

1. Integrated Nutrient Management: Soil Health Cards for Sustainable Agriculture

Context:

- Application of fertilisers based on soil testing taken up on a mission mode is creating a Quiet Revolution.

Brief Background:

- 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.

Impact of Green Revolution:

- India, in 2018-19, produced 284.95 million tonnes (mt) of food grains – 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 food grains. 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 due to deleterious effects of the rampant and imbalanced use of chemical fertilisers.**
- To address this imbalance use of chemical fertilizers, Soil Health Card Scheme was introduced.

Soil Health Card Scheme:

- It was launched on February 19, 2015, laying the foundation for **evidence-based integrated nutrient management in Indian agriculture.**
- It **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
- 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.
- 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 crucial infrastructure requirement for the programme has been provided through the setting up soil testing labs (STL).
- 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.

Other initiatives to boost Integrated Nutrient Management:

- 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 **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.** This 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.

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- 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.

Conclusion:

- 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 government, krishi vigyan kendras.
- Farmer can, thus, be enabled to fulfil the mantra of ‘Swasth Dhara, Khet Hara’ (if the soils are healthy, the fields shall be green)