ICAR’s study on Climate Change and Unbalanced Fertilizer

Prelims: *Current events of national and international importance | Agriculture*

Why in news?

A study conducted by the Indian Council of Agricultural Research (ICAR) reveals that climate change and unbalanced fertilizer use are significantly degrading soil organic carbon across India.

- **Coordinated by –** ICAR’s Indian Institute of Soil Science in Bhopal, it was started in 2017.

Key Findings

- **Influence on soil –** Organic carbon influences soil chemistry, physics, and biology—critical for soil health.
- **Decline in soil organic carbon –** It found that unscientific fertilizer use & climate change are degrading organic carbon in arable soils.
- **3 factors –** Decide the organic carbon concentration in the soil irrespective of the crops and cropping patterns - temperature, rainfall and elevation.
- **Micronutrient deficiency –** If the organic carbon is low, then the deficiency of micronutrients in the soil is high, and if the organic carbon is high, the deficiency is low.
- **Effect of elevation –** Higher land elevations tend to have greater organic carbon content in the soil, whereas, as the elevation decreases from hills to lowlands, the organic carbon levels also decline.
- **Influence of temperature –** Temperature negatively correlates—hotter regions like Rajasthan and Telangana have less organic carbon.
- Low carbon leads to less heat absorption, more heat reflection & greater greenhouse gas effect.
- **Importance of cropping system –** Rice & pulse-based systems show higher organic carbon due to water use and microbial activity, whereas, wheat & coarse grains correlate with lower organic carbon.

- **Regional trends –** Wherever imbalanced fertilizer application was there, then the organic carbon in the soil had declined.
    - **Haryana, Punjab, Western UP** – High fertilizer use (urea, phosphorus) leads to decline in organic carbon in soil.
    - **Bihar** – Balanced fertilizer use leads to better soil carbon levels.
- **Suggestions –**
    - **'Agri-ecological base' map –** Developed to assess how cropping patterns & fertilizer usage influence soil organic carbon across 20 agro-ecological regions.
    - **Universal Soil Coverage –** Promote cropping and plantation across all soils to enhance organic carbon levels.
    - **Targeted Carbon Sequestration –** In areas with ***less than 0.25%*** soil carbon, governments should promote organic carbon sequestration through improved cropping systems & irrigation.
    - **Carbon credit –** Offer financial incentives to farmers who successfully trap CO_2 & convert it into organic carbon.
    - **Climate-Smart Crop Management –** Develop and promote region-specific crop management strategies for climate change mitigation.

Reference

The Hindu | ICAR's study - Climate Change and Unbalanced Fertilizer