

Soil Literacy & Soil Testing: Guidance Note for CARE Staff

OVERVIEW This note is intended to serve as guidance and recommendations for CARE staff working on sustainable agriculture initiatives. Specifically, this note is intended to support new business opportunities, bolster program development, improve existing programs and projects, and promote collaboration.

Importance of Soil Literacy

A healthy soil is a living ecosystem and is essential for productive, sustainable, and resilient farms. Healthy soils are the “**foundation of the food system,**” and provide important nutrients and minerals needed to grow nutritious food crops for both human and animal consumption. They are essential to addressing a multitude of interrelated global challenges, including global food security and nutrition, climate change mitigation and resilience, and a range of ecosystem services.¹

Many industrial agricultural methods have put an incredible amount of strain on soils and have negatively impacted natural resources. Current statistics are staggering and state that **33%** of the earth’s soil is degraded, and that soil erosion can lead to up to **50%** loss in crops!² Understanding soil as a whole concept, including its natural characteristics (physical, biological, and chemical), required management practices, and its interaction with other ecosystems, are of paramount importance for farmers, producers, agricultural extension workers, agricultural educators, input dealers, and more.

The benefits of healthy soils are endless! It is critical that farmers are provided with knowledge, resources, and access to services that support them to properly understand the complex nature of soils, and ultimately strengthen their ability to create and manage healthy soils and nutrients. The ability of farmers to treat soils as living ecosystems improves soil’s long-term function and resilience³, can increase food production, improve incomes, and protect critical natural resources. One way to improve soil health and fertility is through soil testing, which provides farmers with important information to make the most informed decisions.

Benefits of Healthy Soils

- ❑ Creates healthy, strong plants that are more resilient, and less vulnerable to pests and diseases.
- ❑ Increases crop production and yields for nutritious foods and improves income.
- ❑ Conserves water by increasing water retention and prevents erosion.
- ❑ Captures, filters, and infiltrates stormwater.
- ❑ Helps to suppress weeds.
- ❑ Captures and stores carbon.
- ❑ Reduces the need for unnecessary, and often harmful, fertilizers.
- ❑ Increases environmental protection from contaminations by runoff and leaching of excess fertilizers.



¹ <https://ebrary.ifpri.org/digital/collection/p15738coll2/id/133203>

² What is soil erosion? <https://www.fao.org/about/meetings/soil-erosion-symposium/key-messages/en/>

³ <https://sarep.ucdavis.edu/are/ecosystem/soil>

Critical Need for Soil Testing

Healthy soils are full of life⁴! Healthy soil is made of “millions of species and billions of organisms that make up a complex and diverse mix of microscopic and macroscopic life that represents the greatest concentration of biomass on the planet.” These organisms play an important role in creating and maintaining healthy soil systems and are essential to growing healthy crops.

However, soils have different requirements and needs to thrive. Soil tests increase the understanding of a soil’s exact needs. “The goal of soil testing is to provide an accurate assessment of the soil’s fertility,⁵” including available nutrients and minerals. They support an informed analysis and take out the “guesswork.” Soil tests can serve as an important tool during production planning and management to help determine existing nutrients, identify deficiencies,⁶ support best decision-making and recommendations for fertilizers and amendments, and even help to determine the best sustainable agriculture methods to utilize to increase soil health.

Additionally, soil testing can help farmers save money. In recent years, fertilizer prices have increased drastically, reducing incomes, and leaving farmers vulnerable and dependent. When farmers have increased access to soil testing, combined with soil literacy, farmers are able to determine the exact needs to increase soil health and save time and money by applying the right type and “only the amount of fertilizer needed.”⁷



Benefits of Soil Testing

- Increases knowledge of soil-nutrient availability.
- Optimizes production by creating nutrient-rich, fertile soil through strong soil knowledge and management practices.
- Supports decision-making, and increases understanding of the 4R Principles of nutrient management - right source, right rate, right time, and right place.
- Saves money and conserves energy by applying correct amounts of fertilizers.
- Protects the environment, improves ecosystem services, and contributes to conservation.

Barriers to Soil Literacy and Testing

While soil literacy and testing are critical components of maintaining healthy soils, it is often not accessible to small-scale farmers. Often farmers lack access to educational opportunities. Additionally, farmers are not always aware about soil testing and its importance. When awareness exists, it is often out of reach. Soil testing services can be expensive, while soil testing kits and accompanying education and training are not always available.

These barriers become even more difficult for women and youth who face inequities in access to productive resources, education and trainings, policies, time availability, and more. Such constraints not only lead to challenges in improving soil health, but also to “gender-differentiated perceptions about ecosystem services and behavior regarding resource use and agricultural technology adoption. Additionally, soil health is often not a consideration in youth education. However, given that soil health is directly linked to the current and future health of the planet, soil health education for youth is critical.⁸ It is also vital to note that farmers globally have Indigenous Technical Knowledge (ITK) for soil fertility and testing. However, soil interventions have excluded this valuable knowledge.

Removal of these constraints can lead to solutions, opportunities, and future problem-solvers and innovators!

⁴ <https://www.nrcs.usda.gov/sites/default/files/2023-01/Healthy-Soils-Are-full-of-life.pdf>

⁵ <https://cropwatch.unl.edu/soil-testing-more-important-ever-efficient-fertilizer-use>

⁶ <https://cropwatch.unl.edu/soil-testing-more-important-ever-efficient-fertilizer-use>

⁷ <https://ag.umass.edu/greenhouse-floriculture/greenhouse-best-management-practices-bmp-manual/soil>

⁸ Washington State University. 2023. Growing Interest in Soil Health: An Appreciation-Based STEM Curriculum for Kids.

What CARE Can Do

This guidance seeks to work across the [Gender Equality Framework](#) to ensure solutions build agency, change relations, and transform structures. A few recommendations include:

- **Prioritize education, access, and opportunities, especially for women and youth.**
 - Integrate soil literacy and testing into all agricultural programming.
 - Incorporate the [Farmer Field and Business School \(FFBS\)](#) approach and utilize the Sustainable Agriculture Tools to strengthen technical knowledge; ensure farmers can measure soil health and analyze results of experimental practices to support decision-making.
 - Champion sustainability! Encourage closed-loop farming systems for necessary fertilizers using local, renewable resources.
 - Introduce soil health into youth-related programming and schools as pathways. Support youth to become soil health stewards and encourage future opportunities as agricultural, food systems, and environmental experts.
 - Advocate for soil health by facilitating educational opportunities, linking interest groups, support learning, monitoring, scale-up support, advocacy and more!
- **Complement new information, knowledge sharing and appropriate technology with existing local and indigenous knowledge.**
 - Work with farmers and local experts to integrate solutions with existing soil health knowledge and practices.
 - Advance localization by partnering with local social enterprises and research institutions.
 - Support decision-making and participatory management by sharing data with farmers and partners on the benefits of soil literacy and soil testing.
 - Work with local governments and government extension workers, research institutions and like-minded development actors to promote sustainable development of soil health and fertility.
 - Partner with private sector partners on information sharing and technical training opportunities.
- **Work with CARE colleagues around the world** to consider new approaches, adaptations, innovations, and learnings from other CARE projects.
- **Ensure financing mechanisms are a priority** by encouraging farmers to access soil health and soil testing services through VSLAs, as well as other agricultural finance mechanisms.
- **Work closely with service providers** to understand business models and technologies. Advocate for increased access, affordability, education and training to services. A few successful models include:
 - [CropNuts](#) - provides soil testing in Nigeria, Zambia, Malawi, and Kenya and are scaling to other regions, and strives to inform farmers on their fertilizer strategy to reduce input costs.
 - [Soil Cares Foundation](#) in Nairobi provides affordable, digital soil testing services, equipment and [training packages](#).

SUCCESS STORY

Through the PepsiCo She Feeds the World program, CARE Peru worked with women in the Piura region, where 32 women were trained on conducting soil tests and analysis using “quick field kits.” This activity was carried out in collaboration with a soil specialist from the faculty of the Agronomy of the National University of Piura, where the tests initially took place for organic banana producers and lemon producers. The activity had such successful results that the women formalized themselves into the “Association of Promoters of Agrarian Competitiveness of Sullana.” The women now provide soil testing and analysis services in their localities.

ONGOING PILOTS

October 2023 to June 2024, [CARE10x](#) is piloting a partnership with CARE Kenya and a local social enterprise, [Ujuzi Kilimo](#), to increase smallholder farmers’ access to soil testing. Ujuzi Kilimo’s soil testing device, SoilPal, is specialized for the unique needs of smallholder farmers: it’s portable, affordable, and easy-to-use for analyzing soil’s moisture, pH, nutrients, and electrical conductivity (EC) levels. Minutes after a test, users receive an SMS message with agronomic recommendations. To date, the pilot has distributed a device to each of the three farmer cooperatives participating in CARE’s ongoing Farmer Field and Business School and trained 19 community-based agents to use the devices and collect commissions for each test. By enabling cooperative’s ownership of tools fit for their unique needs, the pilot seeks to enable climate-smart agronomic practices in a more community-driven and sustainable way.