

## SYMPOSIUM ON FERTILIZERS IN RELATION TO AGRICULTURAL PRODUCTION IN INDIA\*

OPENING the symposium, Shri C. R. Ranganathan, Fertilizer Association of India, New Delhi, emphasised the importance of fertilizers in increasing agricultural production. He mentioned that, at present, harvested crops remove 13.6 million tons of plant food as against 2.0 million tons replaced through manures and fertilizers. With the increased agricultural production envisaged in the Third Plan, the drain in plant food will increase and substantially higher yields can be obtained only if the plant food replaced is more than what is lost. Even with the full use of manures in the Third Plan, he said, it will not be possible to maintain the present level of soil fertility, and, therefore, widespread use of fertilizers has to be taken up. Referring to the results of the fertilizer demonstrations conducted in different parts of the country, Shri Ranganathan said that these demonstrations showed that profits ranging from 40 to 160% can be obtained through the application of three major plant foods and their mixtures. He was of the view that these profits will be more if due account of the residual effects of phosphate is taken. According to him, as the Agricultural Scientists have already worked out the suitable doses of fertilizers for large tracts of the country and for different crops on the basis of fertilizer experiments, it should be possible to make appropriate recommendations to the farmers and to increase agricultural production in the shortest possible time by the use of fertilizers. He then discussed the targets of production and consumption of fertilizers for the Third Plan period. These have been set at 1 million tons of nitrogen and 0.4-0.5 million tons of  $P_2O_5$ . While no targets have been laid out for potash in the draft outline of the Third Plan, the target 0.2 million tons is likely to be accepted. He considered these targets as rather modest as the same will be sufficient just to feed 25% of the cultivated area and 80% of the irrigated area. He emphasised the need to intensify further promotional efforts to increase the demand for fertilizers to the level of consumption

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envisaged by the end of Third Plan, as the present consumption of fertilizers is even less than one-fourth the target for 1965-66. Intensification of the existing demonstration programme, reorientation of the distribution system of fertilizers to make these available to the farmer in a more equitable fashion, and use of audio-visual aids were some of the measures he suggested for increasing the fertilizer consumption. He also wanted that stress should be laid on balanced fertilizers so that the present imbalance in NPK ratio is reduced. Referring to the planning for fertilizer production, he said that since a nitrogen factory takes 4-5 years to come into full production from the stage of planning, planning for new nitrogen factories should start right now so that one million tons production will be achieved by 1965-66.

In regard to phosphatic fertilizers the licensed capacity exceeds lakh tons  $P_2O_5$  mostly in the form of single superphosphate and the full capacity can be achieved provided there is adequate demand. Since a superphosphate factory takes 2-3 years to come into full production, planning for setting up the new factories can wait for another two years or the time when the demand is near 1.5 lakh tons. In regard to potash, imports have to be adequate to achieve the target of 2 lakh tons.

In order to promote wider use of phosphate and potash, he was of the view that mixed fertilizers should be encouraged, as far as possible, and larger quantities of nitrogen should be made available for preparing mixed fertilizers.

Shri T. P. Abraham of the Institute of Agricultural Research Statistics, New Delhi, discussed the optimum fertilizer dressings and economics of manuring based on the results of experiments conducted so far in cultivators' fields. He said that the optimum dressings of nitrogen on rice and wheat were 35-40 lb. of nitrogen per acre, giving an additional yield of 4 maunds per acre and net profit of about Rs. 30 at the current price level. The optimal dressing for maize also was of the same order, but with reduced profit on account of the relatively lower price of this crop. The largest profits were obtained by the application of nitrogen on sugarcane, the net profit from the application of the optimal dressing of 150 lb. nitrogen per acre being of the order of Rs. 220 per acre. The profits with nitrogen application were least on cotton, both irrigated and unirrigated. An important finding from the results of these trials is the fact that moderate to good responses to phosphate can be obtained for rice and wheat in large areas of the country. Profitable responses to phosphate were obtained on rice in as many as 73 districts out of 107 districts for which data were available. For wheat, phosphate application indicated profitable responses in

51 out of 83 districts studied. The optimum dose of phosphate at the present cost and price level is, on an average, 30-40 lb. on rice and wheat. The optimum dose for sugarcane is as low as 30 lb. while no profit was observed on cotton. The profits from application of optimal dressings of phosphate were about two-thirds of the optimum profits from the application of nitrogen on rice and wheat. The optimal dressings and responses given above in so far as they relate to averages over different soil climatic and agronomic conditions need to be interpreted in the light of local knowledge and experience, but they provide a sound working basis for assessing the general needs of the various crops. If optimum doses are used, the targeted consumption of 1.2 million tons of nitrogen will be adequate for only manuring 75% of the rice area and the irrigated wheat area. This shows the inadequacy of the targets of the fertilizers and the scope for substantial increase in crop production with the help of fertilizers. Surveys on fertilizer practices carried out by the IARS in some of the typical districts with better level of agricultural production indicated that only 15 to 25% of the rice area and 7 to 10 per cent. of the wheat area gets any dressing of nitrogen fertilizers, while the extent of the application of phosphate is considerably less and that of potash almost nil. The rates of application given in the fields receiving nitrogen fertilizer was as low as 10 to 15 lb. per acre which is considerably lower than optimal dressings. He said that the relative economics of manuring with nitrogen and phosphate shows that even with the optimum level of application, nitrogen fertilizer is more remunerative to the farmers. With the limited resources of our farmers they can be induced to make more use of phosphate only if this fertilizer is made available cheaply and at prices comparable with nitrogen. In India, the cost of a unit of plant food in terms of that of the produce is largest, and substantially higher compared to Europe, U.K. and U.S.A. Therefore, reduction in the fertilizer prices will be of utmost importance in greater utilisation of fertilizers by the farmers. The optimum combination of fertilizers depends on the relative cost of the two fertilizers, the level of investment on fertilizers and needs of the crop. He was of the view that uncritical recommendation on extensive use of one or a few fertilizer mixtures having fixed ratio of NPK, regardless of the needs of the crop and the soil, will not be conducive for maximum production from fertilizers.

Dr. S. P. Raychaudhuri of the Indian Agricultural Research Institute, New Delhi, discussed the fertilizer responses in relation to soil types. Considering the results of T.C.M. fertilizer trials conducted in India on rice and wheat for the period 1953-56, he stated that the

responses obtained in these trials were not related to the major soil types. He was of the view that the major soil classes could not probably significantly account for the variances in responses, because the growth and yield of a particular crop are mainly dependent upon the fertility status of the surface soil which could be similar in all types of broad soil classes. Further, the differences in management may contribute a major share in final yields. He stated that in many other countries also, the levels of correlation between soil types and fertilizer responses were of a low order when computed from field trials.

It was felt that correlation of fertilizer responses may be worked out in individual agronomic trial centres on the basis of different soil types established as a result of the soil survey work. Such a study was made with the results of trials at the centres Raipur, Hoshangabad, Dumka (Rameshwar), Pusa, Darrang and Agartala.

A study of the data shows that there are indications of correlations between responses and different soil types. However, this type of work needs further investigations. In case of Raipur centre, the differences in responses between Matasi and Dorsa type of soils are not wide, but both are markedly higher compared to Kanhar types, which are reported to be productive soils. Similarly, in Hoshangabad centre, there is not much difference between Mariyar and Morand types (in fact they are described in revenue classification as almost similar), whereas Rankad gives appreciably higher responses (except with  $P_2O_5$  alone) and is reported to be poor soil. The results obtained on centres in eastern states indicate, in general, that fine textured low-lying soils give higher responses than the coarse textured low lands excepting in case of Tripura centre (may be due to wide disparity between the number of trials on two types). He was of the view that fertility soil analytical data collected under All-India Expanded Soil Testing Service Scheme gives a better understanding of this correlation problem.

Dr. D. K. Misra of the Central Arid Zone Research Institute, Jodhpur, discussed the results of agronomic experiments from Bajra conducted under arid conditions. The trials indicated an average increase of the order of 25% with a dose of 15 lb. nitrogen per acre given as top-dressing. Calcium ammonium nitrate was found very suitable for manuring the desert soil of the Jodhpur area.

Dr. R. V. Tamhane of the Ministry of Food and Agriculture (Department of Agriculture), New Delhi, said that judicious and economical fertilizer use can only be made if we regulate the nature and amounts of applied fertilizers on the basis of already available nutrients

supply in the soil. Considerable attention has been devoted of late to the determination of fertility status of soils by extracting soils in the laboratory with chemical reagents and analysing them. These results are being correlated with yield responses and reliable soil test procedures are being evolved to help in making recommendations for fertilizer use. Follow-up of recommendations based on soil tests to test the reliability and usefulness of such tests are being considered. He also pointed out that since enough fertilizers to meet the country's requirements are not available, the limited amount of fertilizers should be used only on those soils that test very low in respect of nutrients; it is only then, the maximum benefit from the fertilizers use can be obtained.

Dr. O. P. Gautam of the Indian Agricultural Research Institute, New Delhi, reviewed the progress of experimental work on fertilizers and other fertilizer use research in India during different periods. He said that rapid advance in the knowledge of fertilizer responses was made during the period 1947-60 when experiments were conducted in different agro-climatic regions, particularly, under cultivators' conditions following the recommendations of Dr. Stewart. He stressed the need for using chemical, biological and pot culture techniques to evaluate the fertilizer needs of different crops and soils in addition to field experiments. He was of the view that the experimental treatments and data obtained in the current fertilizer work probably has limitations for interpretation and use over longer periods due to inadequate number of doses of major plant nutrients in the experiments. He emphasised the need to work out 'adjustments to standard dressings' from available data taking into account various factors like changes in prices of crops and the fertilizers, quality, season, soil type and level of fertility, crop history and manuring, use of FYM and other organic manures.

Dr. A. K. Dutt of the Farm Advisory Unit, Directorate of Extension (Department of Agriculture), New Delhi, emphasised the need for agronomic approach to increased superphosphate consumption in the Third Plan. Reviewing the production and consumption of phosphatic fertilizers in the country, he said that only in the southern zone the demand of fertilizers has exceeded the total production in that zone while in the remaining zones, the demand has been unsatisfactory. Taking data from the results of fertilizer demonstrations conducted in different States by the ICAR, he showed that application of phosphate is remunerative in large areas. He said that in phosphorus-deficient soils, the profitable response from phosphate fertilisation will depend on the kind and quantity of phosphatic fertilizers, the time and method

of application, soil reaction and the crops grown, etc. In this connection, he emphasised the need for proper placement of phosphate and the use of bone-meal instead of superphosphate in highly acid-soil regions of Kerala, North Bengal and Assam. The economy of applying phosphate to high acre-value crops such as vegetables, sugarcane and other cash crops in rotation and leaving the residual effects for the green crops was stressed. The possibility of applying a higher dose of phosphate than that is recommended at present on pulses and other legumes needed consideration. He emphasised the need to make our farmers conscious of the utility of phosphatic fertilizers before the continuous use of nitrogenous fertilizers alone through increased crop harvests and phosphate removals develops situations when crops will start to fail to respond profitably to further nitrogen fertilization. He pleaded for a comprehensive programme of demonstrations where the trials take account of the rotations followed, as this, in his view, is very important to derive full benefit from the limited fertilizers available.

The Chairman, Shri K. R. Damle, in his concluding remarks, stated that he hoped that the targets of fertilizers fixed for the Third Plan period will be achieved by the end of the Plan. He expressed his regret that the fertilizer prices due to unavoidable reasons are higher than in many countries of the world. Although there is no immediate possibility of reduction in the prices due to high cost of production of fertilizers in the country he indicated that the question of lowering the prices will be considered if there is any substantial reduction in the prices of the farm produce.