aesa Sharing, learning and networking for innovation **Blog: 229 (December 2024)** Agricultural Extension in South Asia

HOW PARTICIPATORY APPROACHES CAN ENHANCE SOIL HEALTH

As we celebrate World Soil Day on December 5, K C Shinogi discusses the importance of participatory approaches to promote soil health management.

CONTEXT

Soil is a precious natural resource that plays a crucial role in the survival of all life forms on Earth. Most of the food we eat comes directly or indirectly from soil through plants, making this finite resource the foundation of our food production system. Human activities that harm soil health have a direct impact on global food and nutritional security. While advances in crop production technologies have mitigated the effects of shrinking agricultural land and achieved higher yields from existing farmlands, the ongoing trend of land degradation (Box 1) poses significant risks for future generations.

Box 1: Land Degradation

Recent data from the UN Convention to Combat Desertification (UNCCD) show an annual loss of at least 100 million hectares of productive land between 2015 and 2019 worldwide. A study by the Space Application Centre of the Indian Space Research Organization (ISRO) revealed a sharp increase in degraded land in India, from 94.53 million hectares in 2003-05 to 97.84 million hectares in 2018-19—an expansion of 3.31 million hectares over 15 years. With the growing global population, this loss of healthy soils raises serious concerns about the ability of agricultural lands to meet the needs of present and future generations. The impact of land degradation extends beyond food security, affecting environmental sustainability, ecosystem services, and climate change mitigation.

Preserving healthy agricultural soils and restoring the health of degraded lands are essential for building resilient agro-ecosystems to combat the effects of climate change. While individual countries have programs and policies for soil conservation, the global importance of protecting soils led the Food and Agriculture Organization (FAO) to launch *World Soil Day*. The first official celebration was held on December 5, 2014. Over the past decade, World Soil Day has successfully raised awareness through mass campaigns, resulting in increased adoption of sustainable soil management practices and a gradual reduction in human activities that accelerate land degradation.

FIELD-LEVEL ADOPTION OF SOIL HEALTH MANAGEMENT PRACTICES

Maintaining healthy soils is essential for improved soil functionality and the continued provision of ecosystem services that benefit human well-being. Researchers have identified several agricultural practices to sustain soil health and reverse land degradation, integrating modern techniques with traditional agriculture and nature-based solutions. These include:

- Reduced soil disturbance
- Permanent soil cover through cover crops and mulching
- Crop diversity through intercropping and multilayer cropping
- Crop rotation and integration of livestock
- Agroforestry to improve habitat value
- Optimum use of chemical fertilizers to reduce greenhouse gas emissions
- Recycling farm and household waste into organic manures and compost
- Maintaining year-round living roots to enhance soil biodiversity
- Bioremediation to detoxify contaminated soils

Although many farmers recognize the importance of these practices, their adoption is slower than that of high-yield crops or chemical fertilizers, which yield immediate results. Barriers include low awareness, lack of knowledge, financial risks, resistance to change, and inadequate policies to incentivize adoption.

A more practical and effective technology transfer strategy is needed to promote sustainable soil management. Since the benefits of these practices often take time to manifest, participatory approaches tailored to regional soil conditions can help farmers adopt better methods.

PARTICIPATORY APPROACH TO SOIL HEALTH MANAGEMENT

The ICAR-Indian Institute of Soil Science in Bhopal, Madhya Pradesh, has adopted a participatory approach to promote soil health and nutrient management technologies through a three-step process:

Soil sample collection from the field

STEP 1 - Data Collection

The process begins with understanding farming conditions and identifying land-related issues through Participatory Rural Appraisal (PRA), Farmer-Scientist Interface Meetings, Field Visits, and Agroecosystem Analysis. These methods provide insights into the problems affecting agricultural soils, their causes, and potential solutions compatible with existing practices.

STEP 2 - Knowledge and Skill Enhancement

Soils often suffer due to poor management practices, such as improper tillage, unscientific irrigation methods, and excessive use of chemical fertilizers. A holistic approach is needed to raise awareness about how soil health impacts human health and the agroecosystem. Mass awareness campaigns, seminars, and training sessions help farmers explore alternatives to their current practices. Farmer Field Schools (FFS) offer hands-on learning experiences to empower farmers with the knowledge and skills needed for informed decision-making.

Farmers Seminar in the adopted villages of Ratlam District in Madhya Pradesh, India

STEP 3 - Participatory Technology Development & Field Evaluation

Soil management technologies are often packaged as complementary practices rather than standalone techniques. A gradual shift to new practices is recommended to minimize yield losses during the transition. Participatory technology development incorporates innovative methods suited to local conditions while preserving traditional knowledge. Field evaluations with cost-sharing arrangements encourage farmers to adopt these technologies until they see visible benefits in yield and income.

For example, in the soybean-wheat cropping system of Madhya Pradesh, the nutrient recommendation traditionally involves applying farmyard manure (FYM) at a rate of 5 t/ha. However, rural farm families increasingly use cow dung as cooking fuel, making it less available for agricultural purposes. Given the abundant availability of crop residues, the nutrient recommendation was revised. The modified approach replaces FYM with enriched compost (phospho-sulpho-nitro compost) at a rate of 2 t/ha, along with biofertilizers (applied as seed treatment), while reducing the recommended dose of fertilizers (RDF) by 50% for soybean and 25% for wheat.

A three-year demonstration and evaluation of this intervention conducted by our organization under field conditions showed promising results. On average, soybean yields increased by 24%, and wheat yields by 20%. This led to an average improvement of 22% in net income from the cropping system compared to the nutrient management practices traditionally used by farmers.

Field evaluation of nutrient management technologies for soybean-wheat system, Bhopal, Madhya Pradesh

END NOTE

Soil health management requires on-farm resources and support from governments, technology developers, and extension agents. Behavioural changes, particularly among small and marginal farmers, are challenging but necessary. Policies offering financial incentives—such as subsidies for conservation tools, payments for ecosystem services, and support for composting—can accelerate adoption.

Educating children about soil conservation is critical for fostering a responsible future generation. Lessons instilled in childhood are often carried into adulthood, ensuring long-term care for natural resources like soil.

Dr. Shinogi KC *is a Senior Scientist (Agricultural Extension) at the ICAR-Indian Institute of Soil Science, Bhopal, Madhya Pradesh, India. She works in documenting and validating indigenous agricultural knowledge of tribal farmers and focuses on participatory technology development for soil health and nutrient management.*

AESA Secretariat: Centre for Research on Innovation and Science Policy (CRISP)
Road No 10, Banjara Hills, Hyderabad 500034, India

www.aesanetwork.org **Email: aesanetwork@gmail.com**