

Soil Intelligence for Sustainable Agriculture: A Decadal Review of the SHC Scheme

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ABSTRACT

Soil degradation due to excessive fertilizer use and poor management has emerged as a major challenge for Indian agriculture. To address this, the Government of India launched the Soil Health Card (SHC) Scheme in 2015 to promote scientific soil testing and crop-specific fertilizer recommendations. The scheme analyzes key parameters such as pH, nutrient levels, and organic carbon to guide farmers in optimizing input use and improving soil fertility. Over ten years, the scheme has issued over 24 crore SHCs and established 8,272 soil testing labs. In 2023, digital upgrades including GIS integration and a mobile app further enhanced accessibility, monitoring, and real-time data mapping. Despite its progress, challenges remain: delays in implementation, limited awareness among farmers, and gaps in infrastructure and digital access. This review highlights the SHC Scheme's role in encouraging sustainable, informed farming. Strengthening implementation, advisory services, and private sector participation is essential for long-term agricultural sustainability.

Keywords: Fertilizer recommendation, SHC Scheme, Soil degradation, Sustainable agriculture,

Technological advancement

INTRODUCTION

Soil is the foundation of agriculture, sustaining plant life and ensuring food security for millions. However, over the years, indiscriminate use of chemical fertilizers, monocropping, and poor land management practices have led to the degradation of soil fertility across India. Recognizing the urgent need to revive soil health and promote sustainable agricultural practices, the Government of India launched the Soil Health Card (SHC) Scheme in February 2015 with a Slogan, Swasth Dharaa, Khet Haraa - Healthy Earth, Green Farm .

The SHC scheme aims to provide farmers with detailed information about the condition of their soil based on scientific testing. By analyzing various parameters such as nutrient content, pH, and organic carbon levels, the card offers crop-specific fertilizer recommendations tailored to the farmer's land. This initiative not only helps reduce input costs but also improves crop productivity, optimizes fertilizer usage, and prevents long-term soil degradation. As the scheme completes a decade, it becomes important to assess its reach, effectiveness, challenges, and the path forward in making Indian agriculture more sustainable and scientifically informed.

Key features of the scheme (Covers 5W & 1H)

WHAT

The scheme, Soil Health Card launched by the MoA on 19th February 2015 in the state of Rajasthan. The card contains the information regarding 12 parameters, which are broadly categorized under the headings Macronutrients, Secondary Nutrients, Micronutrients, and physical parameters. Macronutrients include nitrogen, phosphorus, and potassium. Sulphur is the secondary nutrient, and Micronutrients include Zinc, Iron, copper, and manganese. Physical parameters include pH (Acidity or Basicity), EC (Electrical Conductivity) and OC (Organic Carbon). Based on the values of these indicators, SHC will indicate the recommendations.

WHO

The state government will collect samples through the staff of their Department of Agriculture or the staff of an outsourced agency.

WHEN

Soil samples are taken generally two times a year, after harvesting of Rabi and Kharif crops respectively, or when there is no standing crop in the field.

WHERE

The samples are drawn from both the irrigated and rainfed soils. The grid size varies in irrigated and rainfed soils. The size of the grid to draw a soil sample in irrigated soils and rainfed soils is 2.5ha and 10ha, respectively.

WHY

One of the main reasons for reducing yields is the imbalanced application of fertilizers, irrespective of the nutrient content in the soil. To collect the soil sample and recommend proper proportions of the fertilizer to be applied is the major concern of this scheme.

HOW

Technological Advancement of the scheme

For better monitoring and accessibility the government of India came up with the SHC mobile app in the year 2023. The SHC portal was enhanced with GIS integration, enabling real-time mapping of soil test results. A more advanced mobile application was launched to streamline operations and assist farmers with key features include

Restricting sample collection to designated areas for Village Level Entrepreneurs (VLEs)

Automatic capture of GPS coordinates during sample collection

QR code generation to link soil samples directly with lab test results on the portal

Current status of the scheme as of February 2025 (Source: pib.gov.in)

Number of soil health cards issued to farmers in the year 2024-25 is 53.08 lakhs

24.47 Crore soil health cards generated

8272 soil testing labs

Rs.1706.08 Cr have been released to various states/UTs

Soil and Land Use Survey of India has generated 1987 village-level soil fertility maps for 21 states and UTs

Benefits of SHC

- 1) Provide free or affordable access to soil test
- 2) Provide farmers with timely and accurate results of soil analysis
- 3) Facilitate customized soil nutrient recommendations based on the results of the test

4) Enable farmers to optimize their fertiliser use and minimise cost of cultivation

Challenges include:

- 1. Delayed Distribution of Cards :** Time lag between soil sample collection, testing, and card distribution reduces the card's relevance for timely crop planning.
- 2. Inadequate Infrastructure and Manpower :** Many soil testing laboratories lack modern equipment and skilled personnel, causing backlogs in sample analysis.
- 3. Low Farmer Awareness and Utilization :** A large section of farmers either doesn't receive the SHC or lacks the knowledge to interpret and apply the recommendations.
- 4. Poor Quality of Sample Collection :** Inaccurate sampling methods or improper labeling can result in misleading soil test results and ineffective fertilizer guidance.
- 5. Limited Private Sector Involvement :** Most of the implementation is government-driven; insufficient participation from private agri-tech firms limits innovation and efficiency.
- 6. Lack of Timely and Localized Advisory :** Recommendations are often generic and not customized for specific crops, local climate, or updated farming practices.
- 7. Digital and Technological Barriers :** In remote or backward areas, lack of internet access and digital literacy hinders the adoption of the SHC mobile app and portal.
- 8. Monitoring and Evaluation Issues :** Absence of a robust system to track whether farmers follow SHC recommendations and their actual impact on productivity

Conclusion

Over the past decade, the Soil Health Card (SHC) Scheme has emerged as a significant step toward sustainable agriculture in India. By promoting scientific soil testing and customized fertilizer recommendations, it has empowered millions of farmers to make informed decisions, reduce input costs, and enhance productivity. The integration of digital tools like the SHC mobile app and GIS mapping has further strengthened its reach and efficiency. However, to fully realize its potential, addressing challenges such as delayed implementation, limited awareness, infrastructure gaps, and digital access is essential. Moving forward, a more farmer-centric, tech-driven, and inclusive approach will be crucial for achieving long-term soil sustainability and food security.

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