

Guiding Role to be played by the Indian Agricultural Extension Agencies to Bridge the Gaps in Fertilizer Application in India

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ABSTRACT

Chemical fertilizers play a significant role in the development of agriculture sector and successful management of food security concerns in the country. Since the land resource is finite and there are increasing food requirements, the only way forward is to sustain increase in agricultural productivity at the same maintaining and improving the quality of soil. However the management of soil resources is facing several challenges in the forms of gaps in chemical fertilizer applications viz. wide variations in use of chemical fertilizers over the regions, a heavy skewness in favour of Nitrogenous fertilizer use and imbalanced and improper use of fertilizers. This type of challenges can be faced with proper Fertilizer Pricing Policy, Availability of credit facility, development of Knowledge-base of the Farmers, robust Fertilizer Policy, modern irrigation practices coupled with modern product lines of Indian fertilizer Industry. Indian Extension System with broader infrastructure, up-dating and re-orienting the extension workers with a multi-agency mode of work can play a crucial role in changing the irrigation and fertilizer application practices as being applied by the Indian farmers.

Keywords: Chemical fertilizer, soil management, fertilizer pricing policy, fertilizer use

Chemical fertilizers play a significant role in the development of agriculture sector and successful management of food security concerns in the country. Since the land resource is finite and there are increasing food requirements, the only way forward is to sustain increase in agricultural productivity along with maintaining and improving the soil quality. However there are several lacunas to be found in the Indian fertilizer application scenario.

Various Aspects of Gaps in Fertilizer Application in India

A. There is a wide variation in fertilizer use among different states in the country. While per hectare use of fertilizer nutrients is 253 kg in Andhra Pradesh and 242 kg in Punjab, it is only 4 kg in Nagaland and 3 kg in Arunachal Pradesh in 2010 - 2011. Not only that about 85% of the total consumption of fertilizer nutrients is consumed in 273 districts (about two third) only. While per hectare use of fertilizer nutrients is more than 400 kg in some of

the districts of Andhra Pradesh (424 kg in Guntur 417 kg in West Godavari, it is as low as less than 40 kg in some of the districts of Rajasthan (22 kg in Nagaur, 31 kg in Jodhpur) in 2010 – 2011 (Fertilizer Statistics, Govt. of India). There is need for efficient use of fertilizers in the high consuming districts and stepping fertilizer use in low consuming areas and also there is need for integrated and balanced use of fertilizers.

B. Besides wide variation in fertilizer use, the pattern of use is skewed in favour of nitrogen in some of the states. This is because the farmers having irrigation facilities have only been making optimum use of chemical fertilizers, and four major crops, namely sugarcane, paddy, wheat and cotton consume over 80% of the total quantity of fertilizers used in the country.

C. It has been observed that as against the recommended N:P:K ratio of 4:2:1, Indian farmers have been applying fertilizer in 8.5:2.6:1 ratio, which induces initial vegetative growth, susceptible

to pests, diseases, lodging and causes poor floral induction and delayed maturity, thereby reducing the yield.

D. The imbalanced use of chemical fertilizers and neglect of organic manure caused many problems, like stagnation in productivity, soil sickness, widespread deficiency of secondary and micro nutrients, spread in salinity and alkalinity, etc. On an All-India basis, the deficiency of Sulphur has been found to be 41%, Zinc 48%, Boron 33%, Iron 12% and Manganese 5%. Declining response on fertilizer use particularly on food grains has been noticed in the decade of 2000.

The average response to fertilizer application used to be around 10:1 during 1960s and 1970s. The response ratio obtained by research scientists who had been adopted by Department of Agriculture and Cooperation, GOI, for calculating demand projections was 1:7.5 for the 8th Plan 1:7 for 9th Plan, 1:6.5 for 10th Plan and 1:6 for 11th Plan. However, IASRI, ICAR has made a study in the recent years to work out the response ratio of fertilizers for food grains based on the farmers field data and has concluded the response ratio of NPK as 1:7.8, but the response ratio varied for different crops from 1:4.9 for oilseeds to 1:7.1 for pulses and 1:8.6 for cereals. (Source: Ministry of Agriculture, Govt. of India)

Factors behind the Gaps in Fertilizer Application in India

1. Fertilizer Pricing Policy - Price factors such as own price of fertilizers and output prices are crucial in determining fertilizer use. Excessive use of nitrogenous fertilizers, while economizing on P and K and micro-nutrients has been attributed to availability of N fertilizers at a subsidized cost, while P and K fertilizers and micro-nutrients are expensive.

2. Credit Facility - Availability of credit is another important factor which determines the fertilizer demand at the farm level. Hence, easy availability of credit would facilitate rapid growth in fertilizer use.

3. Inadequate Knowledge of Farmers - Most of the adverse environmental effects of fertilizer use result from inadequate knowledge among farmers regarding fertilizer application. Farmers are usually not aware of the need of the crops and the current status of their soils. This gives rise to nutrient

mining. Crops remove significantly different nutrients available in the soil.

Most farmers use fertilizers indiscriminately without adequate information on actual soil/plant requirements and they often fail to synchronize fertilizer application and crop uptake. The high fertilizer application by farmers for over-optimistic yield expectations often leads to considerable leaching of nitrate. One analysis of the nutrient dose in high yield value crops in India shows that there are significant gaps between the recommended dose and the actual dose of fertilizer; and the gaps are greater for TSP and MOP than for urea.

Moreover, the delay between fertilizer application and crop uptake increases the chance for environmental losses through leaching, volatilization, and denitrification. Furthermore, the loss of nitrate is further increased due to other limiting factors such as deficiencies of secondary or micronutrients. The inadequate knowledge of the farmers is mainly due to the lack of proper support service in the agriculture system.

4. Tilted Fertilizer Policies - Most of the policies relating to fertilizers cover major nutrients like N, P, K and S. The micro nutrients have not been covered adequately as a result of which the soils have been heavily depleted. It has also resulted in declining productivity of crops.

5. Out dated Irrigation Practices - The concept of fertigation using 100% water soluble fertilizers to enhance both the efficiency of water and nutrients is in a very nascent stage in India. Further, in spite of the potential benefits from drip and sprinkler irrigation methods, these have not been widely adopted in India. Lack of technical support, particularly maintenance of micro-irrigation systems, inadequate and lack of information about the operation and maintenance are the main reasons.

6. Out dated Product Line of Indian Fertilizer Industry - The present Indian fertilizer product line/pattern which is dominated by urea, DAP and MOP is not conducive for solving the problem of multi-nutrient deficiency. New fertilizer materials with value addition/ fortification with secondary and micronutrients is in a primary stage which would be required to ensure balanced fertilizer use involving all or most of the nutrients required by crops.

The Role to be played by the Indian Agricultural Extension Agencies for Minimizing the Problems of Imbalances in Fertilizer Application

1. Strengthening the Infrastructure - Extension agencies should ensure that farmers use the fertilizers in accordance with soil fertility status and crop needs. It will require strengthening of the existing soil testing laboratories by providing facilities for analyzing secondary and micro-nutrients.

2. Updating the Extension Workers - The inadequate knowledge of the farmers is mainly due to the lack of proper support service in the agricultural extension system. The current agricultural extension services are poorly starved and equipped to manage the complexity of the problems arising from issues relating to fertilizers, crops, and climatic and soil diversities. Also, it is seen that extension officers are sometimes more involved in fertilizer distribution rather than providing support service to the farmers. Therefore, the need for India is particularly for strengthening/developing quality-conscious and efficient soil/fertilizer analysis facilities and training skills for imparting knowledge/services to farmers through competent field-level extension strategy (Pandey, 2010).

3. Enhance Effectiveness of the Indian extension services - The existing extension service system needs to be well equipped and adequately starved to cover the large number of small farmers. The extension agents should receive regular training so that they are equipped to transfer appropriate location and crop specific knowledge to the farmers. A vibrant network of the extension system with research institutes, agricultural universities, scientific associations, non-government organizations, fertilizer producing and trading companies can greatly enhance the knowledge base of the extension workers.

4. Encouraging the Farmers to Adopt Modern Fertilizer Application Technologies - Fertilizer use efficiency can be significantly increased and associated costs can be reduced by using new techniques such as deep urea placement and the use of leaf charts. The use of smart fertilizers with better application method will further enhance fertilizer effectiveness. The concept of fertigation should be

promoted by using 100% water soluble fertilizers to enhance both the efficiency of water and nutrients.

5. Equipping the Extension Workers as well as the Clientele regarding Modern Irrigation Practices - In spite of the potential benefits from modern Irrigation practices such as drip and sprinkler irrigation methods; these have not been widely adopted in India. Lack of technical support, particularly maintenance of micro irrigation systems, inadequate and lack of information about the operation and maintenance are the main reasons. Capacity building of the extension clientele viz. the farmers on micro irrigation technologies, including maintenance will help to solve the problems. The government departments and the private farms dealing in micro irrigation systems may be encouraged to get involved in the service provision capacity building process. Extension system should be strengthened to educate farmers about the modern agricultural fertigation practices using 100% water soluble fertilizers to enhance both efficiency of irrigation water as well as fertilizer and nutrients.

6. Multi-Agency Extension System - Public-private partnership would go a long way in improving farmers' awareness about the importance of balanced (beyond NPK), efficient (value added products) and integrated (fertilizers, bio-fertilizers, organic manure etc.) use of plant nutrients to maintain soil health and increase crop productivity. In this regards, as far as possible, fertilizer dealerships should be upgraded to agro-input sale cum service centers by equipping them with diagnostic facilities (soil and water), bringing all agri-inputs under one roof and providing linkages with banks for credit and these Fertilizer Dealers should be empowered with information, knowledge and skills to act as Extension Agents regarding fertilizer issues.

6. Reorienting the Public Sector Extension Agencies - Farmers can be oriented to make judicious use of nutrients based on the soil fertility, organic matter content, soil moisture availability and the crop requirement, as the balance between organic manure, macro and micro-nutrients is very critical to induce flowering and crop yields. It is therefore necessary to strengthen the linkage between the Agricultural Research Institutions and State Agricultural Extension Department with the farmers at the village level, preferably through local

voluntary agencies. The State Agricultural Extension Department and the Krishi Vigyan Kendras should focus their role on providing such field technical service through training, demonstration and field visits. The Agriculture Department should also play a role in coordinating between various other departments like Irrigation Department, Food Processing Department, Agricultural Credit and Banking System to ensure better services.

Some Recent Initiatives

1. For the last three years a massive campaign on “Universalization of Soil Health Cards” has been launched by the Central Government being implemented by the State Departments, Krishi Vigyan Kendras, and Institutes etc. This programme of preparing and distributing Soil Health Cards among the stakeholders are based on Grid Mapping of the cultivable plots with GPS Latitude and Longitude positions. Though this programme has several limitations like gross quantification as well as qualification of soils and once in a while approach, but still the programme is laudable as it try to focus on the importance of awareness about the nutritional status of a given plot and management practices to manage it.

2. The installation of Point of Sale (POS) Machine at the Government recognized Fertilizer Shops has just been initiated from the beginning of the Financial Year of 2017-18. These machines are to be AADHAR linked with in-built facility for Direct Benefit Transfer (DBT) to the clientele. In the future, the Scheme is to link the Universal Soil Health

Card Platform with these POS Machines, so that a practicing farmer or farm women can have exactly that amount of fertilizer as recommended in his or her respective Soil Health Card for a specific crop in a specific season and the subsidy as accrued to the practicing farmer or farm women will go directly to his or her designated Bank Account. If this programme becomes successful, it will go a long way to ameliorate the gaps and insufficient transparencies shrouded the India fertilizer industry and markets and its consumers as well as illogical and un-scientific use of chemical fertilizers.

CONCLUSION

The gaps in fertilizer use in India are multi-faceted and have been continuing since the advent of chemical fertilizers in Indian Agriculture. The need of the hour is the sustaining of the mammoth Universal Soil health Card Programme, its intensification both in time and spatial scale, its digitization and opening up of that digitized platform to all the stakeholders as well as linking up that digitized platform with the Fertilizer Point of Sale (POS) System without no further delay to preserve the valuable natural soil health of India and to revitalize the already decayed soils of India.

REFERENCE

Pandey, T. 2010. *Convergence Model of Public Private Partnership in Agricultural Extension*, Paper presented in the NAARM-IFPRI Workshop on Redesigning Agricultural Extension in India: Challenges and Opportunities, August 20-21, 2010, Hyderabad, Andhra Pradesh.