Landscape Restoration Evidence Series

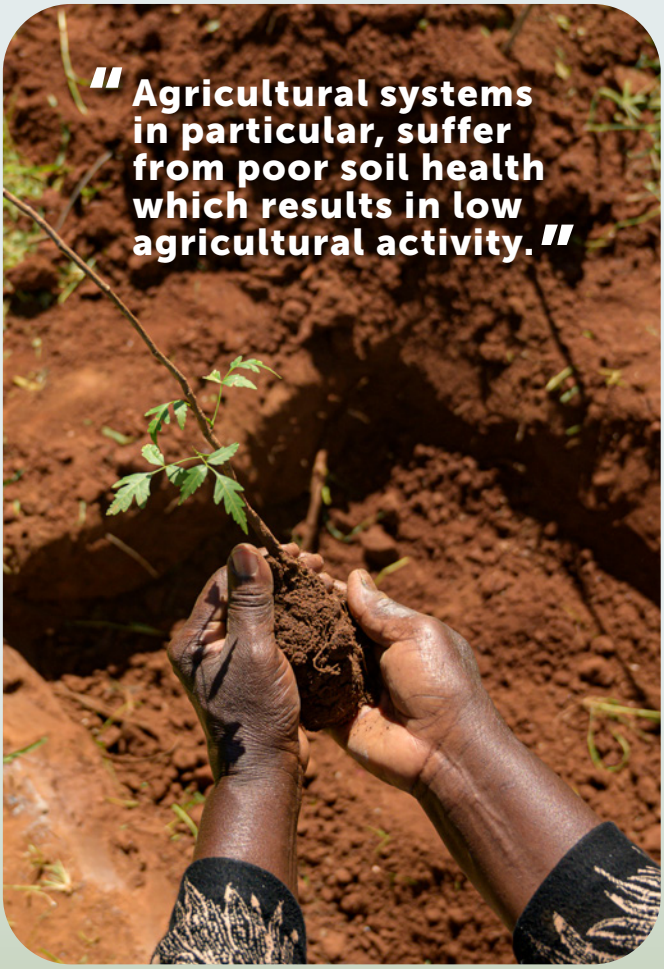
ADDRESSING LAND DEGRADATION AND FOOD SECURITY THROUGH ADVANCED & COST-EFFECTIVE SOIL TECHNOLOGIES

CIFOR World Agroforestry

06

Healthy soil is fundamental to our wellbeing. Without them, achieving our collective commitment to sustainable development, climate action and ecosystem restoration will be impossible.

Today, soils face an unprecedented crisis. About **40% of Earth's surface is degraded, with an estimated loss of over 75 billion tons of topsoil every year**. In Africa, it is estimated that over a quarter of the continent's land is degraded. This directly threatens the livelihoods, food and nutrition security of more than 60% of the population in sub-Saharan Africa that are dependent on smallholder agriculture.



Drylands are extremely resilient and important ecosystems for livelihoods, covering over 60% of the continent and home to more than 525 million people. Despite their resilience, drylands are especially susceptible to soil degradation. The combination of poor management practices (or the lack thereof) and climate change, has resulted in drylands having the most pronounced land degradation.

While **land degradation is most pronounced in Africa's drylands**, it is very context specific and varies from farm-to-farm even within communities. A major constraint to addressing the challenge of land degradation is understanding the key drivers and root causes. Key to this is advanced, cost-effective soil testing.

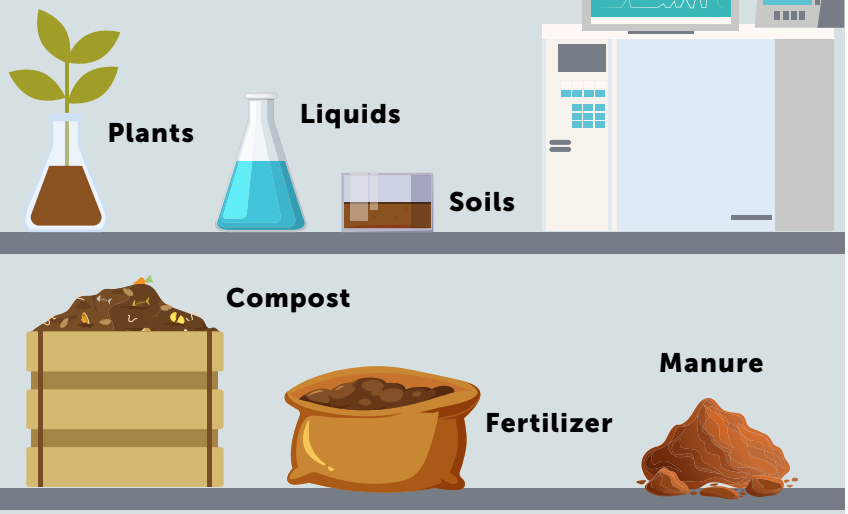
Conventional soil laboratory methods are known to be very expensive, time consuming, and often required massive amounts of soil samples. This substantially reduces the number of samples collected, particularly in developing regions like Africa. Today, a breakthrough in how soils are analyzed, has better equipped farmers, pastoralists and government decision-makers to enhance the management of agricultural and rangeland systems, as well as restoration efforts.

CIFOR-ICRAF have co-developed the application of soil spectroscopy, a cost effective, robust, and rapid approach to analyzing soil samples.

If you cannot measure it, you cannot manage it.

Soil spectroscopy has completely revolutionized how we sample soil and conduct land and soil health assessments.

Soil Spectroscopy enables accurate, robust, low-cost analysis of multiple properties simultaneously. It can be used to analyze:



The technology relies on **infrared electromagnetic radiation** to measure the amount of energy the soil surface reflects at specific wavelength, providing what scientists call a spectral signature. This provides detailed information on the ability of the soil to supply nutrients, retain nutrients, hold water, and resist erosion.

SOILS
SOIL AND LAND HEALTH THEME

The Soils Theme of World Agroforestry (ICRAF) in collaboration with partners, has been at the cutting edge globally of innovations in soil spectroscopy. Under the umbrella of the **Global Soil Laboratory Network**, ICRAF has created a large planetary database of soil data, which plays an important role in agricultural research and ecosystem restoration.

The ICRAF Soil Archive is one of the largest physical archives of systematically collective soil samples, containing samples from 46 countries across Africa, Asia and Latin America. All these soil samples have been collected using the systematic field sampling method, the **Land Degradation Surveillance Framework (LDSF)**.

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Further resources

- Land Health decisions
- Soil-Plant Spectral Diagnostics Lab
- Blog - 'Data streaming from the spectrometer': a new dawn for soil assessments

This evidence series was developed by researchers and practitioners spearheading the new Landscape Restoration TPP, with support from GLF **www.globallandscapesforum.org**

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