ceded Districts, Coimbatore, Tinnevelly, Nilgiris and Vizag. Districts. The erosion observations conducted at A. R. S. Hagari show that there is considerable soil erosion in that area where the slope varies for 0·5 to 3%. It is one of our post-war programmes to implement a comprehensive water and soil conservation by controlling erosion.

Erosion Control-Measures. For purposes of erosion control, soil erosion may be deemed to consist of two distinct processes. They are :— (1) Displacing or tearing the soil loose. (2) Transporting the soil material.

Thus soil erosion is the detachment and transportation of soil materials by erosive agents. The principle of erosion control must be to improve the adhesive powers of the soil and reduce the run off and velocity of run off which transport the soil.

Soil conservation (erosion control) may be broadly classified as.— (1) Biological control and (2) Mechanical control.

Biological Control. If the soil is performing its natural biological functions of feeding and being fed by living organisms it will not in general erode seriously. Biological soil conservation is not new, indeed, the cultural operations that were evolved to keep humid soils in good heart may be regarded as biological measures of soil conservation. They improved the soil structure, æration and drainage and by enabling the soil to support the rich flora and fauna (microscopic as well as macroscopic), kept the plant nutrients circulating in the surface layers. Consequently the productivity of soil and cohesive property of the soil are improved, and thereby resistance to erosion is built up. Biological control chiefly consists of:— (1) Use of manure, lime, soil building legumes and appropriate mineral or other fertilizers to improve productivity (2) Mixed farming and crop rotations (3) Regulated forestry and grazing (4) Selective weeding (5) Cover cropping.

Mechanical Control. Mechanical control chiefly aims to reduce the run off and the velocity of run off which is chiefly responsible for the transportation of soil. Of the different means of mechanical control such as contour bunding, terracing, contour trenching, listing gully damming and strip cropping it is proposed to make a mention of the contour bunding and terracing as they are mainly responsible for combating erosion. At the same time detailed data to adapt these measures to suit our conditions are not available.

Contour Bunding. In sloping lands subject to erosion, bunds are thrown along the contours with a view to arrest erosion and impound water to conserve the same and allow it to soak through the soil and these are known as contour bunds. They shall be designed to hold the maximum run off and shall be so spaced that the run off does not attain the velocity at which the soil will be transported. The run off water shall not be allowed to attain a velocity higher than the critical velocity for the soil (critical velocity for a soil is the maximum velocity, the soil can stand without being eroded). Thus the design of contour bunds is becoming a specialised engineering job in which the local characterestics of climate, rainfall, erodability of soil, its critical velocity and the velocity the run off will attain in a particular slope have to be considered. So far no such observations and research have been done in our department in these lines. We have not determined the erodability of the soil, (its cohesive power and resistance to transportation), its critical velocity and the velocity the rain water can attain in a particular slope. We have been using empirical formulæ given by American Books — which are meant for American soils and climatic conditions. It, is high time extensive soil erosion research is taken up on the above lines.

Terracing. Perhaps there is no other word so widely used and misunderstood. The term terracing is often misunderstood and generally the bench terracing (levelling the land into benches having horizontal cultivable lands) is thought of as terracing. This is no doubt one of the several methods of terracing, but technically terraces divide a large sloping area into a number of distinctly separate ones. Each area has its own drainage facilities. Or in other words terracing is essentially a process of constructing a series of drainage channels across the slope of the hill side whose function is to collect the run off water before it attains the harmful velocity and conduct it slowly to an erosion-proof out let. These drainage channels are usually partly run in cutting and partly in embankment by providing bunds along the contour, known as level terraces or with a little fall (say 1 in 300) known as graded terraces. The Americans have evolved different types of terraces depending on their mode and type of formation and the important among them are the Mangum terrace and Nichols terrace. The terrace bunds have to be designed to hold the rain water till they reach the erosion-proof out let and have to be spaced so that the run off water does not exceed the critical velocity.

Contour bunding is adapted in semi arid areas where the rainfall is low and every inch of water has to be conserved. Contour bunding aims at soil and water conservation. Terracing is adopted in places of heavy rainfall where periodical rains seldom fail. No attempt is therefore made to conserve water. Terrace bunds aim at arresting the rain water before they attain the eroding (or critical) velocity and is conducted slowly and finally disposed of through an erosion-proof out let.

It has been generally pointed out that for our semi arid areas, contour bunding is not suitable as the area in the upstream side are likely to be water stagnated and the sowing season may have to be put of on that count. This is a difficulty that cannot be said to be insurmountable. A contour drain on the downstream side connected by drainage pipes across the bunds will dispose of the water without erosion and give a second opportunity for the soil to absorb water. There can be no water stagnation. However these suggestion have to be tried. Yet another objection is the breaching of bunds. There is no reason why a properly designed bund-designed to hold the maximum run off should breach. However as a safety measure escape weirs may be provided and the surplus water could be diverted through existing drainage channels or vankas.

Water. Next to soil the most important resource and requirement for any crop is water. Of all the natural resources perhaps water has great potentialities — power, generation and irrigation.

The chief and main sources of water are.— (1) Rain water (2) Rivers and (3) Underground water supply. Water conservation with reference to agriculture would mean the utilising of these sources for agricultural needs to the fullest extent.

Rain Water. Rain water can be conserved by collecting them in tank or reservoirs and can be utilised for irrigation. These falling on cultivated sloping land can be conserved by contour bunding, contour trenching, listing etc. All the same we have during monsoons, large quantities of rain water running to waste through vankas throughout our province. Engineers can be entrusted to investigate the possibilities of utilising these rain water for irrigation purposes. The sloping cultivable lands in our province should be bunded along the contours to conserve the water and improve the fertility of the soil.

Rivers. Perhaps this is the least exploited natural resource, so vital to agriculture. On a rough calculation the mean annual supply of water in our (Indian) rivers appears to be the order of 2·3 million cubic foot per second. The mean annual consumption of water for agricultural purposes derived from the canals have been roughly figured out as 1,33,000 cubic foot per second. Possibly another 30,000 cubic foot is utilised for irrigation from wells. This means that less than 6% of the available water in our rivers is being utilised and the balance of 94% is running to wast into sea and in the process doing incalculable damages to life and property. It is difficult to say off-hand what portion of the 94% of our available water wealth which is at present running into waste can be put into beneficial use, but there is no gainsaying that a very substantial portion of it can be utilised. There is immense scope for great extension of irrigation facilities which will definitely solve our food problem. Though the Central Government have constituted an irrigation commission to explore the possibilities of extending the irrigation system, the Provincial Government should also follow and try to utilise every drop of water for irrigation purposes.

Ground Water. The world contains an unlimited ground water supply and perhaps it is thought there is no need to conserve it. It must be conserved and utilised. The ground water or sub-soil water is fed or recouped by rain water, and naturally if rain water is allowed to run to waste into the sea, the ground water supply will be depleted. Hence it is imperative that the rain water should be allowed to percolate through the soil by proper water conservation means such as, contour bunding. trenching, basin listing etc., with a view to maintain a steady supply to the ground water.

There is immense scope and it has proved to be so — to utilise these waters through wells for irrigation and help agriculture. We have taken

a step in the right direction in promulgating a well digging scheme. It is hoped ere long our province will have plenty of wells to irrigate all cultivable lands not commanded by any irrigation canals. It is highly necessary and it will be of immense help to the ryots if mapping of ground water supplies and preparation and issue of sub-soil water levels form a part of the activities of the Engineers of our department. On a perusal of the departmental activities from the administrative reports it will be noticed that exploration and mapping of ground water supplies were one of the activities of our department during the years 1917 to 1919. The work can be revived along with the investigation of arable areas under well irrigation.

Conclusion. Having said that the soil and water are the essential requirement of agriculture and any depletion or misuse of them will affect our crops — as it has already happened — let me conclude with an appeal to promulgate proposals for an extensive soil and water conservation scheme on the lines suggested in this paper.

ERRATA.

The following corrections are to be made in Volume XXXV of the Madras Agricultural Journal (October 1948).

1. **Page 293—Statement:**
   (a) Opposite to "S. No. 3" and under 'F' of G. J. 103 read as 16 for 26.
   (b) Opposite to "Value @ 10 lbs. grain etc." and under 'F' of Local (Paira) read as Rs. 26—13—0 for Rs. 26—3—0.
2. **Page 294—Statement:**
   Opposite to "Cash value @ 10 lbs. etc." under N. 4 read the total value as Rs. 69—2—0 for Rs. 9—2—0.
3. **Page 297. Line 8 from the top:**
   Read Miss I. P. Janaki for Miss G. P. Janaki.

Cotton Seed

By

R. BALASUBRAHMANYAN,
(Cotton Specialist, Coimbatore)

The extension of World War II to South East Asia at the end of the year 1941 and the initial reverses of the Allies leading to the loss of the chief rice growing countries in that theatre, contributed to the steady deterioration in the stock and supply position of food in India. The Government were forced to take emergent and concerted measures to retrieve the difficult food situation in the quickest possible time. In accordance with this general policy, the Madras Government intensified the food drive now familiar to all as the "Grow more Food Campaign". The plan for stepping up production consisted among other items of (a) area increase by bringing in the cultivable wastes then lying uncultivated (b) legislation to curtail non-food crops (c) extension of irrigational sources both as canals and wells (d) supply of power for pumping water and essential needs of the Agriculturist in the shape of manure, seeds and tools at controlled rates and (e) liberalisation of price structure for food grains and checking the inflationary tendencies of commercial crops like cotton through price controls. The achievements of the campaign have been the subject matter of periodical reviews by the Government on the one hand and criticisms of the rate-payers on the other. The fact that we are alive to day and that starvation deaths have been few proves that the crisis has been tided over. Our thanks are due to the rationing system which saved us from collapse in the period of emergency. It cannot, however, be said that the health of cattle received the same amount of consideration as human beings. It shall be my endeavour in this paper to review the various legislative measures promulgated to discourage growth of cotton in this province and the effects they had on the position of cotton seed as a rich source of protein for stockfeed.

In the pre-war years, the annual cotton area and production in Madras fluctuated round about 2·4 million acres and 5·5 lakhs of bales of 400 lb. of lint. The cotton seed production was estimated at roughly 2·0 lakh tons, of which barely 16,000 tons were used for planting purposes, leaving the bulk of it for consumption as cattlefeed. Restrictions on the cultivation of cotton except as a mixture with food crops in specified proportions were imposed from time to time since the year 1943, first on short staple varieties like *mungari* in Ceded Districts, later on the red cotton in the Circars, and finally on medium staple qualities of all deshi cottons on rainfed lands. In March 1946, total ban was extended to the southern districts where the irrigated *māsipattam* Cambodia-one of the

very best long staple varieties in the whole of India was being grown. The imposition of price controls with a trading margin for each specified variety and the introduction of a New Indian Cotton Contract in 1944, helped the buyers to a very large extent by keeping down the prices at or near the floor levels fixed for each style of cotton. The cumulative effects of all such artificial controls stepped down the statistical position of cotton in the province to 1·6 million acres, 3·4 lakhs bales of lint, and 1·2 lakh tons of cotton seed in the year 1946—47. Doubts have been expressed whether the whole of the land released from cotton amounting to 0·8 million acres annually, went under food crops like millets grown in rotation in these rainfed areas. Recent statistics collected by the Indian Central Cotton Committee, Bombay, showed that only a small part of it was diverted to food, a major part of it to other commercial crops like groundnut, tobacco and the balance remained fallow. It was even stated that in certain tracts millets were fed to cattle when acute scarcity for cotton seed was experienced. The estimates might be viewed as exaggerated figures but still the fact that millets did not entirely displace the cotton and therefore failed to contribute materially to increase food production remains uncontroverted. There was, however, an apparent deterioration in the supply and production figures of raw cotton needed for clothing and cotton seed for cattle food.

As per the census of 1940, the cattle wealth of the province for oxen and buffaloes which supply the power needed by farmers for agricultural operations or village transport, and which supplement our resources of human food in the shape of milk or beef is as follows:

	Serviceable Stock.	Young Stock.	Unserviceable Stock.	Total Stock.
Oxen	11,321	3,807	869	15,997
Buffaloes	3,942	2,032	148	6,122
Total	15,263	5,839	1,017	22,119

N. B :- The figures are in thousands.

Fifty million people resident in the province depend on these animals for the maintenance of their health and prosperity in a very large measure. The condition of the cattle cannot be said to be in any way satisfactory. Let us see what we did in return to what the animals gave us during the food campaign and what they are still expected to give in the postwar period. We diverted groundnut cake to manurial purposes; we banned polishing of rice beyond a point and thereby curtailed the bran supply; we reduced cotton seed production, we worked them more but were unable to provide the required quantity of concentrates for their proper upkeep. It was a Hundred percent food plan for human

beings, and cattle were ignored. If at all we did anything, we gave them more straw during the food campaign. The condition of cattle consequently deteriorated to a very marked degree, their capacity for hard work was lowered, and the category of unserviceable stock swelled up in recent years. The index for the cost of cattle labour has increased fourfold and in certain areas, it has made the rich farmers machine-minded. Indian Agriculture is centuries old and our tenancy system coupled with land fertility status and manurial resources will not be conducive to large scale machanisation. We will have to depend increasingly on cattle for agricultural purposes in regions where new irrigation projects or well-sinking campaigns are contemplated. The scheme of livestock development in the province includes the production of more cattle and better cattle, and it cannot be implemented unless a co-ordinated development in the matter of fodder and concentrates is also provided for. The sooner we formulate plans for the well-being of cattle, the sounder will be our future prosperity

The average daily requirements of animals as worked out from the maintenance rations prescribed in the nutritional studies conducted at Coimbatore are 0·825 lb. protein + 0·475 lb. fat for work animals and 1·550 lb. protein + 0·844 lb. fat for young calves below three years. On this basis the annual requirements of protein and fat for the whole cattle of Madras excluding unserviceable stock, will amount to 35,27,000 tons and 19,84,000 tons respectively if they are to be maintained in a healthy and fit condition. In the above calculations it has been presumed that carbohydrates will be fully met from the available plant residues and grazing areas. The following tabular statement gives our estimated resources under the two categories for 1946—47 as worked from the chemical analysis of various feeds. It is apparent that we are short of both by a huge amount.

Kind of feed.	Quantity in tons.	Percentage contents. Protein	Fats	Total quantity in tons. Protein	Fats
1. Cotton seed	1,20,400	20·5	20·4	24,682	24,562
2. Groundnut cake	7,61,000 (a)	47·9	9 4	95,800	18,800
3. Gingelly cake	47,000	39·5	9·0	18,565	4,230
4. Coconut cake	15,000	21·6	7·9	3,240	1,185
5. Rice bran	4,85,000	14·2	17·5	68,870	84,875
6. Dholl husk	10,000	7·7	0·8	770	80
7. Fodder of all kinds & grazing	63,306,000	2·0	1·0	12.66,120	6,33,060
				14,78,047	7,66,792

(a) It is estimated that only about 2,00,000tons will be available for cattle feeding even if liberal allowances are made for other invisible quantities fed as leguminous fodder or taken during periods of grazing.

It will be apparent from the above statement that cereal straws and grasses are low in protein and as such the stockfeed must invariably be of a balanced ration containing adequate quantities of protein-rich concentrates. Any one who sees the average condition of cattle in the villages will bear testimony to the fact that it is far from satisfactory. Unless concerted measures are taken to increase the over-all production of every kind of concentrate to the level of minimum requirements as defined by the nutritional standards the cost of maintenance will be high and the return not commensurate with the outlay. Other countries are progressively reducing the cost of production of agricultural crops and India has no other way of meeting this challenge except by building an efficient cattlewealth.

Cotton seed has long been recognised by the farmers as one of the most abundant sources of protein of very high quality from the nutritional standpoint. In view of its importance as stockfeed, breeding research in Texas has been recently directed towards development of cotton varieties producing seed only. Any increase in cottonseed production will therefore help in building up a better health of Indian cattle.

During the war years we have practically reached the limit of expansion in cropped area and all our future plans must, therefore, be framed on getting more per acre through increased irrigation facilities, application of artificial manures to all crops adopting remunerative systems of agronomy including intensive cultivation, and use of improved high yielding varieties. In the case of cotton, a developmental plan to produce eight and half lakhs of bales every year in the course of another ten years, has been drafted and partly given effect to. It will make the province self-sufficient regarding textiles and its contribution towards the stockfeed deficit is estimated at 1,83,200 tons of cotton seed equivalent to 37,600 tons of protein and 37,400 tons of fat. There will be still a huge gap between production and requirements. The fodder and grazing committee have plans for improving the quality and increasing the production of fodder and grasses and it will be in the fitness of things if they include in their plans the measures needed to produce the full target of protein requirements for the entire cattle population of the province.

Regional Peculiarities in Apple Production

By

U. NARASINGA RAO

(Assistant Fruit Specialist, Coonoor)

In the course of a recent survey of the apple growing industry in different parts of India, the author was struck with the amazing diversity of practices with reference to almost every aspect of apple production. Although characteristically a temperate zone deciduous fruit, the apple as grown in the different provinces and states of India has become adapted to such a great extent as even to be ranked as a commercial fruit to be grown amidst the tropical mango or citrus, as in certain parts of South India. The very wide diversity of conditions under which the apple is being produced is, therefore, a study of immense interest and has accordingly engaged the attention of the author. The present contribution is made with the hope that the varied features that are associated with apple culture in different regions of India may serve to bring out the immense possibilities for effecting improvements with due regard to the experiences of the particular locality and of those regions where entirely dissimilar conditions prevail.

It is an admitted fact that apple production is only a relatively minor industry in India, but one which has deservedly attracted much attention because of firstly, the scarcity of the fruit which leads to a wide disparity between the production and demand, secondly, it being a fruit that can stand travel to much greater extent than most others, its popularity as a commercial fruit has ever been on the increase; and thirdly, the increasing imports of the fruit during the pre-war days.

Despite the oft-expressed policy of every country fostering only such industries for which the natural conditions are most favourable, there is everything to be said in favour of stimulating such industries as that of the apple in most parts of India, if the policy would serve to assist the country to become self-sufficient in regard to the particular produce. With the apple, the policy of extension and improvement can be justified on both these grounds, since the country has regions possessing natural facilities in some measure as well as those wherein the production can be augmented without much effort and cost and with great economic advantages. The future of the industry can only be planned satisfactorily if its peculiarities are properly assessed, and it is on this consideration that the present attempt has been made.

Area. There are about 16,900 acres under the apple in India, distributed roughly as follows:- Kashmir 10,000, Kumaun Hills 6,000, Baluchistan (Quetta) 500, Kulu Valley 160: Simla Hills 120; Bangalore 60, Murree Hills 30, North-West-Frontier Province (Abbotabad) 20; and the Nilgiris 10 acres.

In Kashmir, the possibilities for extension are almost unlimited. In the Kumaun Hills, land suitable for apple cultivation is restricted due to the nature of the terrain and the general unfavourableness of the summer weather. Any appreciable increase in the Kulu Valley will be only possible with a marked improvement in the existing transport facilities. The Simla and Murree Hills should not have much difficulty in expanding their apple industry if conditions there are as favourable as they are reported to be. It may not be possible for Quetta materially to augment its existing area due to prohibitive production costs. Abbotabad, Bangalore and the Nilgiris appear to be climatically unsuitable for the optimum growth of the apple. This may restrict the choice of varieties to a few which are hardy. But it is very unlikely that they will compare well with the types under commercial cultivation in other more favourable parts of India and may therefore, only serve at best the needs of a purely local market.

Climate. The apple requires considerable winter cold to release it from dormancy and is therefore, pre-eminently a temperate zone fruit suited to regions which have a low winter temperature attended by snow fall. High temperature adversely affect the quality of fruit and for this reason the best apples are characterestic only of tracts with a mild summer weather which is warm but not hot. Judged by these standards, in India, the cultivation of this fruit should be successful in tracts whose maximum temperature is between 90°F. and 100°F. and the minimum from 24°F. to 30°F. Kashmir, Quetta, the Kumaun Hills, the Kulu Valley and the Simla and Murree Hills are well within these ranges; and it is not unnatural, therefore, to see the largest areas under the apple concentrated in these tracts. Abbotabad, while meeting to some extent the requirements of winter cold, has too hot a summer. The Nilgiris and Bangalore have at best only a mild winter with a temperature above 30°F. These places can never, therefore, aspire to become important apple growing centres.

The apple likes an annual rainfall ranging between 25 and 30 inches, though it can bear with much less or tolerate far more. What is important, however, is its distribution during the year. Heavy summer showers are harmful to the developing fruits and hailstorms cause great damage. This feature is the greatest deterrent factor on the Kumaun Hills Late autum rains delay the movement of the trees into dormancy and an insufficient winter rest is reflected in the succeeding poor spring growth and blossoming.

Heavy snow falls are injurious unless the trees have been carefully pruned to provide a strong frame-work. Late spring frosts by their scorching effect on leaf and blossom are particularly detrimental to early flowering varieties.

No apple tract in India is in the fortunate possession of all the desirable climatic features indicated above. But by a judicious selection of varieties, bearing in mind their blossoming and fruiting periods, a proper choice of aspect, site and soil, and a careful building up of the frame-work and the provision of irrigation and drainage where these are necessary, much can be accomplished in places declared unsuitable after a superficial assessment of the climatic factors.

Soils. The apple grows on a variety of soils ranging from the deep loams of Kashmir, the light loams of the Kulu Valley, the brown sandy forest soils of the Kumaun Hills to the stony infertile soils of Quetta. Though it is able to adopt itself to such diverse soil types, it can thrive only if unfavourable factors are modified suitably. The deficient moisture content of sandy soils in summer months must be made good by irrigation. Infertile soils should be frequently manured to meet the needs of the trees. In Abbotabad and the Kumaun Hills, the apple tree is prune to root-borer attack on sandy or sandy loam soils and prophylactic measures may be necessary to keep the trees free from it. In any particular locality, however, where a choice among different soil types is available, a deep heavy loam is to be preferred to all others.

Varieties. The choice of the varieties to grow in any particular tract is conditioned by several factors. First, there is the suitability of the olimate to be taken into consideration. While in temperate tracts like Kashmir or Kulu, most apple varieties may do well, in places like Bangalore or the Nilgiris, the range of varieties that would grow is restricted to those that are only sub-tropical in their requirements. On these grounds, for example, it is seen that while varieties like Rome Beauty farewell at the latter places it is manifestly impossible to expect success with a purely temperate variety like Cox's Orange Pippin. Secondly, as circumstances exist now, certain varieties, though naturally adapted to a tract, may not thrive due to their susceptibility to pests like the woolly aphis, if it has established itself there. There is no better example of this feature than on the Nilgiris. Rome Beauty, Winterstein and Edward VII are varieties which would thrive in this region except for their extreme susceptibility to the pest which renders the trees unthrifty and unprofitable to cultivate. As measures to control the pest or to inculcate some degree of resistance in these varieties involve several time-taking devices, the choice in the first instance requires to be restricted to blight-resistant types such as Irish Peach, Carrington, and Allsop's Early. Thirdly, where conditions permit of a wide choice of fruits to grow, it becomes an economic necessity to limit the choice of apple varieties to those that would yield better returns than other fruits. An instance to illustrate this is available in Kashmir, where the majority of apple growers prefer the indigenous Ambri to all others, for its superior yields bring in an income larger than closely competing crops such as

pears, cherries and walnuts. Fourthly, the varietal selection also depends upon the market which absorbs the produce. From Kashmir, the produce is easily transported and as such, bulk consignments are despatched with facility to markets in Bombay and other large cities. The consumers in these areas are largely Indians who prefer the sweet Ambri to the sub-acid English or French varieties. In contrast, the Kulu apples reach the consumers directly from the place of production as transport in bulk is beset with difficulties and the crop has therefore to be consigned in small lots. This has made it possible to cater to the Europeans scattered in different places in India who prefer the sub-acid fruit of the foreign varieties they have been accustomed to. The consequence of this chain of factors is, that while in Kashmir the Ambri is the predominant variety under cultivation, in Kulu, English, French and other foreign varieties hold the field. Finally the selection of varieties depends on several other factors such as late blossoming to avoid spring frosts, sturdy growth to sustain the weight of snowfall in the winter and resistance to drought where natural rainfall is low and water sources inadequate.

It will thus be seen that the final choice of a particular variety or varieties in any tract has to be made after giving due consideration to several independent and intermingling factors. Out of experience over several decades, each of the apple-growing tracts in India has on hand a list of the best varieties to grow. This is given below but is by no means final, and will no doubt, be added to, from time to time. The names of the varieties have been recorded as they were given to the author in each of the tracts he visited.

Kashmir Ambri, French Red, Russett, Cox's Orange Pippin, Mackintosh, Pearmain, Ribston Pippin, Golden Russett, Esopus Spitzenburg, Northern Spy, Mr. Gladstone and Blenheim Orange Pippin.

Kulu Valley: Red Delicious, Black Ben Davis, Golden Delicious, Cox's Orange Pippin, Granny Smith, Baldwin, Stamford Pippin, Red MacIntosh, Yellow Newtown, and Red Astrachan.

Kumaun Hills: Red Delicious, Jonathan and Rymer.

Quetta. Varieties going by the name of Kulu and Kashmir but apparently unidentified.

Bangalore: Rome Beauty.

Coonoor, on the Nilgiris: Irish Peach, Allsop's Early, Carrington, Signe Tillisch, Zouche's Pippin, Rome Beauty, Winterstein and Edward VII.

Stocks and Propagation. It is interesting to note that nowhere in India are apple orchards built up from seedlings. Vegetative propagation of varieties on some rootstock or other is universal.

The rootstocks in use are varied and peculiar to each tract. In the more important apple-growing tracts such as Kashmir and Kulu, though the existence of clonal rootstocks is known, seedling stock is common, as it is a general belief that the former are not essential to ensure uniformity in the orchard population. The seedling rootstocks in use are generally of the wild apple varieties, occurring in each tract, which are mostly known by local names. It should prove an interesting study to describe these in detail and assign them to the particular botanical species to which they belong. In Kashmir, the wild indigenous apples are known as 'trels' and the two types recognised are 'Buth trel' and 'Kichahama trel'. In Kulu again, the crab seedling is generally used as stock, but it is not known if this is an imported type or indigenous to the tract. In Quetta, two varieties of the local wild apple known as 'Shakar Sheb' and 'Jungli' are utilised. In Kumaun, the general practice is to collect seed of any apple available and use it for raising seedlings for stock. In Bangalore, the original apple plantations were all raised on the imported crab stock. But the industry failed due to the infestation of the stock by the woolly aphis. Thereafter, the resistant rootstocks were brought into use and most of the apple orchards now consist of scion varieties on resistant Northern Spy stock. On the Nilgiris, again, the existing area of apple is on the crab stock.

The importance of clonal rootstocks and of those that are resistant to pests and diseases has not yet been sufficiently appreciated except in tracts like Bangalore and the Nilgiris where probably, apple cultivation would become extinct without such stocks. In the more favoured tracts, the perceptible effects of their use are not likely to be spectacular but are bound to improve on the present position. For instance in Kashmir, the standard is the most popular system to which apple trees are trained and the utilisation of variable seedling stock often fails in this purpose. Clonal stocks of the very vigorous Malling XVI would eliminate this defect. In the Kangra and Kulu Valleys and in Quetta and the Kumaun Hills, it is admitted that the woolly aphis takes a fairly large toll of the yearly crop by the damage it inflicts on the growing buds. Here, root-grafting scion varieties to the immune Merton stocks may appreciably reduce the loss. In Bangalore and the Nilgiris, the apple fails to thrive when infested by this pest and the use of the resistant Northern Spy or Merton stocks is indispensable. Though the crab was replaced by Northern Spy in Bangalore, the position is still not very satisfactory due to the susceptibility of this stock to collar rot disease, and a further change-over to the Mertons or *Pyrus baccata* for resistance to both the pest and disease simultaneously is now being attempted. On the Nilgiris, orchard experience gained during the last three years has given indications that root-grafting apple varieties on the immune Mertons offers a promising combination immune to the root phase and resistant to the aerial phase of the woolly aphis pest.

For propagating the apple, shield budding is generally adopted excepting on the Nilgiris, where, in spite of repeated trials, the process has at best given only a success of about fifty per cent. The reasons for this are obscure but the climatic features may be responsible in some measure for this unusual feature. Whip grafting, on the other hand, gives almost one hundred per cent success in this tract, and the method, therefore, is in general use. It is also reported that grafting is fairly commonly used on the Kumaun Hills. Of the other methods, bench-grafting is being given serious consideration, though the purpose varies in the tracts where it is being tried. In Kulu, for example, the prevailing nursery practice involves a period of three years from the time the seeds of the stock are sown to the stage when the apple grafts are ready. A reduction in this long period would cut down production costs considerably and an attempt is therefore now being made to root-graft apple scion varieties on root pieces collected from the base of old established trees. This process takes only one year for the preparation of an apple graft ready to go into its orchard site. On the other hand, as has been detailed before, on the Nilgiris, the root-grafting is of special applicability when varieties susceptible to the woolly aphis are desired to be propagated on the immune Merton stocks.

Orchard Practices. *Training:* The bush tree is generally preferred, excepting in Kashmir where the standard seems to be more popular. It is said that in Simla Hills also the trees are in considerable part, standard. This tree habit seems necessary to cope with the exhuberant growth of the trees as also to enable the scaffold limbs to bear the heavy load of snow during winter in these places. The bush form in the other tracts is adopted to suit the higher summer temperatures which might scald the trunks of standard trees.

Cultural Practices: These differ from place to place depending on the climatic features. Manuring, intercultivation and irrigation are all adopted in a lesser or greater degree depending on the tree requirements. Kashmir alone presents some unusual features. To the apple grower in this region, manuring and irrigation are not of so much significance as the hoeing and intercultivation of the soil at least four times in a year. Every apple orchard is kept meticulously clean of weeds and ploughed in the alleys. But manuring is done, if at all, only once in the course of three or four years, each tree getting even then, only two or three bushels of cattle manure. Irrigation, again, is sometimes given only to young orchards in their pre-bearing age. These peculiar practices have been evolved through experience and are possible because of the natural fertility of the soil and the adequate yearly rain and snow fall.

Pruning: Nowhere in the apple growing tracts of India are orchards pruned to a definite method. Largely, the process resolves

itself into building a frame-work in the early years and the removal of dead, diseased and crossing limbs later. It appears as though a more rational system for the various varieties could be formulated if careful trials are conducted. Singh R. S (Pruning of Deciduous Fruits–U. P. Dept. Agri. Fruit Series Bulletin, 18, 1937, p. 5) has described a system of pruning apples but it does not seem to be practised in any of the apple-growing regions in India. At Coonoor an annual tipping of leader and lateral shoots in a pronounced non-spur bearer viz., Winterstein, has recorded even up to 14 per cent increased yields over unpruned trees. With suitable variations in the details, it should be possible to devise pruning systems suited to different varieties in cultivation at different places.

Fruit thinning Fruit thinning as a measure of preventing the exhaustion of heavy bearing trees and for the increase in size of individual fruits is a normal practice in Kashmir, Kulu and the Kumaun Hills. The severity of thinning varies in the different places. While in Kashmir and Kulu the thinning is done on empirical lines, in Kumaun, work at Chaubattia has shown that the early varieties should be thinned thirty days after full blossom while with the later varieties the period may be extended by another ten days. It has also been found here that, in the former group, thinning should be restricted to leave one fruit to 30 leaves and with the latter one fruit to 25 leaves. At Coonoor, attempts at thinning one of the few prolific varieties, Irish Peach, resulted in severe restriction of the crop without tangible increases in fruit size. It thus seems necessary to determine the effects of thinning for each tract independently.

Yields. Perhaps there is no other character of the apple which differs so widely in the different tracts as the estimated yield. In Kulu, it is reported that yields up to 1,250 pounds have been recorded annually. The estimate in Kashmir is 150 pounds per tree which appears too modest considering the eminent suitability of the tract to apple-growing and the large size to which the tree grows. The figure, more likely, represents the average for the State on the basis of the total number of trees which would include young and non-bearing plants. The average yields cannot be far inferior to those for Kulu. The bearing propensities of apple trees in Quetta and Kumaun are decidedly on a lower scale than in either Kulu or Kashmir and an average yield per tree per year of about 100 pounds may not be far from reality. At Bangalore and Coonoor, the apple performs poorly, the orchard average, perhaps, not exceeding 25 pounds per tree per year.

Longevity. The economic orchard life of apple trees in Kulu and Kashmir is reported to be more than sixty years. In Quetta and Kumaun Hills, forty years is a fair maximum. In Coonoor, the profitable life of a tree extends only up to about 25 years, while at Bangalore it is even less, being only about twelve years.

Pests and diseases. The pests and diseases to which the apple is subject, in so far as the northern territory is concerned are more or less the same. The woolly aphis, root and stem borers and the San Jose scale among pests, pink disease, collar rot, stem black, and stem brown among diseases, are some of the major enemies. In the South at Coonoor, the woolly aphis and pink disease and lately the San Jose scale are the only three which have assumed serious proportions, while at Bangalore, in addition to these, the collar rot is also of importance.

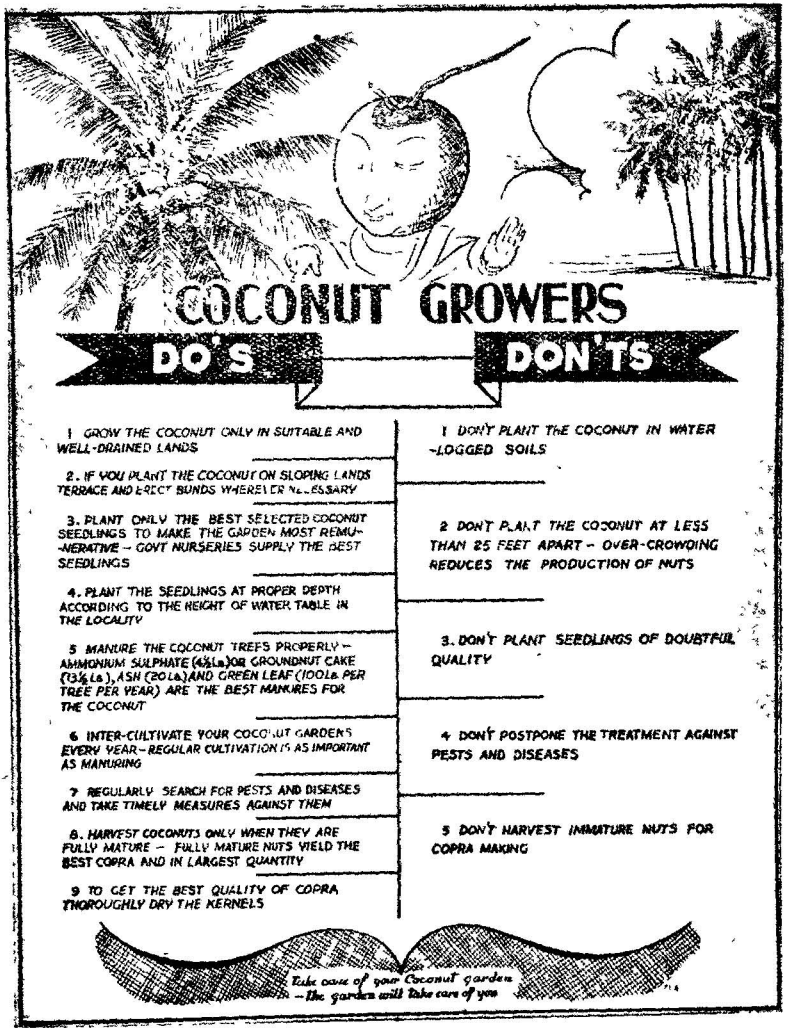
Acknowledgements. The material embodied in this paper was collected by the author during a tour of three months on which he was deputed by the Government of Madras to study fruit-growing and research problems in some of the more important fruit-growing provinces and States of India. His thanks are due to the officers of the various Departments of Agriculture of the Provinces and States he visited, who so readily assisted him in collecting information on the cultivation of the apple and other fruits. His thanks are also due to Sri K. C. Naik, M. Sc., Fruit Specialist, Madras for his helpful criticisms and suggestions in the preparation of this paper.

[*Author's Note*: Since the writing of this article, there have been changes in the constitution of some of the provinces, and some of the regions such as Abbotabad and Quetta now form part of Pakistan But since the survey was made of the provinces as a whole and the subject was dealt with taking India as a unit as it then existed, it is felt that the presentation of the material as collected would be the best, instead of trying to recast it to fit it into the revised boundaries.]

D. D. T.

D. D. T. has been found a cheap and effective means of control of the two pests that attack linseed crops — Heliothis Armigera, (a caterpillar known also as the tomato grub, corn-ear worm, cotton boll worm or lucerne caterpillar), and the red-legged earth mite. The Heliothis caterpillar is controlled by dusting either from the air or from power dusters mounted on jeeps or trucks. The rate of application is 12 lb. to the acre of 5 per cent dust, or 30 lb. to the acre of 2 per cent dust. Where crops are being grown under contract, the purchasers have arranged to dust crops from the air at their expense, the farmer being only responsible for the cost of the D. D. T. dust used. Usually only one treatment is necessary. Crops are dusted about 10 days after they come into full flower by light aeroplanes which trail the insecticide in 30 foot strips. To protect crops against the earth mite, farmers mix D. D T. with super-phosphate and apply it through a seed drill or fertilizer. After a few weeks, when the mites have been killed, the super is worked into the soil. (Agricultural News letter No. AGN/216).

HINTS TO FARMERS



(CONTRIBUTED BY THE OIL SEEDS SPECIALIST.)

HINTS TO FARMERS.

Green Leaf Manuring is the trampling in of green leaves of all kinds brought from outside. Apart from the beneficial effects in the mechanical condition of the soil resulting in the application of a bulky organic manure this method of manuring adds distinctly to the plant food already stored in the soil.

Green Manuring is the ploughing in of a green manure crops, usually leguminous crops like sun-hemp, kolingi, daincha etc., green on the land. It saves cart hire and other transporting charges incidental to green leaf manuring and so far as potash and phosphoric acid are concerned, does not add to the total manurial content of the soil, only these ingredients are absorbed by the green manure plants from deeper layers and left in a fairly easily decomposable form in the debris of these plants. So far as nitrogen is concerned green manuring is distinctly advantageous in that leguminous plants, developing nodules in the roots full of nitrogen — assimilating bacteria which act in symbiotic growth with the plants, are able to fix the atmospheric nitrogen and store the resulting organic nitrogen in their tissues for future uses of subsequent crops.

— *Contributed by P. Satyanarayanan, Anakapalle.*

Agricultural News Letter October, 1948.

ISSUED BY THE DEPARTMENT OF AGRICULTURE.

1. Training Boys to Take to Agriculture as a Profession:

An Agricultural Training School to equip sons of mirasdars as professional Agriculturists on scientific lines has recently been opened at Orathanad in the Tanjore District. The District Board, Tanjore, has placed lands for the farm with necessary buildings and funds at the disposal of the Government to run the Institution. Boys from all the Tamil districts with a pass in the III Form are eligible for admission to the School Tuition is free and students will have to meet only their boarding charges. Instructions are given in Tamil. The course lasts for one year.

2. Right Guidance to Establish and Maintain Orchards for Profit and Pleasure:

In order to give correct guidance in the selection of sites, layouts, choice of varieties of fruits and maintenance of orchards, Diploma and Certificate courses in Horticulture for selected Agricultural graduates and fieldmen of the department have been opened on the 15th August. The duration of the courses will be one year and the trained men will be posted as Special Agricultural Demonstrators to the districts to advise ryots on scientific fruit-farming.

3. A Promising Strain of Castor:

Castor strain TMV. 1, in a trial in Markapur taluk in the Kurnool district recorded an yield of 635 lbs. per acre while the local unselected block yielded 272 lbs. Cultivators growing castor are advised to apply for supply of this strain of castor to the nearest Agricultural Demonstrator.

4. Welcome News to the Sugarcane Growers:

Apart from high yield, sugarcane varieties are judged by their richness of juice with high sucrose, low glucose and organic non-sugars. Of the number of varieties that are under trial in the various Research Stations, CO. 449, while combining high sucrose contents and low glucose and organic non-sugars has been consistently found to outyield 419, now holding the field. It is expected that CO. 449 will soon become a popular variety both in the factory areas and for making jaggery with good keeping quality and colour.

5. Prospect of Improving the Western Cottons in the Bellary District:

H. 1, otherwise popularly known as Farm Westerns among traders and Farm Cotton among cultivators, has been the ruling type covering over 85% of the area under westerns in the Bellary and Anantapur Districts. This strain is however poor in its ginning quality (29%) and other characters like fineness, strength, length of fibre and yield compared to the types grown in the Bombay cotton tracts. The Bombay types yield well and record a ginning percentage going upto 40%. But they are of longer duration and will not be successful in the Bellary area. In order to combine the good characters of H. 1 and that of Bombay types, an intensive breeding programme is in progress, to isolate a type combining the desirable characters of both the parents. The work has now reached a stage when some promising cultures are ready for being tried in cultivators' fields.

6. A New Mungari Cotton:

Trials of 881 F on cultivators fields to obtain a fair estimate of its yield and cash acre return has been in progress in the mungari area of the Bellary District. 881 F. proved its superiority over the control in lint length, spinning value and cash return per acre. It is also gratifying to note a voluntary demand from farmers for the seed of the new strain 881 F. even in its trial stage.

7. A Case of Intelligent Application of Research:

A tea estate owner 3 miles from Coonoor has a fruit garden of 7 acres with a mixed crop of tea. After receiving instructions from the Pomological Station, he has with advantage topworked unthrifty common pear trees, with scions of superior varieties (Kieffer) and also topworked a few branches of each of the trees belonging to infertile plum varieties with scion of other varieties which flower simultaneously with the former to provide effective cross-pollination. It is hoped many more estate owners in the Nilgiris will take advantage of the researches carried on at the Pomological Station, Coonoor and profit themselves.

8. A tip to the apple growers in Coonoor:

A three per cent raw linseed oil emulsion dormant spray in Winterstein apple trees in the Pomological Station, Coonoor, increased their flush and flower production *five-fold* and also brought them into spring activity, six weeks in advance of the untreated trees.

9. Cinomon Growers to Note:

At the Burliar Fruit Station, propagation trials with different fruit trees, spices are in progress. In the course of trials it was noted that cinnamon could be easily propagated vegetatively by layering.

10. No need to be worried over potato tubermoth:

Consignment of a parasite on the potato tubermoth was obtained from New Delhi. It is being successfully multiplied at the Insectory, Agricultural College, Coimbatore. These parasites in large numbers will soon be regularly released on the potato crops on the Nilgiris.

11. Do not despair of the damage by early shoot borer on sugarcane:

The havoc done by the early shoot borer pest on sugarcane is successfully checked by weekly releases of Trichoramma parasite, a dozen times, commencing a month after planting. The parasite "nips the attack in the bud". It lives on the contents of the eggs of the borer and makes the hatching of the larvae impossible. The results of the trial for the past few years have shown that the regular releases of the parasites bring down the borer infestation in the field with consequent higher yield compared to untreated areas. From 1947, the East Indian Distilleries and Sugar Factories Ltd., Nellikuppam are systematically rearing the parasite for liberation in about 60 acres of the sugarcane crop grown directly by the Factory.

12. Waste not—Croton sparsiflora (Malagaipoondu):

Croton Sparsiflora (Malagaipoondu) is a common weed growing wild in all waste land, road margins, tank bunds, canal, embankments and in the field in the offseason. In some tracts, there is a prejudice against its use as green manure and it is a pity to see it utilised as fuel by potters in villages. It is also considered harmful by some cultivators to use it as a green manure or convert it into compost. At the Tirurkuppam Rice Research Station, this weed is being used as green manure for the paddy crop in succession for a number of seasons with good advantage. Its effect is as good as that obtained by using pungam leaves. No adverse effect was noted on the crop. Do not therefore hesitate to use the wild growth of Croton sparsiflora as green manure. Chemical analysis of the plant compares very favourably with other green manures and also shows higher percentage of potash than some of the common green manure crops now in use.

13. Adopt the correct method of applying phosphatic manure:

Many farmers very often make the mistake of applying phosphatic manure such as bone-meal, hoof and horn-meal and super phosphate as a top dressing and say that no useful results are obtained by their application. They are no doubt concentrated manures like ammonium sulphate and oil cakes. But their action is best realised only when applied before the final cultivation operation. The manure should be available at the root zone of the plants for them to utilise the full benefits of the manure applied. Avoid surface application of phosphatic manures when the crop is on the field. Plough in phosphatic manures before sowing or planting.

14. A new food crop for the Nilgiri:

Buck Wheat is an exotic crop and it is found to thrive well in the Agricultural Research Station, Nanjanad on the Nilgiris. The seeds are edible and the flour can be used for preparing pan cakes, bread and pastry. This crop can be successfully cultivated after potatoes. It is to be sown in April and is ready for harvest in August yielding 450 lb. per acre. Small quantities of seed are available for trial at 4 as. a lb. from the Superintendent, Agricultural Station, Nanjanad, the Nilgiris.

Extracts.

The teaching of Statistics (Calcutta Statistical Association Bulletin No. 4, August 1948, 191).

In the context of the rapid growth of the subject, a complete teaching programme in statistics must be designed to meet the needs of four principal categories of students (1) all college students, (2) future consumers of statistics, (3) future users of statistical methods and (4) future producers and teachers of statistical methods.

As regards the first category, statistical method is a vital branch of scientific method and it is widely used in most sciences, business, government and ordinary life. Some understanding of the nature of inductive inference from quantitative data on the basis of the theory of probability as portrayed in statistical methods is an indispensable part of a liberal education. It would be an appropriate subject to include in survey courses of physical or social sciences that have become common in recent years. No mathematics need be included although some elementary experiments may well be shown to instill concepts of sampling variation, randomness and statistical predictability.

Under the second category i.e, future consumers of statistics, come all those who specialise in administration, business or other subject matter where it is necessary to understand the results of statistical analysis of special problems, although they themselves do not make the analysis. These students will require some knowledge of the kind of statistical material available in their field of specialisation of the sources of such data, and of their limitations. They will also require a knowledge of what statistics can and cannot do, what the major statistical techniques are and how to interpret the results obtained by the application of such techniques.

In the third group the students are training themselves for careers of specialisation in economics, population, business research, industrial production, agricultural science, biology, physics, chemistry, psychology, or some other field that makes extensive use of statistical methods. Students planning to specialise in such fields need statistical theory and statistical methods as a tool. They would require a thorough comprehension of the logical foundations underlying the various statistical devices and sufficient of the derivation of these devices to be able to adapt them to the special circumstances that arise in their special fields. To provide this background a minimum of a full year's course in fundamental statistical methods is essential followed by courses of application. It is usually advisable that three courses in application be given in the department of application (eg. agriculture, population, engineering etc.) The fundamental one year course would obviously be a prerequisite.

The fourth group comprises those who intend to specialise in statistical methods for the sake of statistical methodology. Many of these will become teachers or full time research workers, though some may find posts in Government or Industry in high grade statistical work that requires the development of new statistical theory or methods. These people clearly require a far more intensive training in theory than the other three groups, and a knowledge of advanced mathematics as an essential prerequisite.

The teaching and training programme for all the four categories should be organised around an Institute or Department of Statistics In addition, the Department should offer its services as a consulting centre on problems in statistics arising in other departments because research in statistical methods peculiarly require stimulation from close contact with applications. The department should be primarily responsible for the teaching of courses in statistical methods, the fundamental courses, specialised methods in particular fields of application and advances courses in theory. Intermediate courses dealing primarily with applications ordinarily belong to other departments such as agriculture,

economics, etc , although some may be given in the department of statistics. The exact location of these applied courses will depend on the accident of the departmental affiliations of the persons competent to teach them. Co-ordinations of the teaching programme in statistics can be achieved by an inter departmental committee.

There is in addition the need of providing training facilities to nature research workers who lack adequate statistical training to keep them abreast of recent developments in statistical methods. There is also the need of providing advanced research workers in particular fields with highly specialised guidance in selected topics.

In conclusion, it is also to be emphasised that courses in statistical methods should be taught by competent statistical theorists, while the applied courses should be taught by people thoroughly conversant with the relevant subject matter in practice as well as in statistical methodology. — T. R. N.

Gleanings

Rice is vital to World Food Economy: First Post-War Allotments to Europe— Very small quantities of rice will soon be available to the public in Britain for the first time since World War II when rice imports were suspended to help the rice-eating countries of Asia.

Following Britain's example, no rice allocations were made to European Countries from non-European sources during 1946 and 1947. Only at the end of last year was it decided to resume limited shipments and the small amount of 61,000 tons was allocated to Europe for the first six months of 1948. This experiment followed proposals by the principal exporting countries that the resumption of the historic trade would be an inducement to their growers, who before the war had developed markets for special types of rice. In consideration of such allocations to European countries, exporters of rice also agreed to put additional quantities of rice into the general pool for distribution in South and East Asia.

It has now been decided to continue this policy of limited shipments to Europe and an allocation of 1,72,250 tons of rice to European countries for the whole of 1948 has been recommended, this quantity includes the 61,000 tons previously allocated. Compared with pre-war years, when Europe's rice imports averaged 12,62,000 tons, the allocation is, of course, small.

World Production: World Production of rice in 1947—48 was slightly below the pre-war average. In milled rice equivalents the latest crop totals 94,300,000 tons, as against the pre-war average of 9,48,00,000 tons. The most significant fact that emerges from an analysis of the available statistics is the post-war decline in the yield of paddy (rough rice) in Asia. Except for China, this decline has been general.

For Asia as a whole, the rate of yield seems to have fallen from 17·9 quintals* before the war to 17·4 quintals in 1946 and 1947. Lack of good seeds, fertilizers and other production requisites continues to affect the productivity of the rice land under cultivation. Restoration of the damaged irrigation and drainage systems in the war devastated areas is being carried out, but the progress is slow because of the shortage of machinery and equipment.

*Quintal = 220 lb.

International trade in rice during the five years 1934—38 averaged 8,300,000 tons annually. About 70 per cent of this amount came from three leading surplus countries—Burma, Siam and French Indo-China. Next in importance as exporters were Korea and Formosa, which together furnished about 22 per cent of the total. The balance came from Europe, the Middle East, the Americas and Australia.

As a result of the Japanese occupation, the Asiatic exporting countries suffered heavy damage, but progress in the restoration of exports is now satisfactory in Burma and Siam. Burma is expected this year to export about 50 per cent of its pre-war average, and Siam about 40 to 45 per cent. Recovery in French Indo-China is retarded and Formosa and Korea have not yet resumed exports.

An outstanding development in international trade in rice has been the role assumed by the United States as an exporter in recent years. Before the war, the U. S. exported about 205,000 tons of rice annually, in 1947 her exports were 446,000 tons. Thus, the U. S. became the second largest exporter of rice after Burma. Without the contributions made by the United States, Brazil, Egypt, Ecuador, Mexico and other non-Asiatic countries, the food situation in Asia would have even been worse than it was, in fact, during 1947. More than 40 per cent of the 2,200,000 tons of rice which entered international trade in 1947 came from these non-Asiatic sources. A quantity of Egyptian rice was bought by the United Kingdom Ministry of Food for export to Ceylon, India and other rice-consuming countries of Asia in exchange for an equivalent amount of bread grains.

Export Prospects: This year, world rice exports are expected to reach about 3,300,000 tons, which, however, is still less than 40 per cent of the pre-war figure. The United States and several of the South American countries are expected to supply smaller amounts to the deficit countries, while the traditional sources of supply in Asia will regain some of their lost ground.

In spite of the improvement in production and exports of rice, the supplies available to the rationed populations of deficit countries are far from adequate. Even if pre-war levels of exports were attained, this would not be sufficient in view of the increased population in the deficit countries. At the same time, the surplus countries have themselves increased populations to feed, and these increased domestic requirements have reduced their export surpluses.

The acute shortage of rice in South and East Asia, where more than 90 per cent of the world's rice is eaten, has created an abnormal demand for substitute food grains, which are themselves in short supply. It has also induced greater consumption of oil seeds in Asiatic producing areas and thus reduced the supplies available for export to Europe and America. Thus the rice shortage has had a serious effect on world food economy.

Only increased rice production can solve the problem, and an increase of 4,000,000 tons in the production of milled rice over the next three years, for 14 Asiatic and 10 non-Asiatic countries, is planned. [George Martin—Bulletin issued by the British Information Services—New Delhi].

The Discovery of Sugar as Medicine: Only within very recent times has sugar come to the fore as a valuable medicine. In 1907, Dr. Fleig published an essay in which he pointed out the advantages of using sugar in preference to any other stimulating fluid. Among the most ancient of diseases is seasickness; and it was found that in seasickness the blood contained a great many acid bodies, which gave rise to a state, known as a acid osis. This discovery proved of particular interest to Dr. G. H. Oriel of the Canadian Pacific Steamship Company, who found that sugar given by mouth in cases of seasickness produced a distinct improvement, stopping almost at one the bothersome symptoms sugar such as headache, dizziness and vomiting. The acid bodies in the blood were neutralized, the urge to vomit was controlled and the patient felt in high spirits at once. The vomiting of

pregnancy too was akin to the vomiting of seasickness—the reason being lack of sugar in the mother's body, caused by the heavy drain made by the growing child in the mother's womb. The injection of sugar directly into the blood stream restores the sugar level at once to its required level and counter-acts the whole train of unpleasant symptoms, the most serious of which is vomiting.

In cases of sleeping sickness which follows severe attacks of influenza, intravenal sugar injections have proved very helpful in relieving the undesirable symptoms such as delirium and tremor of the arms and legs. Sugar is also very useful in diseases of the liver, arising out of the effects of choloroform and phosphorus. In jaundice, where the skin becomes yellow due to the leakage of bile into the blood, the administration of sugar by mouth in mild cases and by vein in more severe cases is very helpful not only improving the itching of jaundice but also in bringing the coagulating power of the blood to normal, sugar also a very desirable food for patients with stomach ulcer as it furnishes the required energey without irritating the stomach and setting up painful hunger contractions. In the treatment of shock, brought on by a variety of conditions viz., long exposure to cold or privation, extreme fatigue, wasting diseases, exhaustion after child bearing, injection of sugar solution directly into the blood stream is often the means of saving life Sugar acts as a reviving tonic in all cases of over-strained heart action and increases the value of other drugs used in combating heart disease. As the years went by, it was found that sugar is one of the greatest poison fighters known, particularly the poisons secreted by germs which seemed to have a peculiar affinity for the heart, like diphtheria for example and pneumonia toxins. In the crippling heart disease known as angina pectoris, sugar is of great value, as it relaxes the spasms of pain and supplies readily available energy to the heart muscle.

So valuable has sugar proved as a medicine that doctors have looked about for new conditions in which it might be tried. Dr. Sansum found that sugar was of value in reducing the terrific eye tension in glaucoma, a serious eye disease. Dr Guthree found that when sugar was injected into the veins it raised the lowered blood pressure resulting from gangrene of the limbs. Sugar is the fuel which fires life's engines. It is the means by which the body is run. It is the most quickly utilized of all foods and is in fact the only food which can be injected directly into the blood stream to bolster up bodily energy quickly and without any unpleasant reactions. [Edward Podolsky. Sugar: June 1948.] T.R N.

Agricultural College and Research Institute Library.

LIST OF ADDITIONS FOR OCTOBER 1948.

1. ADAMS (ROGER) Etc. Ed. Organic Reactions (2 Volumes), 1947.
2. CHESTER (K. STARR) Nature and Prevention of the Cereal Rusts, 1946.
3. CHITRA (V. R.) Furniture and Other Designs, 1947.
4. HOWES (F. N) Nuts, Their Production and Every Day Uses, 1948.
5. LOOMIS (FREDERIC BREWSTER) Field Book of Common Rocks and Minerals (17th Impression), 1943.
6. YEGNANARAYANA IYER (A. K.) Foods and Fodder, 1944.
7. YEGNANARAYANA IYER (A. K.) Milk and Milk Products (Edition 2), 1948.
8. INDIAN COTTON Textile Industry (Annual, 1947—48).
9. STATISTICAL ABSTRACTS for British India, 1936—37 to 1940—41, 1948.

Mr. V. C. VELLINGIRI GOUNDER.

OBITUARY

It is with great regret we record the death of Mr. V. C. Vellingiri Gounder which occurred on Sunday, 7th November 1948 at Coimbatore.

Mr. V. C. Vellingiri Gounder was a leading agriculturist of the Coimbatore District who took a prominent part in the public life of the Province. He was a member of the old Council of State and the old Central Legislative Assembly for a long period. He was President of the Coimbatore District Board for a term and served on a number of non-official committees of public importance. He was closely associated with the activities of the Madras Agricultural Department, and was at the time of his death one of the non-official visitors to the Agricultural College and Research Institute.

He was an esteemed Patron of the Madras Agricultural Students' Union, and took an abiding interest in all its activities. He seldom failed to attend the Annual College Day and Conference, and his contributions to the discussions bearing on the practical aspect of agriculture were always very helpful.

Though saddled with heavy responsibilities pertaining to his position as the senior member of a family with large landed properties distributed throughout the Province, Mr. Gounder acting on the motto "*Noblesse Oblige*" devoted considerable part of his time and energy on matters of public weal, in a spirit of disinterested devotion to duty, and sincerity of purpose. In all his public activities, he was greatly respected by his colleagues for his integrity of character and loyalty to principles.

His death is an irreparaple loss to the Province and the Madras Agricultural Journal, takes this opportunity to place on record, its appreciation of Mr. V. C. V., for the invaluable services rendered by him to the cause of agricultural progress in this Province.

Crop and Trade Reports

Statistics — Crop — Paddy — 1948-'49 — First Forecast Report. The average area under paddy in the Madras Province during the five years ending 1944—'45 represents 13·3% of the total area under paddy in India. The area shown with paddy upto 30th September 1948 is estimated at 6,099,000 acres. When compared with the area of 6,203,000 acres estimated for the corresponding period of last year, it reveals a decrease of 1·7 per cent. The area estimated is the same as that for the last year in the Nilgiris District An increase in area is estimated in the disiricts of Vizagapatam, East Godavari, West Godavari, Krishna, Kurnool, Bellary, Malabar and South Kanara, and a decrease in area in other districts of the Province. The decrease is due to late and inadequate rains during the sowing period and insufficient supply of water in irrigation sources. The first crop of paddy is being harvested in parts of East Godavari, Chingleput, Coimbatore, Tiruchirappalli, Tanjore, Tirunelveli and Malabar Districts. The yield is expectd to be generally normal in the Circars, Malabar and South Kanara and below the normal in the other districts of the Province. The condition of the standing crop is reported to be generally fair except in parts of the Deccan, Chingleput, Chittoor and Ramnad Districts. Attack of pests have also been reported in parts of Krishna, Guntur and Tanjore Districts. The average wholesale price of paddy 2nd sort per imperial maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from important market centres on 16—10—1948 was Rs. 6—5—0 in Negapatam, Rs. 6—10—0 in Masulipatam, Rs. 6—14—0 in Mangalore, Rs. 7—1—0 in Kumbakonam, Rs. 7—2—0 in Tirunelveli, Rs. 7—8—0 in Vijayawada and Cuddalore, Rs. 7—13—0 in Thiruchirappalli, Rs. 8—11—0 in Ellore and Rs. 9—9—0 in Virudhunagar.

(From the Economic Adviser).

Statistics — Crop — Gingelly — 1948-'49 — Second Report. The average area under gingelly in the Madras Province during the five years ending 1944—'45 represents 14·7 per cent of the total area under gingelly in India The area under gingelly upto 25th September 1948 is estimated at 371,900 acres. Compared with the area of 372,200 acres estimated for the corresponding period of last year, it shows a decrease of 0·1 per cent. The area estimated is the same as that of last year in the district of Madura. An increase in area is revealed in the districts of Vizagapatam, Guntur, Nellore, Salem, Coimbatore, Tirunelveli and South Kanara and a decrease in the other districts of the Province due mainly to want of timely rains for sowing The variations are marked in the districts of East Godavari (—2,000 acres), South Arcot (—3,000 acres), Salem (+ 14,000 acres) and Tiruchirappalli (—4,000 acres) The early crop of gingelly has been harvested in parts. The yield per acre was generally normal except in the districts of West Godavari, Chingleput, Madura and Ramnad. The main crop of gingelly is reported to have been affected for want of rains during the period of its growth in the districts of West Godavari, Bellary, Anantapur, Cuddapah, Nellore, Chingleput, Salem, Tiruchirappalli, Tanjore and Madura. The condition of the crop is generally satisfactory in the other districts of the Province The wholesale price of gingelly seeds per Imperial Maund of 82 2/7 lb. as reported from important market centres on 4—10—1948 was Rs 28—7—0 in Tuticorin, Rs. 28—5—0 in Cocanada, and Cuddalore, 27—15—0 in Tirunelveli, Rs 27—12—0 in Rajahmundry, Rs. 27—4—0 in Salem, and Rs 26—1—0 in Vizagapatam. When compared with the prices published in the last report i. e., those which prevailed on 9—8—1948, these prices reveal a decrease of 20 per cent in Tirunelveli, 19 per cent in Salem, 9 per cent in Cocanada, 6 per cent in Vizagapatam and 4 per cent in Tuticorin and Rajahmundry.

(From the Economic Adviser).

Statistics — Crop — Groundut — 1948 — Third Forecast Report. The average area under groundnut in the Madras Province during the five years ending 1944—'45

represents 41·5 per cent of total areas under groundnut in India. The area sown with groundnut upto 25th September 1948 is estimated at 2,907,100 acres. When compared with the area of 3,087,200 acres estimated for the corresponding period of last year it reveals a decrease of 5·8 per cent.

The area estimated is the same as that of last year in the district of Madura. An increase in area is revealed in the districts of Guntur and Salem and a decrease in all the other districts of the Province due mainly to want of timely rains for sowing. The variations are marked in the districts of Vizagapatam (—15,800 acres), Kistna (—20,000 acres), Kurnool (—45,000 acres), Anantapur (—26,000 acres), South Arcot (24,000 acres), Chittoor (—10,000 acres) and North Arcot (—12,000 acres). The summer crop of groundnut has been harvested. The yield per acre was normal in South Arcot, North Arcot, Tiruchirappalli and Tanjore and below the normal in the other districts of the Province. The yield of the early crop was normal in the district of Salem and Coimbatore. The main crop is reported to have been affected in parts of Vizagapatam, West Godavari, Kistna, Cuddapah, Chingleput, North Arcot, Salem, Madura and Ramnad by want of timely rains and to some extent in parts of Guntur, Bellary and Anantapur districts on account of insect pests. The condition of the main crop in the other districts is reported to be generally satisfactory. The yield per acre is expected to be normal in East Godavari and Malabar and below the normal in all the other districts of the Province. The seasonal factor for the Province as a whole works out to 89 per cent of the average as against 95 percent estimated for the corresponding period of the previous year.

The wholesale price of groundnut (machine shelled) per Imperial Maund of 82 2/7 lb. or 3,200 tolas as reported from important market centres on 13th October 1948 was Rs. 23—4—0 in Salem, Rs. 23—0—0 in Erode, Rs. 22—14—0 in Coimbatore, Rs. 22—5—0 in Guntur, Rs. 21—11—0 in Tadpatri, Rs. 21—6—0 in Cuddalore, Rs. 20—15—0 in Cuddapah, Rs. 20—7—0 in Nandyal, Adoni and Hindupur. When compared with the prices published in the last report, i. e., those which prevailed on 9th August 1948, these prices reveal an increase of 2 per cent in Hindupur and decrease of 10 per cent in Adoni 7 per cent in Nandyal, 6 per cent in Guntur, 5 per cent in Cuddalore 4 per cent in Erode, 3 per cent in Salem and 1 per cent in Tadpatri.

(From the Economic Adviser).

Raw Cotton in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1948 to 29th October 1948 amounted to 337,091 bales of 400 lb. lint. The receipts in the corresponding period of the previous year were 336,069 bales. 407,592 bales mainly of pressed cotton were received at spinning mills and 30,561 bales were exported by sea while 92,673 bales were imported by sea mainly from Karachi and Bombay.

(From the Director of Agriculture)

Statistics — Crop — Sugarcane — 1948 — Second Forecast Report. The average area under sugarcane in the Madras Province during the five years ending 1944—'45 represents 3·4 per cent of the total area under sugarcane in India. The area under sugarcane up to 25th September 1948 is estimated at 166,650 acres. When compared with the area of 218,860 acres estimated for the corresponding period of last year, it reveales a decrease of 23·9 per cent. The estimated area is the same as that of last year in the Nellore District. An increase in area is estimated in the district of East Godavari, Kistna, Guntur and South Kanara and a decrease in area in all the other districts of the Province. The decrease in area is mainly due to the general fall in the price of jaggery as compared with the price that prevailed during the previous year. The condition of the crop is generally satisfactory except in part of Anantapur, Chingleput, North Arcot, Salem and

Ramnad Districts where the crop has been affected adversely due to inadequate rains during the growing period. The seasonal factor for the Province as a whole works out to 92 per cent of the normal as against 94 per cent estimated for the corresponding period of last year. On this basis, the total yield for the Province, in terms of jaggery, works out to 478,250 tons as against 638,590 tons for the corresponding period of last year, representing a decrease of 25·1 per cent. The wholesale price of jaggery per imperial maund of 82 2/7 lb. (equivalent to 3,200 tolas) on 23rd October 1948 was Rs. 17—13—0 in Erode, Rs. 15—7—0 in Coimbatore, Rs. 14—11—0 in Tiruchirappalli, Rs. 14—4—0 in Adoni, Rs. 13—11—0 in Vizagapatam, Rs. 12—8—0 in Salem, Rs. 11—8—0 in Rajahmundry, Rs. 10—15—0 in Vizianagaram, Rs. 10—11—0 in Cuddalore and Vellore, Rs. 9—13—0 in Cocanada, Rs. 8—4—0 in Chittoor and Rs. 7—13—0 in Bellary. When compared with the prices published in the last report i e., those which prevailed on 11th September 1948 those prices reveal a raise of approximately 35% in Tiruchirappalli, 20% in Vizianagaram, 17% in Coimbatore and 10% in Erode and a fall of 8% in Cocanada, the prices remaining stationary in Vizagapatam, Rajahmundry, Adoni, Bellary, Cuddalore, Vellore, Salem and Chittoor.

(From the Economic Adviser).

News and Notes.

The Hon'ble Sri K. Madhava Menon, Minister for Agriculture to the Government of Madras opened an Agricultural Farm, attached to the Sri P. S. Sivaswami Iyer High School, Tirukattupalli on the 15th November 1948. The Hon'ble Sri M Bhaktha-vatsalam, Minister for Public Works presided. The Farm is situated about a mile from the school premises on the Budalur road

II. **Officers' Club:** The Annual Club Day was celebrated on 23rd October 1948. The Club Day commenced with Breakfast, Indoor and Outdoor games in the morning; there was an enjoyable variety entertainment by the Club members in the evening after a light tea by the Club Committee. Mr. M. C. Cherian, the President of the Club, presided and distributed the prizes.

III. **Students' Corner:** *Meetings*.— A meeting under the auspices of the Students' Club was held on 31—8—1948 when Mr. Chartrand, of American Information Service Bureau, delivered a lecture on "Democratic Diplomacy". Sri R. N. K. Sundaram, Senior Lecturer in Agriculture and Superintendent, Central Farm presided over the meeting.

A special meeting was held on 13th November 1948 when Sri Ashok Mehta addressed the students on the "Problem of Inflation". Sri S. N. Chandrasekhara Iyer, Government Systematic Botanist, presided.

Debates:— A debate was conducted on Friday 5th November 1948. The subject was "That in the opinion of the house an International Organization like U. N. O can only bring about World peace."

Speaker: Sri J Gnanavaram.

Observer: Sri R. N. K. Sundaram, Senior Lecturer in Agriculture and Superintendent, Central Farm.

Proposer: Sri B. Chandrasekhara Rao.

Opposer: Sri P. Krishnamurthi

Many members took part in the debate and at the end the motion was lost by 4 votes.

Inter Collegiate Debate:— Sri B. Chandrasekhara Rao, Final year class, has been awarded third prize in the "Inter Collegiate Debate" held in the College of Technology, Peelamedu, on 6th November 1948.

Students' Tour:— The Final year students of the College were taken on tour during the second fortnight of October in two batches. They visited Katpadi American Mission Farm where goat and Poultry Breeding are in progress. At Gudiyattam, they studied the experiments and the cultivations of sugarcane. Sheep and cattle breeding were studied at Hosur Cattle Farm and Palayakottai At Tiruppur the students visited an extensive grape vine gardens and studied the economics of marketing of grape vine and Cotton. The students of B. Sc. Ag. Class II were taken on tour to the Southern Districts from 31—10—1948 to 13—11—1948. One batch started from Tenkasi while the other began their tour from Nellikuppam The places visited were Tenkasi, Koilpatti, Madura, Pattiveeranpatti, Kodaikanal, Aduthurai, Palur and Nellikuppam. In the various places visited, the local Agricultural practices and the departmental improvements effected were studied At the Agricultural Research Stations at Koilpatti, Aduthurai and Palur the various Experiments conducted and the results obtained were gone into in detail The students evinced a keen interest in the various apparatus etc., seen at the Meterological Observatory at Kodaikanal and the Sugar Factory of Messrs. East India Distilleries and Sugars Ltd., at Nellikuppam.

Weather Review—For October 1948.

RAINFALL DATA.

Division	Station	Actual for month in inches	Departure from normal in inches	Total since January 1st in inches	Division	Station	Actual for month in inches	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars.	Gopalpore	4·0	—4·6	32·6	South.	Negapatam	4·7	—5·9	18·2
	Calingapatam	0·3	—7·6	27·3		Adutural*	3·7	—0·1	12·2
	Vizagapatam	3·6	—4·2	24·7		Pattukottai*	...	...	...
	Anakapalle*	5·0	—3·4	29·1		Madura	8·7	+1·2	24·6
	Samalkot*	2·9	—6 2	25·5		Pamban	3·0	—5·5	7·3
	Cocanada	4·6	—3·9	34·0		Koilpatti*	5·7	—0 9	22·9
	Maruteru*	5·2	—3·2	27·0		Palamkottah	6·0	—1·0	18·6
	Masulipatam	6.0	—2·6	24·0		Amba-samudram*	10·8	+3·1	24·1
	Guntur*	...	...	...					
	Agri College, Bapatla	4·1	—4·2	...	West Coast.				
	Veeravanam College Farm	1·1	...	...		Trivandrum	7·1	—3·6	61·1
						Cochin	4·6	—8·8	104·8
						Calicut	3·7	—6·6	110·3
Ceded Dists.	Kurnool	2·8	—0·4	19 5		Pattambi*	6·9	—2·7	89 1
	Nandyal*	2·4	—0·4	25·0		Taliparamba*	5·9	—2 3	134·0
	Hagari*	1·8	—1·4	18·2		Nileshwar*	3·4	—3·0	135·3
	Siruguppa*	3·6	+0·5‡	19·3		Pilicode*	5·3	+0·4§	136·9
	Bellary	2·4	—1·8	18·2		Mangalore	2·9	—5·3	113 7
	Rentichintala	1·4	...	24·8		Kankanady*	2·4	—5·0	113·4
	Cuddapah	1·5	—3·3	17·7	Mysore & Coorg.				
	Anantharajpet*	2·8	—4·6§	17·5		Chitaldrug	3·3	—1·5	27·5
						Bangalore	5 4	—0·5	37·7
Carnatic.	Nellore	7·6	—1·9	18 9		Mysore	2·2	—3·7	28·1
	Buchireddi-palam*	4·4	—4·9	16·9					
	Madras	9·2	—2·8	23·9	Hills.	Mercara	8·1	—0·2	136·7
	Tirurkuppam*	5·9	—5 4§	23·6		Kodaikanal	11·3	+1·0	52·1
	Palur*	7·7	+0·8	38·0		Coonoor*	13·65	+3·91	39·6
	Tindivanam*	4·2	—2·8	18·7		Ootacamund*	..	...	...
	Cuddalore	4·5	—7·0	24·8		Nanjanad*	4·56	—1·88	60·3
Central.	Vellore	4·7	—2 1	20·5					
	Gudiyattam*	5·8	—0·4	22·0					
	Salem	4·9	—1·5	25·6					
	Coimbatore (A. C R I.)*	4·3	—2·3	15·9					
	Coimbatore (C. B. S.)*	5·1	—1·4	17 8					
	Coimbatore	3·1	—3·2	13·1					
	Tiruchirappalli	5·8	—1·4	21·1					

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

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

(3) § Average of five years in Tirurkuppam, Anantharajpet and six years in Pilicode.

(4) ‡ Taluk office rainfall being 4"

(5) ... Figures not available.

Weather Review for October 1948.

A trough of low pressure which lay over West Bengal on the 1st October disappeared on the next day and a deep depression at 20½°N. and 90°E moved and lay over Eastern Pakistan and filled up on the 4th October

A 'low' over West Kathiawar seen on the 4th October has weakened and filled up on the 6th October.

A Bay depression seen at 18½°N. and 92°E. on 7th October crossed coast between Chittagong and Akyab on 8th October and lay on Upper Burma on 9th October.

Another western depression seen over north Rajaputana moving eastwards on 10th October which weakened on 11th and disappeared. Unsettled conditions in Central Bay noticed on 11th and passed inland and lay as low over West Bengal on 12th and became unimportant. Conditions became favourable for the setting in of North-East Monsoon in Madras. A 'low' over East United Provinces on 15th became unimportant on 17th October.

The unsettled conditions in South-East Arabian Sea noticed on 18th moved away westwards. A depression in East Arabian Sea at 8°N. and 72°E. noted on 20th intensified and moved northwards and developed into a storm and moved north-westwards on 24th, and weakened into a depression and passed away on 27th

On the 29th a well-marked depression was found in the South Bay and Andaman Sea and crossed at 11½°N. and 91°E. on 30th and intensified.

Rainfall: Rainfall had been generally below normal in the Madras Presidency and far below normal in Orissa and Circars. The South-West Monsoon withdrew from the Peninsula on 4th October and North-East Monsoon conditions were setting in Coramandal Coast on 16th October. North-East Monsoon was very active in the third week of October in Andhradesa and South-East Madras, and dry weather conditions prevailed during the last week of the month The rains in October were very helpful for the revival of dry crops like cholam, pulses and other millets which had undergone an ordeal of severe drought conditions in September, and averted a complete famine of millets.

The Noteworthy Rainfalls.

No.	Place.	Date.	Rainfall in inches.
1.	Ongole	12—10—48	5·1
2.	Meenambakkam	18—10—48	3·6
3.	Madura	22—10—48	3·3

Departmental Notifications.

GAZETTED SERVICE—PROMOTIONS.

Sri Narasimha Ayyar, B. S.	Assistant Agricultural Chemist.
,, Raghavendrachar, C.	Assistant Agricultural Chemist

POSTINGS AND TRANSFERS.

Name of officers	From	To
Sri. Somayya, M.	On leave,	D. A. O. Ellore.
,, Subramania Pillai, M.	On leave,	D. A. O. Nellore.

SUBORDINATE POSTINGS AND TRANSFERS.

Names	From	To
Sri Anantapadmanabha Pillai, R.	D. A. O., Nellore,	A. D., Tanjore.
,, Bhushanam, K.	D A. O., Ellore,	A. D., Narasaraopet.
,, Bhima Raju, S.	A. D., Arruppukottai,	A. D., Srivilliputhur.
,, Balasubramaniam, P.	Fruit Asst.	A. D., Pulivendla.
,, Chandrasekharan, N. R.	Paddy Asst. Tirurkuppam,	F. M., A. R. S., Pattukottai.
,, Gopala Rao, M.	On leave,	A. D., Palaconda.
,, Gourangamurthi, K. V.	A. D., Ramachandrapuram,	Teaching Asst. in Agriculture, Bapatla.
,, Hanumantha Rao, D.	P. A., to D. A. O., Cocanada,	A. D., Tadpadri.
,, Jayaraman, M. V.	Meteorology Asst. Coimbatore,	A. D., Arni.
,, Kolandaswami, M. S.	A. D, Thiruvannamalai,	A. D., Musiri.
,, Konda Reddi, G.	P. A., to D. A. O, Anantapur,	A D, Tadpatri.
,, Krishnaswami, T. E.	A. D., Cheyyur,	Technical Officer Food, Ministry, Madras.
,, Krishnaswami Sarma, M. C.	Asst. F. M Koilpatti,	Asst. A. D., Melur, Madura.
,, Narasimha Rao, G L.	A. D., Palaconda,	Special A. D., Guntur.
,, Nageswara Rao, T.	A. D., Rajampet,	A. D., Bapatla.
,, Ramakanta Reddi, G.	A. D., Bhimavaram,	A. D, Goppanapalam.
,, Ramakrishna Sastri, K.	On leave,	A. D., Amalapuram.
,, Raman Menon, K.	P. A., to D. A. O, Calicut,	A. D., Ponnani.
,, Ragunatha Reddi, K	A. D., Kalyandrug,	P, A., to D. A. O., Anantapur.
,, Ramalingam, A. N.	A. D., Lalgudi,	A. D., Perambalur.
,, Rajagopala Reddi, V.	F. M., A. R. S., Pattukottai,	Paddy Asst. Tirurkuppam.
,, Samuel Ponnaya, P. J. H.	F. M., Central Farm, Cbe.,	F. M., A R. S., Palur.
,, Sambandam, C. N.	Millets Asst. Coimbatore,	A. D., Nanguneri.
,, Sundaram, V. P.	A. D. Srivilliputhur,	A. D, Cheyyur.
,, Subramania Ayyar, R.	On leave,	A. D., Srivaikuntam.
,, Subba Raju, A.	A. D, Narasapur,	F. M., A. R. S., Samalkota.
,, Suryanarayana, J.	A. D., Kothapeta,	P. A to D. A. O., Cocanada.
,, Uttaman, P.	On leave,	Paddy Asst. A. R. S., Aduthurai.
,, Vengu, C.	F. M., A. R S, Palur,	A. D. Shiyali.
,, Venkatchalam, K.	F. M, A. R. S., Samalkota,	A. D., Kothapeta.
,, Vaidyanathan, S.	(On leave),	Asst. in Botany S. R. S. Gudiyattam
,, Zainulabdeen Sahib,	A D, City Vegetable Scheme, Madras,	P. A., to D A. O., Anakapalli.

The following Upper Subordinates are appointed as Plant Protection Assistants:—

District	Mycology	Entomology
Anantapur,	Sri Krishnaswami, D.	Mr. Job Servai.
Arcot, North,	,, Narasimha Ayyar, R.	Sri Raghavan, K.
Arcot, South,	,, Venkataswami, B	,, Muthukumarappa, S.
Bellary,	,, Krishnamurthi Rao, S.	,, Kanaka Rao, G.

District	Mycology	Entomology
Chingleput,	Sri Veeraraghavan, S. N.	Mr. Edwards, J. J.
Chittoor,	,, Srinivasan, C.	Sri Seshadri, T.V.
Coimbatore,	,, Hanumantha Rao, K.	,, Thayagaram, U. V.
Cuddpah,	Janab Ali Hyder Sahib.	,, Ranga Rao, P. V.
Guntur,	Sri Sankara Rao, P.	,, Koteswara Rao, M.
Godavari, E.	,, Ragunatha Rao, N.	,, Ramamohan Rao, A.
Godavari, W.	,, Prakasam, P.	,, Ammi Raju, P.
Krishna,	,, Venkateswara Rao, P.	,, Rama Dass, P
Kurnool,	,, Raghavendra Rao, W.	,, Mahananda Reddi, C.
Kanara, South	,, Balakrishnan, N.	,, Venkatraya Pai, T
Madura,	,, Rangaswami, C.	,, Subramaniam, R.
Malabar,	,, Suryanarayana Ayyar, P.S.	,, Srinivasan, P. A.
Nilgiris,	,, Morachan, Y B.	,, Nagarajan Rao, P. R.
Nellore,	,, Ramakrishna Rao, P.	,, Moorthy Raju, K.
Ramnad,	Janab Ebrahim Ali, S. A.	,, Pandiperumal, S.
Salem,	Sri Thyagarajan, N.	,, Narasimhalu, T. R.
Tinnevelly,	,, Sundaram Pillai, K.	Janab Mohammed Madar, A. M.
Tiruchirappalli,	,, Srinivasagopalan, D.	Mr. Vincent, E. R. C.
Tanjore,	,, Sethuraman, M. S.	Sri Narasimhachari, R.
Pattukottai (C.M.P. Area),	,, Navaneethakrishnan, T.V.	,, Narayanaswami, K. R.
Vizagapatam, North.	,, Kutumba Rao, V. V.	,, Appalanarasiah, K.
Vizagapatam, South.	,, Narasimha Sastri, V. L.	,, Ramanna, V.

The following subordinates are posted as Assistants in Oil Seeds for five years for the Comprehensive Scheme of establishment of Government Coconut Nurseries in the Province:—

1. **Anakapalli** (Vizagapatam District)	Sri T. Kylasa Rao.
2. **Central Farm, Coimbatore.**	,, K. Sheenappa.
3. **Maruteru** (West Godavari District)	,, P. V. Sambsiva Rao.
4. **Nileshwar** (S. Kanara)	,, M. Narayana Nambiar.
	,, O. V. Ummerkutty.
5. **Pattambi** (S. Malabar)	Janab P. M. Sayeed Sahib
	Sri. B. G. Narayana Menon.
6. **Pattukottai** (Tanjore District)	Janab P. A. Muhammad Ibrahim.
7. **Palur** (S. Arcot)	Sri N. V. Sundaram.
8. **Samalkota** (E. Godavari)	,, T. Narasimha Dass

The following are appointed as Upper Subordinates under emergency provisions:—

Names	To
Sri Anji Reddi, D.	F. M., Central Farm, Coimbatore.
Janab Abdul Bhasher,	A. D., Darsi.
Sri Ananthakrishnan, V.	A. D., Chengam.
,, Antoni Reddi, Y.	Nursery Asst Kodur.
,, Balasubramaniam, M.	A. D, Kulitalai.
,, Bhaskara Rao, V.	A. D, Ichapur.
,, Chalapathi Rao, S. V.	A D., Kalyandrug
,, Dharmalingaswami, P.	Paddy Asst. A. R. S, Maruteru.
,, Dharma Rao, M.	F. M, Bhagavadi Farm, A. R S, Siruguppa.
,, Doraiswami, K.	F. M., A. R. S., Palur.

Names	To
Sri Durgha Prasad,	F. M., A. R. S., Palur.
„ Gopalachari, N. C.	Chemistry Asst. A. R. S., Anakapalli.
„ Gopalakrishnan, A.	A. D., Chicacole.
„ Hanumantha Rao, Ch.	A. D., Narasaraopet.
„ Hanumantha Rao, A.	A. D., Harur.
„ Kannan, S.	A. D., Kodavasal.
„ Krishna Raju, K.	A. D., Madura.
„ Krishna Rao, R.	Meteorology Asst. Coimbatore.
„ Leela Menon, K. P. (Miss)	Fruit Asst. Madras.
„ Malathi Devi, S. (Miss)	Chemistry Asst. Coimbatore.
„ Mohan Rao, N. V. K.	A. D., Jammalamadugu.
„ Nageswara Sarma, D	A. D., Namakal.
„ Nagarajan, V.	A. D., Tiruvarur.
„ Narasimha Reddi, B. C.	A. D., Kalahasti.
„ Nageswara Rao, S	A. D., Pollachi.
„ Narasimha Rao, G. L.	F. M., Agricultural College, Bapatla.
„ Narasimha Rao, R.	A. D., Alur.
„ Purnachandra Rao, V.	A. D., Kanigiri.
„ Ramalinga Reddi, K.	A. D., Vellore.
„ Radhakrishnamurthi, P.	A. D., Anakapalli.
„ Rama Rao, B. V.	Millets Asst. Coimbatore.
„ Rama Rao, M.	A. D., Kudligi.
„ Rama Rao, V.	A. D., Nellore.
„ Ramachandra Reddi, B.	F. M., A. R. S., Nandyal.
„ Rama Rao, C.	A. D., Dharmavaram.
„ Ramani, P.	A. D., Kalakurichi
„ Rajagopalan, K.	Paddy Asst. A. R. S., Aduthurai.
„ Satyabalan, S.	A. D., Mudukalathur.
„ Syanarayana, T.	A. D., Tiruchengode.
„ Suryanarayana, T.	A. D., Polavaram.
„ Suryanarayana Sarma, D.	A. D., Ponneri.
„ Somanna, K. B	A. D., City Vegetable Scheme, Madras.
„ Suryanarayanamurthi, V,	F. M., Araku-valley.
„ Sreeramamurthi, S.	F. M., A. R. S., Guntur.
„ Srinivasa Rao, V.	F. M., A. R. S., Hagari.
„ Srinivasa Rao, K.	Mycology Asst. Coimbatore.
„ Sithalinga Reddy, S	A. D., Punganur
„ Sitarama Rao, K.	F. M., Central Farm, Coimbatore.
„ Venkataraghava Raju, M.	A. D., Bhimavaram.
„ Venkata Rao, M.	A. D., Narasapatam.
„ Venkayya, P.	A. D., Tiruvannamalai.