

## Maximisation of Crop Growth through Manuring

By

P. D. KARUNAKAR, M. Sc., (Rutgers) A. B. I. C.

Government Agricultural Chemist

Agricultural College and Research Institute, Coimbatore

The necessity of manures for crop growth has been recognised on all hands from time immemorial and is second only to water. Every farmer in any part of the world knows this; and it is unnecessary to labour this point before an assembly of expert agriculturists.

There is, however, one point which needs amplification here. In India it is common for the farmer to grow crops without manurial additions. This gives an impression that crops can grow without food. This seeming confusion of thought is brought about by the forgetfulness that plant foods are already present in the soil and when crop is grown without visible addition of manures to the soil, it means that they obtain their manurial requirements from the soil itself. This practice has been going on for several centuries in India, raising a crop without manuring, and it is a matter of wonder, and for deep thankfulness to nature, that a fairly decent crop is still obtained. The soils in India are presumably not easily emptied of their plant food due to some factor. Perhaps India is under the special care of the Gods, who in their bias towards us, rejuvenate our soils periodically.

We have been complacent for centuries about the crop yields obtained from our lands. At the present moment however, we have received a tremendous shock which has jolted us out of our self-satisfaction with our crop yields. We are facing a crisis and are, it is hoped not belatedly, trying to improve our crop yields.

The pessimist thinks that this is a superhuman task. He talks of the closed mind of the ryot to modern thought and his stubbornness to follow in the footsteps of his fore-fathers. The frequent visitation of "Acts of Gods" such as drought, floods, cyclones, pests and diseases individually and collectively, bring down crop production. It would perhaps be more correct to say "Acts of the Devil" for these visitations, rather than ascribe them to acts of God. But there is a silver lining to these dark clouds in that such visitations are never throughout the country and there would be vast stretches where a normal season obtains and a normal crop. To offset these calamities the normal crop in these areas should be bettered and this again improved and the maximum of crop production obtained.

In the past four decades of experimentation in the various Agricultural Research Stations of the Madras State with all the major crops and with many fertilisers and manures, it is now possible to sum up our information and to state without fear of contradiction, that other factors being favourable, it is certainly possible to maximise crop production through manuring. The increases in yield obtained under favourable conditions in many Research Stations are indeed spectacular. To cite only a few instances: in the case of paddy, a Thaladi crop gave 111% increase, by the application of 5,000 lb. of green manure; Co. 13 gave 128% increase in Tirurkuppam, due to green leaf at 10,000 lb. per acre. In the Central Farm 107 and 97% increases due to green manure have been obtained in A and D blocks. In the case of sugarcane an increase of 180% has been obtained in Gudiyattam and a 62% increase in Palur, due to nitrogenous manures. In the case of cholam 68% increase in Koilpatti due to farmyard manure, 77% in Nandyal due to nitrogenous manure and 300% increase in Siruguppa due to nitrogenous and phosphoric acid manures have been obtained. By the application of nitrogenous manures to cotton, 63% increase in Palur, 81% in Koilpatti, 175% in Siruguppa and 47% in Nandyal have been obtained. In potato 97.4% increase in yields have been obtained at the Nanjanad farm by the application of complete fertilisers consisting N, P and K.

As mentioned before, only the most spectacular reactions to manuring have been culled out and presented to indicate the potentialities of manuring. From the list given above it will be seen that such spectacular responses have been obtained from one corner of the State to the other. It is not localised to any particular research station nor to any one crop.

The percentage increase of yields due to manuring does not give a clear picture of the potentialities of our soils. Any text-book on agriculture or any article dealing with the subject states that the average yields of this country is very near the bottom, if not the last, of the world figures. It is generally accepted that the average yield of paddy in India is only 1,000 lb. per acre and slightly higher, about 1,500 lb. in Madras State. Accepting these figures as more or less correct, perhaps slightly on the optimistic side, the average yields obtained in the past few years in our Agricultural Research Stations will give a clear picture of the potentialities of our soils. At the same time it should be kept in mind that we have not, by any means, reached our maximum production as yet. The average yield of paddy in Simalkota is about 4,000 lb., Central Farm and Paddy Breeding Station, 3,500 lb., Adurhurai 3,000 lb., Anakapalle, Maruteru, Pattukottai and Tirurkuppam 2,500 lb. and Pattambi, 2,000 lb. Similarly it is held that the average yield of sugarcane in India would be about 15 tons per acre. The average yield in Anakapalle and



Palur and Gudiyattam would be about 40 tons. Again the average yield of potato in the Nilgiris is around 8,000 lb. whereas at Nanjanad, yields of 15,000 lb. are now being obtained for several years.

It is a matter for legitimate pride that in a short period of three decades, we have been able to increase considerably the average yields in our Agricultural Research Stations of many of our crops. This has been achieved by the co-ordination of all the correct agricultural practices, not the least of which is manuring. At the same time it should be admitted that this laudable achievement has stopped within the wire fenceings of the Research Stations all these years. Recently, however, due to various causes, chiefly due to the high prices that prevail for agricultural produce, the ryot is becoming manure-minded, and is clamouring for manures. Take the case of sugarcane; the ryot is prepared to buy manure even at black market prices. It is now a rarity to see sugarcane cultivated without application of heavy doses of manure. While the departmental recommendation is a maximum of 250 lb. of nitrogen per acre, in the Nellikuppam area it is not uncommon to find that the ryots are applying as much as 500 lb. of nitrogen per acre. Similarly in the Nilgiris, potato is always grown with manures by the ryot. In the case of paddy, however, this manure-mindedness has not assumed such a wide prevalence though even here, it is now common to see this habit is taking hold of the ryot. Kolinji plants are brought from a distance of about 30 miles to Bhavani, bundled as bales and sold to the paddy cultivator under the Kalingarayan Channel at 30 rupees per bale of about 1,000 lb. Similarly in Ambasamudram area also, green leaves gathered from the the forests fetch about 30 to 50 rupees per cartload. The fields near Madeswarankoil near the Agricultural College is a classic example where 100 cartloads of compost per acre is not an uncommon application for a crop of cotton. All these augur well for the country and in course of time is sure to raise the standard of crop production and the average yields of crops in our State.

There is not enough fertilisers and manures to meet the demands of the country. We import every year about a crore of rupees worth of fertilisers, chiefly ammonium sulphate and superphosphate. The fertiliser manufacturing plants in the country produce about 22,000 tons of ammonium sulphate. Our natural resources in the shape of cattle manure, composts, bonemeal, oil cakes etc., are small and meet only a fraction of the demand. There is considerable possibility of increasing production of compost and green manures. Even so, there will always be a considerable demand for quick-acting nitrogenous and phosphatic fertilisers. Importing these commodities every year from foreign countries is in no way different from importing foodgrains, from the point of depletion of our finances. The Government of India are aware of

it. It is expected that the Sindhri Factory would soon come into production and that production would be increased considerably at Always. But this is possible only with nitrogenous fertilisers. We have still to depend on foreign countries for the supply of raw materials for superphosphate manufacture and to a certain extent for potash also, since these two do not occur as deposits in our country to any large extent.

For obtaining a decent yield of paddy, say, about 2,500 pounds per acre it is necessary to add to the soil something like 5,000 lb. of green manure plus 30 lb. of nitrogen plus 30 lb. of  $P_2O_5$ . This quantity of manure multiplied by 8.5 million acres under wet paddy in the Madras state, assume astronomic proportions. This quantity of manure can be reduced somewhat by adopting the T. V. A. plan of indirect fertiliser application to the green manure crops. The T. V. A. authorities claim that the large measure of success achieved by them in the rehabilitation of the wornout soils of the Tennessee Valley was mainly due to this plan. Briefly, this plan lies in growing a leguminous green manure with phosphate manure application. The phosphate manuring greatly stimulates the capacity of the legume to fix atmospheric nitrogen. Thus for the expense of one manure, phosphate, three manures, phosphate, nitrogen, and the much-needed organic matter are secured at one stroke. This idea is under experimentation in many of the Agricultural Research Stations for paddy and at Nanjanad orf potatoes.

The plan of the experiment is to grow the commonest leguminous plants of the State, dhaincha, pillipesara, cowpea, sunnbemp and lupin in Nanjanad, with 30 and 60 lb. of  $P_2O_5$  in the shape of superphosphate, plough in the green matter into the field, and then grow paddy (or potatoes in Nanjanad) with no further manuring. While it is too early to draw definite conclusions from these experiments the indications at present are very encouraging. If these experiments prove successful they would show a 50% reduction in our manurial bill, not only for paddy but for many other irrigated crops.

In recent years some cross cuts have been employed to overcome the high cost of manuring with some success. Presoaking seeds in nutrient solutions, vernalisation to shorten the growth period, use of hormones and other growth-promoting factors to shorten the resting period of the seeds have been tried and have given encouraging results in this laboratory.

Based on the results obtained from many years of experimentation at the Agricultural Research Stations it is now possible to recommend in a broad and general way, dosages of manures required for producing maximum economic yields of the major crops of the

Madras State. Naturally there will be variations due to soil climatic zones, and hence these basic formulæ will require to be modified to suit local variations.

*Paddy*: 5,000 lb. Green manure plus 30 lb. N., plus 30 lb.  $P_2O_5$ .

Note: Malabar and Wynaad soils require a larger dose of  $P_2O_5$ .

*Sugarcane*: 5 tons cattle manure plus 100 lb. N (in the form of groundnut cake and ammonium sulphate in 3:2 ratio) applied in two instalments at planting and earthing up time.

Higher doses up to 250 lb. nitrogen can be recommended for Nellikuppam area.

*Cholam Ragi*: (Dry or Irrigated) 5 tons cattle manure per acre. Irrigated cholam has given increased response with addition of 30 lb. of N as fertiliser.

*Cotton*: Nitrogen 50 lb. plus 25 lb.  $P_2O_5$  plus cattle manure or compost 3 tons.

*Cotton*: (Rainfed) Nitrogen 50 lbs. plus 20 lb.  $P_2O_5$  plus 20 lb. N. in the form of groundnut cake over 3 tons of cattle manure or compost. This should preferably be applied to a previous crop of cereal to benefit both.

*Banana*: 50 lb. N. plus 75 lb. potash plus 45 lb.  $P_2O_5$  per acre.

*Potato*: 80 lb. N. plus 200-lb.  $P_2O_5$  plus 100 lb.  $K_2O$ .

*Minor Millets*: Farmyard manure or compost to give 50 lb. of nitrogen.

While it is undoubted that manuring would increase crop production to a substantial extent in the very year of its application, the maximum effect is seen only by continued application year after year for a considerable period. A reserve of plant food is thus built up and at the same time when organic matter as basal applications are included in the manurial schedule, the physical texture of soil is rendered optimum for crop production. This would require that the manure consciousness of the ryots of the State be stimulated to the extent as obtains in China where it is considered a sin to waste any organic substance. This is not an insurmountable task and the present awakening by the ryot can form the spark which could be fanned to a splendid flame.