

4. CSE Assessment on Indian Soils – Economy

Centre for Science and Environment (CSE) analysis of government data finds 64% of Indian soil samples low in nitrogen and nearly half low in organic carbon. Recent assessments by the Centre for Science and Environment (CSE) highlight severe nutrient deficiencies in Indian soils and a persistent decline in soil organic carbon (SOC). As soil health underpins food security, climate resilience, biodiversity, and water sustainability, this issue is central to sustainable agriculture.

Major Findings

India's soils are critically deficient in nitrogen and organic carbon – two fundamental indicators of soil productivity. These deficiencies pose dual challenges –

1. Falling agricultural productivity and crop quality
2. Reduced soil carbon sequestration capacity, hampering climate mitigation goals

Healthy soil functions as a carbon sink, and India's soils have the potential to sequester 6–7 teragrams (million tonnes) of carbon annually – a key climate opportunity.

Soil Health Card (SHC) Scheme – Limitations

Launched under the National Mission for Sustainable Agriculture (NMSA) in 2015. Tests 12 chemical parameters, but experts note –

1. Limited monitoring of soil biological and physical indicators
2. Inadequate analysis of micro-nutrients and soil biodiversity
3. Need to include soil moisture, microbial biomass, toxic residues, and pollution data

Fertiliser Use Inefficiency

CSE finds current fertiliser practices not improving nitrogen or organic carbon levels. Indicates –

1. Misaligned fertiliser subsidy structure
2. Overuse of urea and chemical inputs
3. Weak adoption of organic and biofertiliser-based systems

Organic Farming Gap – Schemes exist (PKVY, NOPF), but coverage remains limited, especially in rainfed and tribal areas. Need to scale natural farming, composting, and microbial inputs faster.

Soil Health and Its Significance

Soil Degradation Status

96–120 million ha of India's land degraded (NAAS 2010; ISRO 2021)

1. Forests
2. Croplands
3. Pasturelands

Degradation threatens food security, water cycles, biodiversity, and livelihoods.

Key Functions of Healthy Soil

Nutrient Availability – Ensures balanced N-P-K supply and micronutrients for plant growth.

Biodiversity Reservoir – Microbes, fungi, insects, earthworms enhance decomposition, nutrient cycling, and soil respiration.

Soil Structure & Porosity – Good aggregation enhances root penetration, aeration, and water infiltration.

Water Retention & Regulation – Poor structure increases runoff, erosion, floods, and groundwater depletion.

Carbon Sequestration – Higher SOC supports resilient ecosystems, drought tolerance, and nutrient density of crops.

Climate Nexus

Soil carbon stock is a critical climate buffer. Soil health is central to India's commitments under –

1. Nationally Determined Contributions (NDCs)
2. National Mission for Sustainable Agriculture
3. Land Degradation Neutrality Target (2030)

Government Initiatives

Soil Health Card Scheme (SHC) – nutrient testing & recommendations

Neem-Coated Urea (NCU) – efficient nitrogen utilisation, reducing urea misuse

Paramparagat Krishi Vikas Yojana (PKVY) – organic farming clusters

National Mission for Sustainable Agriculture (NMSA) – soil & water security

Rashtriya Krishi Vikas Yojana (RKVY) – state-driven soil interventions

National Project on Organic Farming (NPOF) – biofertiliser & compost promotion

Way Ahead

Biochar adoption – High carbon-rich soil amendment; India must develop standards & protocols for biochar production.

Strengthen soil laboratories & digital monitoring – Include microbial health, soil organic carbon, pollutants, heavy metals. Improve irrigation & effluent regulations. Prevent salinity, alkalinity, industrial contamination. Correct fertiliser policies. Promote balanced fertilization, fertigation, micronutrient blends, and soil-microbe inoculants.

Build Climate-Resilient Farming Systems – Climate-smart practices. Agroecology & regenerative agriculture

Promote Crop Diversification – Crop rotation, legumes, and intercropping to restore nitrogen and soil structure. Farmer Capacity Building. Training on composting, bio-input preparation, fertigation, soil testing.

Strategic Policy Perspective

Key Shifts Needed

From input-intensive agriculture → soil-biology-centric regenerative systems

From chemical subsidies → carbon-farming incentives

From testing chemical parameters → holistic soil ecosystem monitoring

Source – <https://www.downtoearth.org.in/food/cse-assessment-finds-indian-soils-severely-deficient-in-key-nutrients>

