

Fertilizers and Training in their use *

by

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Genesis of fertilizer demonstrations: During the early period of our independence the country was facing a serious food crisis. At that time the famous four-point aid programme of President Truman was proclaimed, whereby the U. S. Government came forward to offer assistance to any under-developed country to better the standard of living of its people. The Government of India took advantage of this offer and requested that experts may be sent to this country to suggest ways and means to avert the recurring food crisis. Accordingly, a team of food production experts visited the country and made certain recommendations of which the most important was the large scale use of chemical fertilizers in crop production. It may be recalled that those were the years when only very meagre quantities of fertilizers were being used by our farmers. In fact, excepting for fertilizers used by the plantation industry, very little fertilizer was used generally by farmers. Hence the need arose for wide scale demonstrations on the use of the chemical fertilizers. For this purpose the United States Government offered free supply of 50,000 tons of chemical fertilizers and the scheme for demonstrations on the use of fertilizers on cereal crops on a country-wide scale was launched in 1954.

Layout of fertilizer demonstrations: In the conduct of fertilizer demonstrations the emphasis was on laying out as large a number of demonstrations as possible without meticulously adhering to strictly scientific criteria for carrying out comparative demonstration. The layout in these fertilizer demonstrations consisted of a three plot design, one of which was control or farmers' practice, and the other two were treatments, receiving fertilizers.

In these demonstrations, nitrogenous fertilizers were tried alone and in combination with phosphoric acid. In the early years the sources of nitrogen were fertilizers like ammonium sulphate, ammonium sulphate nitrate and urea. In recent years greater emphasis has been laid on demonstrations employing urea, and calcium ammonium nitrate, which is being produced in large quantities at Nangal and Rourkela in our country. Apart from straight form of fertilizers, mixed fertilizers containing nitrogen and phosphorus, and nitrogen, phosphorus and potash have been used as sources of nutrients, phosphorus was supplied in the form of superphosphate and potash in the form of muriate of potash.

Generally the dosage of fertilizer applications was at the rate of 30 lb. nitrogen and 30 lb. phosphoric acid for cereals like paddy and *ragi*. In the case of potash, the rate employed was 15 lb. per acre.

* Part of address delivered by Dr. S. Krishnamurthi, Dean & Ex-officio Additional Director of Agriculture, Coimbatore on the Inauguration of the First State Level Training Programme on proper use of Fertilizers, at the Agricultural College and Research Institute, Coimbatore on 26th September, 1963.

Number of fertilizer demonstrations: The total number of demonstrations that was conducted in this State for the past five years is furnished below :

Year	No. of Demonstrations	Year	No. of Demonstrations
1958—'59	4825	1961—'62	7000
1959—'60	9635	1962—'63	8300
1960—'61	7500		

All these years a large percentage of the demonstrations was confined to cereals like paddy and *ragi*.

From 1963—'64 demonstration on a wider varieties of crops has been programmed, and an abstract of the number of demonstrations contemplated for this year is given below :

	No. of Demonstrations		No. of Demonstrations
Paddy	5650	Sugarcane	250
Cumbu	150	Banana	300
Cholam	450	Tapioca	150
Ragi	1950	Pulses	660
Groundnut	1150	Chillies	400
Cotton	1150		
		Total	12,260

Results of fertilizer demonstrations: The general trend of results from demonstrations on paddy and *ragi* during the years for which analysis has been made is indicated below. In paddy an increase in yield of 300 to 400 lb. per acre has generally occurred due to application of 30 pounds of nitrogen per acre. In Coimbatore district a higher increase of 800 lb. per acre has been obtained. The results from higher rate of application of 45 lb. per acre in the form of urea, made in Thanjavur district have not indicated any extra yield. At the level of 30 lb. nitrogen per acre, urea and ammonium sulphate nitrate registered similar increases in yield. Results from demonstrations with combinations of nitrogen and phosphoric acid conducted in the five districts of Thanjavur, Coimbatore, Tirunelveli, Chingleput and Ramanathapuram have shown an increase ranging between 240 lb. per acre in Tirunelveli and 800 lb. per acre in Coimbatore.

In the case of *ragi* also, response to nitrogen application has been fairly high and more so when both nitrogen and phosphates are applied. Thus, a response representing an increase of about 310 lb. per acre has been obtained for nitrogen alone, while a response of about 640 lb. per acre has been recorded for combination of nitrogen with phosphorus which is a very significant increase of 310 lb. per acre.

Fertilizer use in India: An overall idea of progressive consumption of chemical fertilizers in our country can be had from the following table.

Production, imports and distribution of Fertilizers in India from 1952-'53 to 1961-'62 (Metric tonnes)

Year	Nitrogen (N)			Phosphoric acid (P_2O_5)		Potash (K_2O)	
	Pro-duced	Impor- ted	Distri- buted	Pro- duced	Distri- buted	Impor- ted	Distri- buted
1952-'53	52,810	44,294	57,822	7,445	4,552	3,331	...
1953-'54	52,648	19,346	89,287	13,821	8,261	7,490	...
1954-'55	6,8145	19,984	94,810	14,345	15,027	11,097	...
1955-'56	76,486	53,379	1,07,494	12,365	13,018	10,265	...
1956-'57	78,406	56,768	1,07,764	17,585	15,874	14,791	...
1957-'58	80,751	1,10,100	1,49,019	25,785	21,922	12,786	...
1958-'59	80,374	97,540	1,71,988	30,987	29,490	22,366	...
1959-'60	82,465	1,42,335	2,35,351	51,407	50,111	33,103	21,342
1960-'61	1,09,019	1,71,957	2,19,326	53,722	53,675	24,795	35,047
1961-'62	1,51,135	1,42,614	3,13,584	65,360	62,934	30,381	30,837

The above figures indicate that compared to the situation of about 10 years back, the nitrogen distributed has increased by about five times and the phosphoric acid consumption by about 14 times.

Fertilizer use in Madras State: The comparative statement below gives details regarding consumption of nitrogen and phosphatic fertilizers for the past four years in the Madras State in metric tonnes.

Year	Ammonium sulphate	Urea	Calcium ammonium nitrate	Super-phosphate
1958-'59	90,705	14,825	...	21,600
1959-'60	62,213	18,647	...	46,980
1960-'61	69,495	9,938	...	61,277
1961-'62	59,665	22,806	22,896	49,432

The comparative statement below gives details regarding consumption of nitrogen and P_2O_5 for the past four years in Madras State in metric tonnes.

Year	Nutrient nitrogen	Nutrient phosphoric acid
1958-'59	24,664	3,456
1959-'60	20,657	7,472
1960-'61	18,272	9,804
1961-'62	27,587	7,920*

* Decreased consumption in certain years may be ascribed to difficulties in the movement from producing to consuming centres.

Future scope for application to major crops: At present, the consumption of nitrogen as converted to ammonium sulphate does not work out to more than 40 to 59 lb. per acre as against recommended dosage of 150 lb. per acre. The consumption of phosphoric acid is much less. There is a recognised need for maintaining a balance between nitrogen and phosphorus application. Hence, in the event of increased use of nitrogenous fertilizers, there should be a corresponding increase in the consumption of phosphatic fertilizers. Considering the fact that in this State the total cultivated area under irrigation is about 7.3 million acres, there is ample scope for enhancing the consumption of chemical fertilizers, and increasing production. Working on the basis of 30 lb. each of nitrogen and phosphoric acid per acre the requirements of nitrogen and phosphoric acid for the 7.3 million acres of irrigated area in this State would work out to nearly 1,04,285 metric tonnes each. Expressed in terms of ammonium sulphate and superphosphate, the quantities work out to about 5.2 lakh metric tonnes of ammonium sulphate and 6.5 lakh tonnes of superphosphate. Comparing this with our consumption for 1961-'62 viz., 27,587 tonnes of nitrogen and 7,920 tonnes of phosphoric acid, it is quite evident that we have to exert to our utmost to reach even the target assigned for the remaining period of the current plan.

Current position with reference to Plan targets: The statement given below shows the targeted consumption of different chemical fertilizers for the remaining period of the current Plan.

		(in tonnes)	
	1963-'64	1964-'65	1965-'66
Nitrogen as ammonium sulphate ...	4,06,750	4,78,750	5,83,300
Phosphatic fertilizer ...	2,25,000	2,75,000	3,20,000
Potassic fertilizer ...	60,000	75,000	90,000

To attain the above target, intensive propaganda, chiefly by way of demonstrations, has to be carried out.

Need for training in fertilizer use: All that has been said above, makes it clear that the present position of fertilizer consumption in the State leaves much to be desired. Increase in fertilizer consumption however, cannot materialise successfully, if the cultivator is not convinced, through field demonstrations, about the great gains to be made through the use of fertilizers. If efforts to demonstrate the value of fertilizer are to be effective, they should be carried out by persons adequately conversant with different fertilizer materials and their characteristics in relation to crop growth. It is thus apparent that the persons concerned should be fully trained and these mostly include officials and subordinate staff from the Agricultural and allied Departments who handle fertilizers and demonstrations. Alive to the need for such training in fertilizer use the Government have sponsored a special scheme for this.

Since a large number of demonstrations have to be laid out over a wide area, the responsibility of executing them falls necessarily on the shoulders of ultimate field staff such as Gramasevaks, Fieldmen and Demonstration Maistries. Normally these workers are not quite well versed with the technicalities of layout and characteristics of the fertilizer material to be used. Hence they need sound basic training on this aspect. This training can be imparted to them by the Extension Officers in the Block who should themselves get a through training at the hands of District Agricultural Officers. To ensure proper care in layout and conduct of demonstrations, there should be vigorous inspection by the officials at the district and divisional levels at every stage. Therefore there is need for these officials to have a refresher course on several aspects of fertilizer application and demonstrations.

Training procedures: The training programme envisaged has several phases:

1. *State Level Programme:* At this level, the Regional Deputy Directors would receive training from the Joint Directors of Agriculture in charge of Fertilizers. The technical content of the training programme would be handled by the specialists and officers as indicated below:

(i) *Agricultural Chemist & Associate Professor of Soil Science:* Soil formation, profile development, soil types, soil characters, depth, texture, chemical composition of soils, soil reaction, availability of nutrients, crops suited to soil types.

(ii) *Agronomist & Associate Professor of Agronomy:* Time and method of application of different fertilizers, essential nutrients — mode of applications to paddy, results of agronomic experiments and Simple Fertilizer Trials, Fertilizer recommendations, Soil Management and farming practices.

(iii) *Soil Testing Chemist:* Taking of soil samples, soil testing, importance of linking up demonstrations with soil testing.

(iv) *Assistant Agricultural Chemist (Fertilizer Demonstrations):* Fertilizers available on Indian market - N, P and K content and characteristics of fertilizers. Fertilizer projects in India - Detailed instructions on the layout of fertilizer demonstrations.

(v) *Chief Fertilizer Inspector:* Fertilizer control order, details of sampling and analysis, role of field staff in enforcing the Fertilizer Control Order.

(iv) *Deputy Registrar of Co-operative Societies:* Storage and distribution of fertilizers in the State.

Extension Specialist will be in overall charge of organising the programme.

2. *Divisional level (Deputy Director of Agriculture's regions):* After the State Level Training, the training programme for the Deputy Directors of Agriculture's regions would be organised under the leadership of the concerned

Deputy Director of Agriculture at his respective headquarters. The District Agricultural Officers within the respective jurisdiction of Deputy Directors of Agriculture, Principals of Rural Extension Training Centres, Deputy Registrar of Co-operative Societies, Representatives of Co-operative Societies dealing in fertilizers and Soil conservation officers will participate. At this level the technical content of the programme will be handled by the Agronomist, Agricultural Chemist, Assistant Agricultural Chemist (Fertilizer Demonstration), Chief Inspector of Fertilizers, besides the Deputy Directors of Agriculture.

3. *District Level Programme:* The District Agricultural Officer will organise the training course to Extension Officers in Agriculture, Panchayat and Co-operation, representatives of farmers' organisations and co-operatives dealing in fertilizers.

4. *Block Level Programme:* The Extension Officers after training would in turn train the gramasevaks, fieldmen and demonstration maistries in their respective blocks. At this level the trainees will also include salesmen of Co-operative Depots and a few progressive ryots.

Thus, this programme of training starting from the State Level permeates in progressive stages to the village level where ultimately the gramasevaks and progressive farmers get trained in the efficient use of fertilizers.

It is apparent from what has been stated above that the pattern of training has been very well thought out. The intention behind this training programme is that the idea of fertilizer use, with its concomitant beneficial effect on crop production, should eventually permeate among all the growers in the State and that there should be no lack of knowledge of techniques as far as application of fertilizers is concerned. More and more fertilizer factories are coming up within the country. Year after year, there is a progressive increase of fertilizer production through the establishments of new factories, both in private and in public sectors and different types of fertilizers are being produced according to necessity and raw materials available. When new forms of fertilizers are introduced in the country, farmers have to be educated properly regarding their characteristics and the method of their use. Particularly in the case of nitrogen our growers have been for long conditioned to ammonium sulphate and they have been accustomed so much to this fertilizer that they are unwilling to take up new forms of fertilizers, however efficacious they may be. From this point of view from the time calcium ammonium nitrate was introduced, there has been some difficulty in pushing through its use on a wide scale even though it is as efficacious as ammonium sulphate under a wide range of conditions. Research Officers who have been handling trials with fertilizers have been sending very favourable reports in most cases on crop responses to CAN. By and large CAN has been giving as good response as ammonium sulphate, or ammonium sulphate nitrate or urea pound per pound of nitrogen.

It is thus imperative that the farmer be adequately educated in the use of new, but no less efficacious fertilizers and his unfounded prejudices against new fertilizers eliminated. Our information machinery has to be geared to the needs of the situation in the State and in the country so that the utilisation of fertilizers produced in the country in large quantities is pushed ahead and production increased. It is because of the extension work done among growers regarding fertilizer use that we can make headway in their utilisation. In this context I should think that the training programme being inaugurated today is one of the very best training programmes or courses which have been inaugurated by the Department of Agriculture.

The Department of Agriculture, Madras, has been always advocating a balanced pattern of fertilizer application, along with organic manure. The present training in fertilizer use is not meant to emphasise that artificial fertilizers alone are the solution to all our problems of fertility or increase in agricultural production. While under tropical conditions organic matter has to play its great part, fertilizers play an important part in furnishing to crops in a quick manner the nutrients which are needed thus accelerating production. This is the background which we have to keep in our mind in the matter of use and application of fertilizers. It is never forgotten in the Madras Agricultural Department at least that organic manures have to continue to play a very important role. The results of our Permanent manurial experiments have laid stress on this and they have indicated that the application of artificial manures, when done in combination with organic manures, have not introduced any complications of which we need be afraid.
