Frank Notes

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Soil, Water and Fertilisers to Ensure Food & Nutritional Security

India continues to face a major challenge in achieving food and nutritional security for its huge population. Post-independent India made concerted efforts to ensure food security for the growing population. The introduction of fertiliser-responsive high yielding varieties (HYVs) of rice and wheat in mid-1960s was the turning point which ushered in Green Revolution. This enabled the country to become self-sufficient in foodgrain production by 1970s. However, hunger and malnutrition continue to affect the vast population. Children and nursing mothers are the most vulnerable. There are about 250 million people in the country who are prone to hunger.

The success of Indian agriculture during Green Revolution era is attributed to the availability of quality seeds, increased use of inputs, higher investments and expansion in irrigated area. However, the increased crop production has been realized by putting stress on finite natural resources. Green revolution started showing signs of fatigue in mid-nineties which is reflected in stagnant crop productivity, decline in in soil health, lowering of water tables and ecological imbalance. Global warming and climatic variability have further exacerbated the ill-effects of continuously degrading soil, water and environmental quality.

Soil, one of the most precious and finite natural resource, is under severe stress. About one-third of global soil resources are under degradation and situation is even worse in India as the country supports 18% of the world's population on 2.4% of land area. Due to high growth in population, the per capita availability of land decreased from 0.48 ha in 1951 to 0.13 ha in 2011. It is projected to decrease further to 0.08 ha by 2035. The problem of soil degradation is on rise. About 120.4 Mha of the area is affected by various kinds of degradation such as water erosion (82.6 Mha), wind erosion (12.0 Mha), chemical degradation, (24.8 Mha) and physical degradation (1.0 Mha). Over 5.3 billion tonnes of soil is lost annually through water erosion resulting in loss of about 8 Mt of plant nutrients (NPK). Soil is also losing its fertility due to soil sickness and nutrient mining. Many soils have become sick due to excess acidity, alkalinity and salinity. The shift of productive irrigated lands to non-agricultural use due to lack of planning is an area of serious concern.

Water is vital for life, however, its decreasing availability is threatening the very survival of life on earth. The average annual rainfall of 1160 mm in India is quite satisfactory but its distribution over time and space is uneven and erratic. The variability of rainfall is so high that the country faces drought and floods in different parts simultaneously. Intensification of agriculture and increasing population have put extreme pressure on water resources of the country. The excessive use of water through flood irrigation is depleting the finite water resources. The water tables are falling at alarming rates in the intensive cultivated areas irrigated with ground water. Besides low availability, the problems associated with contamination of irrigation water are on rise due to indiscriminate discharge of untreated sewage and waste waters from the industry and households. The unplanned development and mismanagement of water resources have aggravated the problems of waterlogging and salinity in many of the command areas.

India has the largest irrigation system in the world. However, the increasing gap between irrigation potential created and irrigation potential utilised and low irrigation efficiency are the major constraints in

realising high crop productivity. The overall irrigation efficiency of the major and medium projects is estimated to be only around 38%. The anticipated impact of climatic change (global warming) and climatic variability with frequent occurrence of extreme events such as droughts and floods may further worsen the situation and impact the agricultural sustainability.

One of the major challenges in bringing more area under irrigation is to bridge the gap between irrigation potential created and utilized. The challenge can only be met through a more multidisciplinary and participatory management approach to major and medium irrigation projects. Emphasis has to be on command area development and improving irrigation use efficiency. Indian agriculture requires smarter, precision technologies for irrigation and farming practices that are suitable for a specific ecosystem.

Fertiliser is an essential source of plant nutrients to improve soil fertility. Post-independent India laid emphasis on increased use of fertilisers to realise high yields of all the crops. There was a rapid growth in fertiliser consumption, particularly after the introduction of HYVs in mid-sixties. The country has emerged as 2nd largest consumer of fertilisers in the world. But the per hectare fertiliser use in India is still low and highly skewed in favour of nitrogen. Imbalanced and inefficient use of fertilisers has become a serious constraint in improving the crop yields. Increasing deficiencies of secondary and micronutrients have started impacting adversely the crop response to applied NPK. The partial factor productivity is on decline and has also started reducing the farmers' profitability. Low fertiliser use efficiency not only affects crop yields and farmers' profits but also poses threat to the environment.

The sustainable agriculture for food and nutritional security largely depends upon judicious use of natural resources particularly soil and water. Soil health enhancement should be in the top agenda of the government.

Feeding and housing 1.7 billion people by 2050 is a daunting challenge. It would require restoring degraded soils, purifying surface waters, recharging aquifers, reducing gaseous emissions from agro-ecosystems, re-carbonizing the terrestrial biosphere, and restoring the ecological balance. Further, sustainable practices like soil water conservation, water harvesting and recycling, and use of gray water (urban water) have to be adopted. Policy interventions are needed to promote the use of micro-irrigation (drip sub-irrigation) and other water-saving technologies.

The sustainable agriculture for food and nutritional security largely depends upon judicious use of natural resources particularly soil and water. Soil health enhancement should be in the top agenda of the government. Appropriate use of costly inputs like fertilisers can hardly be over-emphasized. Selective implementation of NBS scheme on P&K fertilisers leaving urea out is mainly responsible for distortion in NPK consumption ratio affecting the soil health. Fertiliser policies should encourage the use of all limiting nutrients. Integrated nutrient management (INM) *i.e.* use of chemical fertilisers in conjunction with bio-fertilisers and all organic sources needs to be promoted.

This special issue of Indian Journal of Fertilisers is being brought out to commemorate the 4th International Agronomy Congress on 'Agronomy for Sustainable Management of Natural Resources, Environment, Energy and Livelihood Security to Achieve Zero Hunger Challenge' being organized in New Delhi during November 22-26, 2016. This issue consists of 10 papers on various aspects of soil, water and fertilisers to ensure food and nutritional security. We hope that all those concerned with Indian agriculture including farmers, policymakers, input suppliers and extension personnel will find the content of the special issue relevant and useful. ■