



International Center for Tropical Agriculture  
*Since 1967 Science to cultivate change*



## CIAT and Germany in Western Kenya: Uniting for Impact

### 1 | Preserving Soil in a Changing Climate

#### The challenge

When it comes to “future-proofing” farming activities, it’s time to mainstream soil health into efforts to make farming more resilient to the impacts of climate change. This entails assessing which agricultural practices preserve and rehabilitate the soil, while leaving a minimal climate footprint, and boosting harvests.

#### How we are tackling it

In Western Kenya and four other countries, we are weighing up different farming practices and their climate-smart credentials. The work will culminate in a portfolio of recommendations for concrete, climate-responsive soil protection and rehabilitation methods which farmers can apply in their fields.

By collecting detailed information on climate-smart attributes of current soil protection and rehabilitation measures, currently lacking guidelines can be formulated by the International Center for Tropical Agriculture (CIAT), together with partners, linking to global initiatives such as the UNCCD Land Degradation Neutrality goal.

#### Scaling up through partnerships

By listening to farmer’s perceptions about which soil rehabilitation and protection practices help them adapt to climate-related problems like flooding or drought for example, we can understand why farmers adopt or avoid certain practices. These can also be dependent on social factors including gender.

CIAT together with partners will identify the most promising practices within specific contexts. Data collected through biophysical soil assessments or through economic assessments can enable decision-makers to prioritize investments. For example, options which make most sense for farmers in the long-term, financially and environmentally, will be presented at county-level in Western Kenya, where planning for climate-smart agriculture is underway and can feed into national policy.

#### How will results be used?

- Existing knowledge databases will be upgraded, taking soil conservation practices into account
- Knowledge about climate-smart credentials of soil protection and rehabilitation practices, evaluated together with farmers and extension workers, is available for roll-out by partners
- Selected portfolios of climate-smart soil rehabilitation practices are available to government officials in Western Kenya, and can be mainstreamed in county-level planning



## 2 | The Bigger Picture: Taking The Long-Term View

### The challenge

Soil formation is not a short-term activity. It takes decades to build up a picture of soil health linked to landscape trends and dynamics, instead of snapshots of soil health indicators. Long-term trials are the only way to measure soil property changes, which takes time and usually can only be documented years after interventions have been put in place.

### How we are tackling it

For over a decade, CIAT has had two long-term experiments in Western Kenya. One covers aspects of conservation tillage, the other addresses integrated soil fertility management. Both trials were established in 2003 and have since been managed by CIAT.

The two long-term trials are the most comprehensive picture of tropical soil health that CIAT has in Kenya. They allow us to show-case crop yield improvements linked to soil health, and changes in soil properties, which illustrate the impact of conservation measures on soil fertility. Over the years, CIAT's long-term trials in Western Kenya have been visited by hundreds of farmers, regional stakeholders, and students studying agronomy and soil health practices through internships, bachelor and master Degrees and PhD theses.

We are testing interventions crucial for advising farmers. For example, assessing the impact of crop rotations in response to farm yard manure or green manure grown on site, enables us to advise which mix of organic and mineral fertilizers can restore productivity to degraded soils

### How will results be used?

- To assess the impact of cropping systems and rotations when crop residues or fertilizers are applied, or when plots are tilled, and to evaluate different cropping systems following conservation tillage practices
- To determine the effect of conservation tillage on sustainability and soil health indicators and to evaluate the effect of tillage and crop residue application on maize and soybean yields, and on soil health indicators
- To assess integration of tillage, crop residue, rotation, and mineral fertilizers as a means to restore the productivity of degraded soils



### 3 Living soil: How Fertilizers and Organic Matter Influence Soil Biology

#### The challenge

Soils provide the fundamental basis for food production. They store water, deliver nutrients to crops, capture carbon, nurture biodiversity and provide clean drinking water. Yet soil functions have received very little attention. Efforts to boost agricultural yields have not focused enough on how intensification influences the functions and balance of soil organisms and soil biology. Measures to restore soil fertility need take into account physical soil and chemical changes related to soil biology and nutrient uptake, as well as those related to climate and productivity.

#### How we are tackling it

We will provide in-depth research on the impact of best-bet conservation practices on soil biological functions, soil fertility and crop productivity. Soil management - including the use of fertilizers and other inputs - plays a crucial role in soil biology. Management techniques will be tested, to find out which options preserve the soil's health, while allowing farmers to intensify their production and profits.

In addition, some soil management techniques may lead to increased release of potent greenhouse gases like nitrous oxide, leaked into the atmosphere. How such losses are influenced for example by using mineral fertilizer, remains largely un-assessed in sub-Saharan Africa. We will monitor which greenhouse gas emissions can be reduced in smallholder farming systems of Western Kenya, keeping climate footprints low.

#### How will results be used?

- Potential impacts of applying only mineral fertilizer on soil biology will be better understood
- Knowledge generated in this project will inform decisions for investment into soil and land restoration initiatives cognizant of soil biology and climate footprints in Western Kenya - and similar agro-ecologies regionally
- Key partners, like the Kenya Agricultural and Livestock Research Organization (KALRO) and development practitioners, will together understand better how soils can provide nutrients, lower climate footprints, contribute to long-term crop productivity and efficient resource use





## 4 More milk and better forage feed in Western Kenya

### The challenge

As populations grow and diets shift, demand for milk and meat is on the rise. For smallholder farmers, livestock represent a good opportunity for better incomes; they also contribute to food and nutrition security, and are socially and culturally important.

But quality feed shortages - especially during the dry season - and subsequent low and unreliable milk yields, are obstacles for dairy production. In addition, the lack of commercially available forage seed results in limited awareness and adoption by farmers, especially since forage cultivation and management requires good guidance.

### How we are tackling it

Given the huge market demand for feeds and forages, higher-quality forages can drastically boost livestock production and improve farmer livelihoods - especially those of women and children who are often responsible for feed collection. Improved forages have environmental co-benefits: protecting soil and water resources, contributing to pest and disease control and reducing greenhouse gas emissions.

Improved forages and forage technologies will be evaluated with farmers and made available to a large number of small-scale dairy producers. The project will also support establishment of sustainable medium and small-scale enterprises along the forage value chain, offering new job opportunities, especially among the youth and women.

### How will results be used?

- The project targets three diverse counties to improve environmental sustainability and boost productivity of dairy producers
- With Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Kenya Agricultural and Livestock Research Organization (KALRO) and other partners, improved forage options will be evaluated by farmers
- Interventions throughout the forage value chain will spur private sector involvement and support sustainable medium and small-scale enterprises, bringing job opportunities to youth and women

#### CONTACTS

**Robin Buruchara**, Regional Director  
✉ [r.buruchara@cgiar.org](mailto:r.buruchara@cgiar.org)

**Deborah Bossio**, Director, Soils Research Area  
✉ [d.bossio@cgiar.org](mailto:d.bossio@cgiar.org)

With the financial support of



Federal Ministry  
for Economic Cooperation  
and Development

