

# INTEGRATED NUTRIENT MANAGEMENT: SOIL HEALTH CARDS FOR SUSTAINABLE AGRICULTURE

Relevant for: Indian Economy | Topic: Agriculture Issues and related constraints

At the dawn of Independence, India was a food deficit nation, largely dependent on imports to feed her people. Faced with famines, stagnant production and rising imports, the adoption of the Green Revolution in the mid-sixties was inevitable. It entailed introduction of high-yielding semi-dwarf wheat and paddy varieties that were responsive to increased application of fertiliser and water.

The leveraging of agricultural research and technology proved successful. India, in 2018-19, produced 284.95 million tonnes (mt) of foodgrains — roughly 3.5 times the pre-Green Revolution level — and that included 23.40 mt of pulses. Moreover, our agriculture has diversified, so much so that production of horticultural crops (fruits and vegetables), at 313.85 mt in 2018-19, exceeded that of foodgrains! The country is today self-sufficient in all major agri-commodities, barring oilseeds.

However, the above output increases have also come at the cost of our natural resources, especially soil and water. Keeping in view the deleterious effects of the rampant and imbalanced use of chemical fertilisers, a unique programme of Soil Health Cards (SHC) was launched by the Central government on February 19, 2015, laying the foundation for evidence-based integrated nutrient management in Indian agriculture. The latest Union [Budget](#) for 2020-21 has also laid emphasis on the balanced use of all kinds of fertilisers.

The SHC programme, implemented over the last five years, assesses soil fertility in terms of the availability of key nutrients — primary (nitrogen, phosphorous and potash) as well as secondary (sulphur) and micro (iron, zinc, copper, manganese and boron) — and physical parameters (electrical conductivity, pH and organic carbon). The SHCs issued to individual farmers also carry a prescription of the right dosage of nutrients based on both deficiency and crops grown in the soils of their particular area. In Phase I of the programme (2015-17), 10.74 crore cards were distributed, with another 11.45 crore being issued in Phase II (2017-19). The programme basically advocates judicious use of chemical fertilisers, together with organic manure and bio-fertilisers, in order to improve the health of the soil and its productivity.

The crucial infrastructure requirement for the programme has been provided through the setting up of 429 new static soil testing labs (STL) and strengthening of 800 existing ones, apart from 102 mobile STLs, 8,752 mini-STLs and 1,562 village-level STLs. As a result, the total soil testing capacity has increased from 1.73 crore to 3.01 crore samples per year. The programme itself has evolved into a mission mode project, to instill belief among farmers in the prescriptions and application of fertilisers as per the SHCs issued to them. As a follow-up to the two phases, model villages are now being developed, one in each of the country's 6,954 blocks. Further, testing at individual holding level is being done, as against grid-based analyses so far, along with SHC-based demonstration of application of fertilisers and farmers' fairs for raising awareness.

The SHCs are only the first link in ensuring healthy soils and production of safe and nutritious food. The receptivity of farmers to the programme has led to the emergence of '*Mitti ke Doctor*' (soil health specialists) and even women's self-help groups that undertake soil testing at village level. Andhra Pradesh currently has 'Raithu Bharosa Kendras (farmers' trust centres)' that offer integrated testing facilities, including of soil. The *Mitti ke Doctor* of Jharkhand, mainly comprising

rural women, are revolutionising the delivery of soil testing and other interventions at the doorstep of farmers, to encourage them to switch to balanced fertiliser and pesticide application for sustainable agriculture without compromising productivity. The SHC programme has also attracted global attention. India is assisting Nepal in setting up soil-testing facilities and capacity building for integrated nutrient management and certified organic farming. These also figure in India's initiatives in South-South Cooperation focusing on African countries.

The Fertiliser (Control) Order 1985 has been amended from time to time to register new nutrient products and formulations. With growing demand for organic produce, the FCO is now also incorporating bio-fertilisers, organic fertilisers and non-edible de-oiled cakes, in addition to chemical fertilisers. The main sources of bio-fertilisers are microorganisms such as nitrogen-fixing azotobacter, phosphate-solubilising bacteria and mycorrhizae fungi that promote uptake of nutrients by plants.

The contribution of chemical fertilisers to greenhouse gases is an important reason for inclusion of organic farming within the National Mission for Sustainable Agriculture under India's National Action Plan for Climate Change. Nano-fertilisers are another emerging category of products with potential to reduce the requirement of urea and other conventional chemical fertilisers. The nano-nitrogen, nano-zinc and nano-copper introduced by the Indian Farmers' Fertiliser Cooperative recently for on-field trials are examples of such fertilisers that allow controlled release of nutrients. These can significantly increase nutrient use efficiency and bring down their runoff into groundwater and water bodies in the vicinity of fields.

Another potential tool for water and soil conservation is 'biochar', which also converges with the National Bamboo Mission. This high-quality charcoal produced by pyrolysis (decomposition at elevated temperatures) of 'waste' bamboo in the absence of oxygen can be used either as such or mixed with organic additives in a suitable ratio. Biochar can enhance crop yields by 5-40%, friendly mycorrhizal fungi by 40%, nutrient retention by 50% and water retention capacity of soils by 20%. It would, thereby, reduce the requirement of irrigation and promote resistance to various fungal and nematode diseases. By enduring in the soil for thousands of years, biochar also helps in mitigation of climate change via carbon sequestration.

In a nutshell, the judicious application of fertilisers based on SHC prescription has multifold benefits in terms of improved soil health, safe food and mitigating climate change. Balanced use will also reflect in reduced water consumption, while at the same time protecting water bodies from run-off pollution. Farmer awareness about balanced fertilisation is being stepped up through the coordinated efforts of the departments of agriculture, cooperation & farmers' welfare and fertilisers, besides the network of the Indian Council of Agricultural Research's Krishi Vigyan Kendras. Farmer can, thus, be enabled to fulfill the mantra of 'Swasth Dhara, Khet Hara' (if the soils are healthy, the fields shall be green)!

*(The writer is Additional Secretary at Department of Agriculture, Cooperation & Farmers' Welfare, Government of India)*

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