



RESTORATION OF DEGRADED LAND FOR FOOD SECURITY AND POVERTY REDUCTION IN EAST AFRICA AND THE SAHEL

Employing a farmer-centered approach in Ethiopia, Kenya, Mali and Niger





World Agroforestry

CGIAR RESEARCH PROGRAM ON Forests, Trees and Agroforestry

ICARDA Science for resilient livelihoods in dry areas

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

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IFAD Investing in rural people

This brief describes implementation work under the ICRAF led project **"Restoration of degraded land for food security and poverty reduction in East Africa and the Sahel: taking successes in land restoration to scale"**.

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Contacts
Leigh Winowiecki (ICRAF) L.A.Winowiecki@cgiar.org
Fergus Sinclair (ICRAF) F.Sinclair@cgiar.org
Malu Ndavi (IFAD) m.ndavi@ifad.org

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Design and Layout by Debra-Jean Harte





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ADDRESSING LAND DEGRADATION TO ACHIEVE FOOD AND NUTRITION SECURITY

Land degradation threatens the livelihoods and the food and nutrition security of the poorest, most vulnerable smallholder farmers and pastoralists. As a result, migration is accelerating, with an estimated 60 million people in Sub-Saharan Africa at risk of being displaced by desertification and land degradation by 2050.

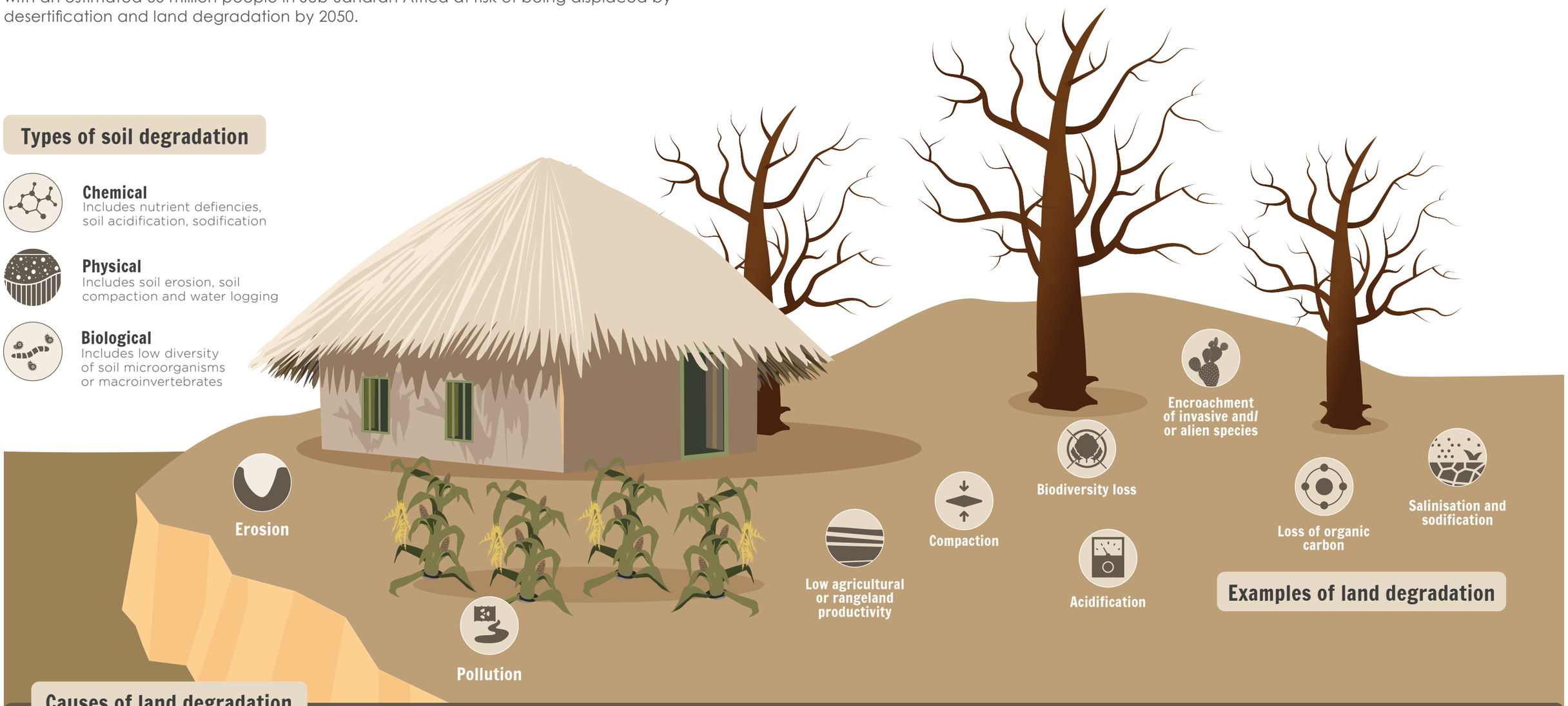
Restoration of degraded land can be a key pathway to achieving food security and reducing poverty for some of the most vulnerable people living in Africa's drylands. Landscape restoration is a process that aims to restore ecosystem functions and enhance human well-being. Restoration options need to be tailored according to biophysical and socio-economic conditions.

Types of soil degradation

Chemical
Includes nutrient defiencies, soil acidification, sodification

Physical
Includes soil erosion, soil compaction and water logging

Biological
Includes low diversity of soil microorganisms or macroinvertebrates



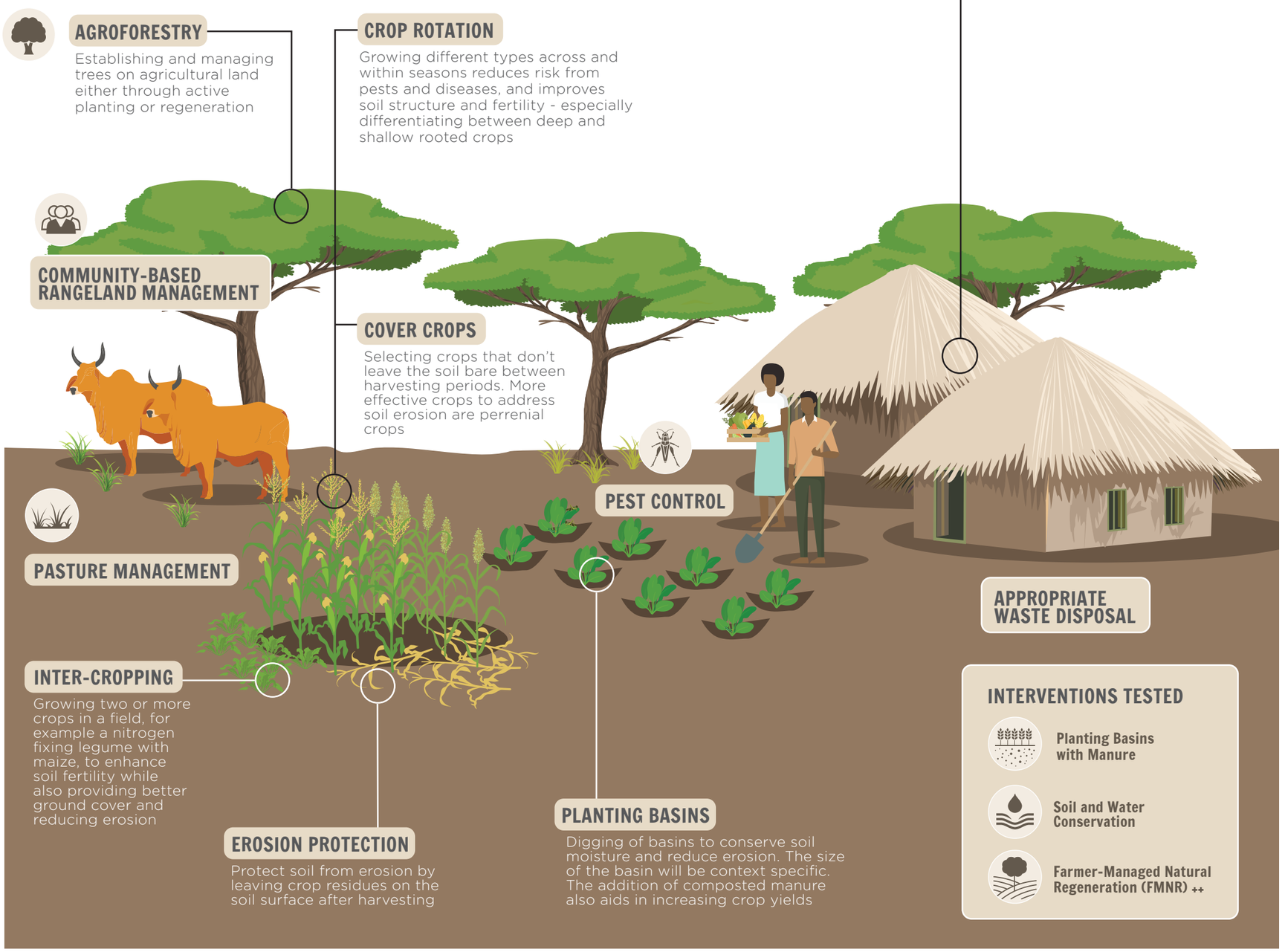
Examples of land degradation

Causes of land degradation

- Land clearance, such as clearcutting and deforestation
- Quarrying of stone, sand, ore and minerals
- Bare soil exposed to wind and water erosion
- Overgrazing
- Agricultural depletion of soil nutrients through poor farming practices
- Spread of invasive species
- Lack of soil and water conservation measures
- Unsustainable agricultural practices

Land restoration interventions in agricultural landscapes

Land restoration and avoiding further degradation can be a key pathway to achieving food security and exiting poverty for some of the most vulnerable people living in drylands. Key to the restoration of degraded land is sustainable soil management locally appropriate agricultural practices



Achieveing the sustainable developments goals through scaling land restoration and addressing land degradation

SUSTAINABLE DEVELOPMENT GOALS

In order to achieve the Sustainable Development Goals (SDGs) of the United Nations (UN), successful restoration efforts need to be taken to scale, both reaching a larger number of farmers and covering larger areas (millions of hectares) over the coming decade. The Agenda 2030 confirms the important place of smallholder agriculture-led growth for achieving the SDGs contribute to the latest declaration -
The UN Decade on Ecosystem Restoration.

In particular SDG 15 relating to life on land recognizes soil as the basis of food production on land, soil restoration can simultaneously increase food production, reduce greenhouse gas emissions by capturing carbon, and help communities adapt to climate change. Specifically target 15.3 **"By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world".**

Other **SDGs** are closely linked to efforts to address land degradation, these include indicators on soil and land, **SDG 2** - End hunger and achieve sustainable agriculture; **SDG 6** - Protect and restore water-related ecosystems.



The Challenge

The role of farmers and pastoralists to restore degraded land

Smallholder farming is a critical contributor to global food security but is under major threat from degradation, loss of soil function and fertility and corresponding low agricultural yields. Addressing land degradation requires active engagement of farmers to integrate restorative agricultural practices on their farms. Achieving the targets set out by the United Nations Sustainable Development Goals (SDGs) requires successful restoration efforts to reach large numbers of farmers and hectares over the coming decade.

A key constraint to scaling restoration is that the ecological, economic, sociological and institutional context varies from household to household, as well as from village to village and that no one technology will suit all contexts.. What is urgently needed are locally relevant restoration options that will work for different farmers in different places.

Matching restoration options to farmer context

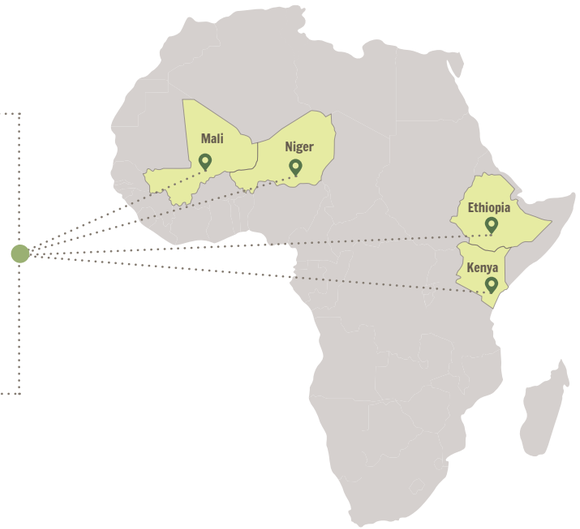
Consequently there is a significant need to compare and test the performance of restoration options under different contexts to better understand what works for different people in different place and how to match options to local conditions and farmer circumstances.

The project directly addressed this need through the use of 'Planned Comparisons' - an innovative approach whereby farmers and local communities compare the performance of promising practices across differing contexts, placing them at the centre of the research and scaling process.

This Brief

Describes advances toward achieving transformative outcomes by placing farmers at the centre of land restoration efforts and agricultural research. Farmers in Ethiopia, Kenya, Mali and Niger implemented on-farm planned comparisons to test and innovate land management practices that restore agricultural productivity and ecosystem health. Radically different to past development approaches, planned comparisons embed research into the development and scaling process, while empowering farmers and pastoralists to restore degraded lands.

Farmer-centered land restoration options have been scaled in Ethiopia, Kenya, Mali and Niger using a planned comparison approach.



RESEARCH IN DEVELOPMENT

The research in development approach is a transition from traditional research methods, which often works on a small number of sites with limited farmer engagement, to an approach based on high levels of farmer participation while generating robust evidence across a high number of sites and multiple contexts. For example, past approaches largely focused on scaling technology successes from agricultural research stations to farmers fields, which often failed to address fine scale variation in local conditions and farmer circumstances.

Large scale impact requires evidence-based innovations to be widely adopted across multiple contexts. The research in development approach used by ICRAF and partners generates this information, by testing and validating options using a farmer-centered approach to understand what works best where and for whom. This is essentially integrating research design into implementation while providing real-time feedback from and with farmers.



WHAT NEEDS TO BE IN PLACE TO IMPLEMENT THE RESEARCH IN DEVELOPMENT APPROACH

WHO IS INVOLVED

Researchers

Researchers need to be:

- Flexible in the design of interventions, to allow farmers to innovate to meet their needs
- Innovate data collection methods (e.g. electrontic data capture), as thousands of farmers will be engaged and traditional methods may no loger be feasible
- Close the learning loop by sharing research results in a timely manner to allow development and government partners to incorporate the learnings into their programmes (for example not just sharing results at the end of the project)
- Adopt new ways of communicating the results that make sense to the various stakeholders

Development and government actors

Need to be open to operating differently. For example, implementing planned comparisons requires a shift in traditional development implementation to allow space for monitoring and co-learning. Farmers will need also to be introduced and trained on the various options

Farmers

Farmers engaged in the planned comparisons will need to be available for the monitoring of performance, as well as keep records on the variations of each of the options they are employing. This will allow for analysis and comparison of the performance of the options

Donors

Donors to recognize the value of using real-time science to inform development programmes. Ultimately, this will encourage more successful outcomes and accelerate impact on the ground to meet national and international targets

KEY ASPECTS THAT NEED TO CHANGE

Communities of practice

Communities of practice between farmers, NGOs, government and researchers are and effective way to stimulate knowledge sharing both within and between stakeholder groups

Communication

Communication is very important throughout the entire process. For example, protocols for the various options need to be co-developed and properly communicated to encourage smooth implementation on the ground

Changes in behaviour - closing the learning loop between and within stakeholder groups

In order to implement the research in development approach, stakeholders need to be open to doing things differently - a shift in behaviour is critical for success

WHAT IS A PLANNED COMPARISON?

Planned comparisons are the testing of various options on a farmer's field. This includes the testing of the variations of the option (i.e., different sized planting basins, manure treatments, etc.). Planned comparisons allow for rigorous assessment of options across different conditions and locations to identify what works where for whom. Planned comparisons allow for understanding the performance of the options at multiple scales, from farmers' fields and communities, to different agroecological zones.

Each farmer has a different context and specific needs. Restoration approaches and technologies must therefore be adapted for each of the varying contexts. **The planned comparison approach accommodates this and allows farmers to experiment and innovate on their farms, which in addition to increasing farmer learning has also led to scaling of land restoration.** For example, the farmer chooses which options he or she would like to implement and compare on their farm. They are also encouraged to innovate around the option to meet their needs.



Key aspects of the planned comparison approach

- High farmer participation
- Participatory identification of the current challenges facing farmers
- Participatory identification of an initial set of potentially promising options as well as the current questions remaining about the viability of these options
- Development of a planned comparison protocol that aims to answer these research and implementation gaps
- Continual review and refinement of the options and protocols together with farmers to address the locally relevant challenges and contexts
- Monitoring of the performance of each of the options to produce rigorous evidence on the constraints and conditions for implementation and the variables of success for specific restoration options
- Aims to scale relevant management/restoration innovations to a large number of farmers by demonstrating the performance and impact of the new innovation in specific contexts
- Facilitates a 'deep' participatory processes with farmers, as well as partners and additional stakeholders, to encourage co-learning, knowledge sharing and innovation
- An innovative way to embed research into development, by reaching large numbers of farmers and having high farmer participation



PLANNED COMPARISONS IN ACTION

Examples from four countries in sub-Saharan Africa

The overaching goal of the ICRAF-led project, **"Restoration of degraded land for food security and poverty reduction in East Africa and the Sahel: taking successes in land restoration to scale in Niger, Mali, Kenya and Ethiopia"**, was to reduce food insecurity and improve the livelihoods of poor people living in African drylands by restoring degraded land, and returning it to effective and sustainable tree, crop and livestock production, thereby increasing land profitability and landscape and livelihood resilience.



MALI (Led by ICRAF)

Soil water conservation, tree planting, and in-situ grafting within farmer managed natural regeneration

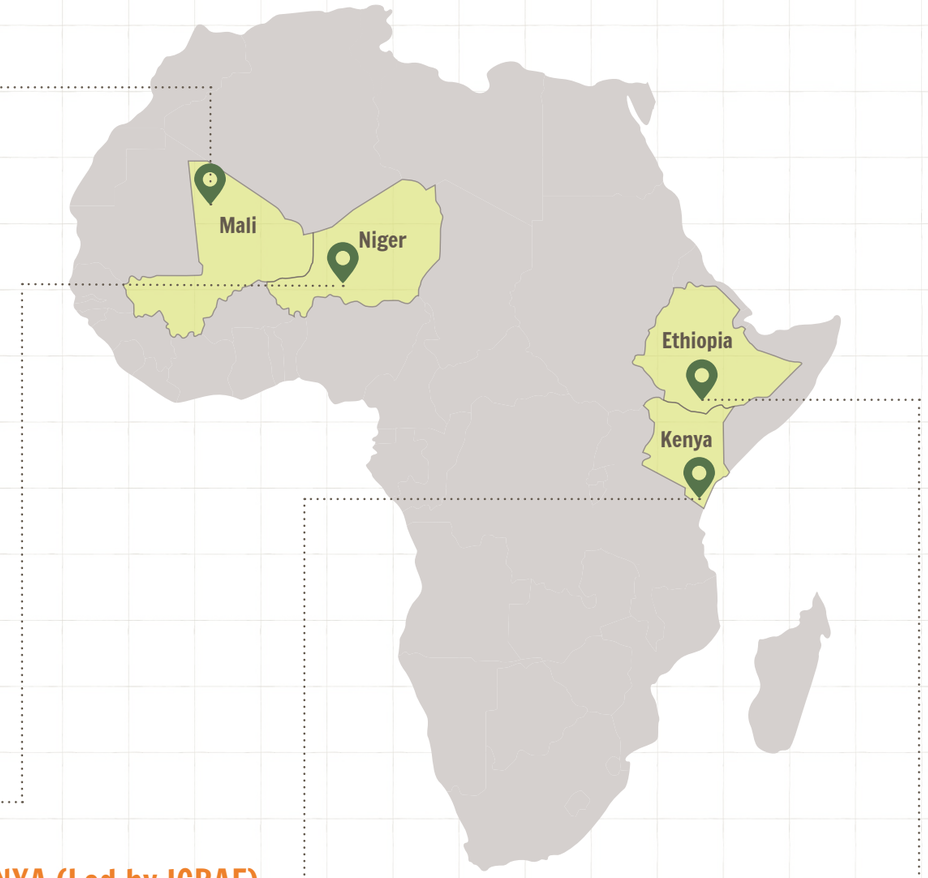
Restoration Options tested

- TREE PLANTING AGROFORESTRY
- SOIL AND WATER CONSERVATION
- IN-SITU GRAFTING WITH FARMER MANAGED NATURAL REGENERATION (FMNR)

Innovative partnerships

IFAD Programme
PAPAM
NGO Partner
Sahel-Eco

Other Partners
West Africa Science Services Centre on Climate Change and Adapted Land Use
AMMEDD & AMEPPE
Institut d'Economie Rurale (IER)
DryDev Programme





NIGER (Led by ICRISAT)

Farmer managed natural regeneration with microdosing and manure application

Restoration Options tested

- FARMER-MANAGED NATURAL REGENERATION (FMNR) ++
- MICRO-DOSING OF INORGANIC FERTILIZERS AND MANURE

Innovative partnerships

IFAD Programme
ProDAF
EC-NIGER
PARC-YANA YI

Other Partners
INRAN & CDR
University of Niamey
University of Maradi



KENYA (Led by ICRAF)

Eating even when the rains fail through tree planting, planting basins, soil and water conservation and test controls

Restoration Options tested

- PEST CONTROL
- PLANTING BASINS WITH MANURE
- TREE PLANTING AGROFORESTRY

Innovative partnerships

IFAD Programme
KCEP-CRAL
NGO PARTNERS
WorldVision
CARITAS
ADRA

Other Partners
University of Nairobi
DryDev Programme



ETHIOPIA (Led by ILRI)

Pasture rehabilitation, tree planting and community-based rangeland management

Restoration Options tested

- PASTURE MANAGEMENT
- COMMUNITY-BASED RANGELAND MANAGEMENT
- TREE PLANTING AGROFORESTRY

Innovative partnerships

IFAD Programme
CBINReMP
NGO PARTNERS
CARE & OSHO
REST
WorldVision

Other Partners
Amhara Bureau of Agriculture
DryDev Programme

THIS APPROACH AIMS AT TRANSFORMATIVE OUTCOMES BY PLACING FARMERS AT THE CENTRE OF LAND RESTORATION EFFORTS, RECOGNISING THAT EACH FARMER REQUIRES OPTIONS THAT MEET HIS OR HER NEEDS

Farmer centred

The planned comparison illustrates a fundamental farmer-centered approach.

Farmers implement the planned comparisons on their farms with technical support, and the farmers experiment and innovate with various land restoration options to see what works best for their context.

These planned comparisons applied in multiple contexts allow for confident targetting and scaling of restoration options.

1. Focus group discussions & brainstorming with farmers options explained to farmers
2. Farmers volunteer to test one or more options on their farm
3. Scientists, farmers, NGOs and other partners design on-farm planned comparison to validate restoration options suitable to specific context
4. Technicians provide training and the treatment design to volunteer farmers, via village-level facilitators
5. Volunteer farmers in each village maintain and monitor the trials with technical support
6. **FARMERS PROFILES**

   Household surveys using electronic data capture, i.e., open data kit (ODK) to provide the context of the farmer in order to conduct analysis of what works where, for how much and for whom

   - Household size
   - Education
   - Farm size
   - Current agricultural practices
   - Food security
   - Length of time farming
   - Land tenure
   - Biophysical characteristics of the farm
   - Gender roles and dynamics
   - Employment, labour availability
   - Number of trees on the farm among other key contextual variables
7. Farmer profile data is combined with the planned comparison monitoring data to assess socio-economic factors influencing restoration success
8. **Farmer to serve as focal point**

   Farmers who successfully implement an option serve as trainers to other farmers in the village and other villages
9. Results and lessons learned are shared through structured, and documented co-learning amongst nested communities of practicethat bring farmers, community facilitators, NGO and government extension staff, private sector actors and researchers together

THE CO-LEARNING PROCESS OF IMPLEMENTING PLANNED COMPARISONS ON THE GROUND

FARMER's role in implementing Planned Comparison

*Provide the field for the experiment
*Management of the cropping calendar and activities (sowing, weeding, harvesting etc)
*Data collection (biomass, yields, cost) with assistance of technicians (research institutions & NGOs)

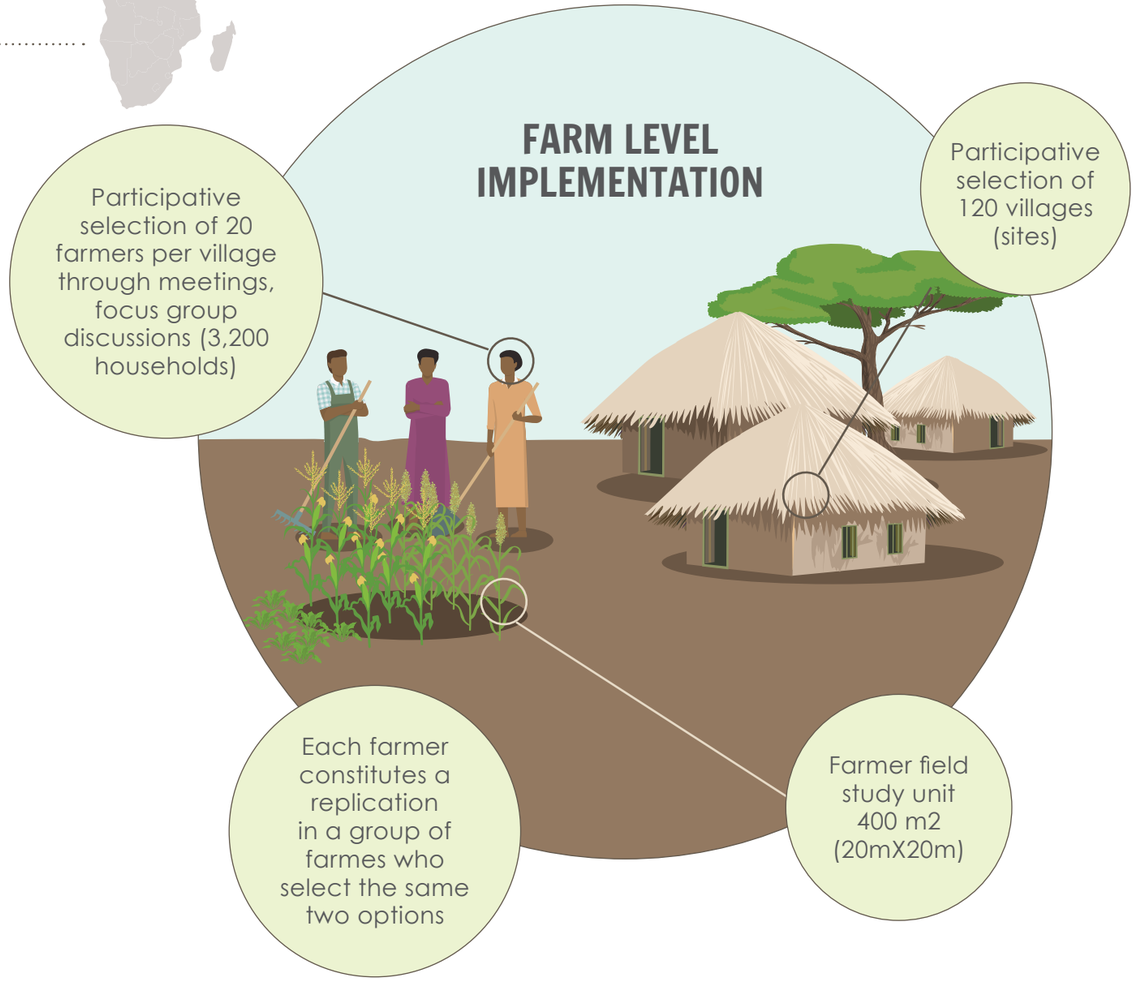
FARMER MANAGED NATURAL REGENERATION WITH MICRODOSING AND MANURE APPLICATION IN NIGER



In Niger, over 2,100 field tests were conducted involving approximately 3,000 households. A farmer participatory approach to select Improved Production Systems (IPS), i.e., Farmer-managed Natural Regeneration (FMNR) coupled with micro-dosing of organic and inorganic fertilizer within legume intercropping, were evaluated across five regions in Niger, in 120 villages.

KEY QUESTION FOR THE PLANNED COMPARISON

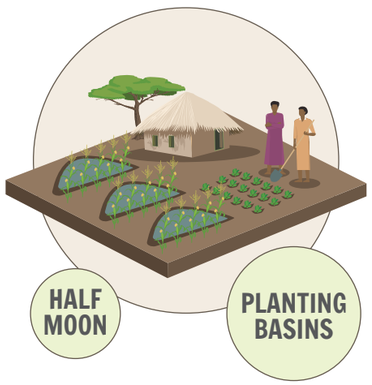
Will combining management options of FMNR, SWC and micro dosing technologies will lead to sustained improvements in farm livelihoods leading to the restoration of degraded lands and higher agricultural productivity and food security compared to fragmented interventions?



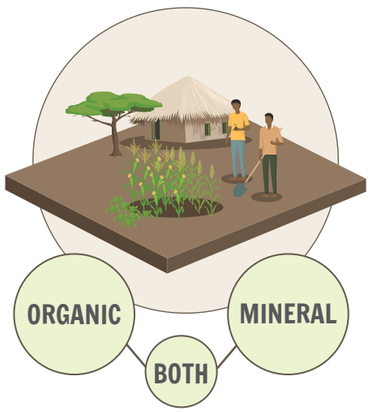
Farmer Managed Natural Regeneration (FMNR)



Soil & water conserving technologies



Micro dosing of fertiliser



Contexts to compare

- Village / cluster / commune / region
- Duration of FMNR / soil organic carbon
- Rainfall regime
- Erosion
- Herd size per household

What the planned comparison measures

- Number of trees per study
- Biomass
- Crop yield per crops
- Net return
- Farmer preference from community of practice and feedback:
  - Constraints
  - Weakness of options







Impacts

- An increase in grain yields between 30-48%
- In 2018, data on millet grain and total dry matter yields from the 551 farmers in the 120 villages indicated higher overall yield in all FMNR practices, i.e., 40% higher yields compared to the control
- Through the **Bio-reclamation of Degraded Lands (BDL)** initiative which aims to convert degraded crusted soils into productive lands to improve food production, household nutrition, income generation and to empower women. The project helps women organize themselves into legally registered associations and provides training support in agriculture and management of farmer organizations. The BDL technology was scaled up with the participation of 11,970 women in 197 villages, reclaiming 175 ha of degraded land



Vegetables produced by farmers on bioreclaimed soils through the Bio-reclamation of Degraded Lands (BDL) in Niger.

Key co-learning findings for scaling restoration

- Millet yields were significantly affected by fertilizer and cropping system - average millet grain yields varied from 250kg ha^{1} in the control treatment to over 300kg ha^{1} in all FMNR treatments
- Combined application of FMNR and micro-dosing mineral fertilizer associated with manure produced the highest yields
- A major constraint is the lack of mineral fertilizer – therefore the application of FMNR with micro-dosing of small quantities of manure in millet/cowpea intercropping systems could be an alternative to improve the productivity of small farming systems

COMBINING SOIL AND WATER CONSERVATION WITH FRUIT TREE PRODUCTION FOR PARKLANDS IN MALI



In West African Sahelian countries low productivity of crops is caused by a variety of factors, including erratic rainfall distribution, which leads to heavy storm events and severe erosion. The erosion removes the organic matter in the topsoil, thus reducing soil fertility and water holding capacity.

To combat this, three different on-farm land restoration were implemented. Restoration activities took place in village forest plantations, rangeland pastures, as well as agricultural land, through a selection of tailored options for the various contexts in collaboration with development partners.

KEY QUESTION FOR THE PLANNED COMPARISON

The aim of the first planned comparison was to find an alternative to stone bunds to reduce runoff and erosion while improving soil water infiltration and the productivity of crops. The second planned comparison was around the most appropriate tree species to be grafted within the FMNR plots. The third planned comparison was to identify suitable tree planting practices to encourage higher tree seedling survival.

Farmer Managed Natural Regeneration (FMNR)



Soil & water conserving technologies - Earth Bunds



Agroforestry Tree Planting



Contexts to compare

- Land use types
- Soil types
- Farm types (compound field, village field and bush field)
- Slope
- Tree cover
- Social status (wealth class, ethnic group, autochthone / migrant, etc.)
- Household size (labour)

What the earth bund planned comparison measures

- Crop-cultivated land without soil bund
- Crop-cultivated land protected with earth bunds
- Crop-cultivated land protected with vegetated contour bunds with earth (earth bund planted using Acacia colei only or and Acacia colei + perennial grass Andropogon gayanus



Enhancing fruit production from FMNR contributes to household nutrition and income generation.

Farmer managed natural regeneration (FMNR), enriched through in situ grafting of indigenous fruit trees was carried out across 24 villages in Mali. The technique is simple and promotes early fruiting after only a few months or years as well as yields good quality fruits from selected varieties.

Furthermore, grafting improved varieties on wild root stock is an opportunity for enhancing FMNR (a land restoration practiced already being scaled up in the region) and creates incentives for farmers to increase the tree densities on their farmland. A total of 2000 scions of three varieties (Ben Gurion, Kaithly and Umran) were collected from the ICRAF field genebank and farmers identified a plus tree of B. aegyptiaca named (Aduwa Messadje) which fruits twice per year with a particular sweet taste. Production of these fruits is contributing to household nutrition and increasing income from fruit sales in local markets.



Harvested sorghum on farm treated with contour bund and micro-dosing

Monitoring of planting Ziziphus with farmers





Flowering Ziziphus mauritiana



Key co-learning findings for scaling restoration

- The results revealed that the use of fertilizer microdose and earth banks doubled crop yields and increased household incomes by 40%. These households are now able to meet their cereal food requirements throughout the year
- Farmers also evaluated the efficiency of plant extracts to combat pests on tomatoes in Mali
- A key finding was that successful pests control interventions depend on proper identification and use of appropriate measures that include timing of applications

EATING EVEN WHEN THE RAINS FAIL THROUGH TREE PLANTING AND SOIL AND WATER CONSERVATION IN KENYA



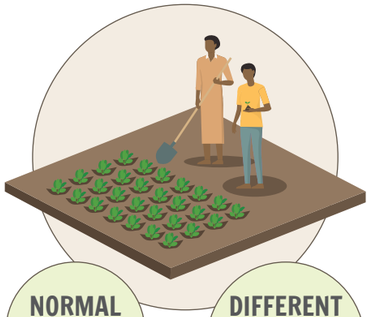
The eastern drylands of Kenya suffer from low soil fertility, high vulnerability to soil erosion, low agricultural productivity and unreliable rainfall. In collaboration with large development projects in Kitui, Makueni and Machakos counties, farmers implemented on-farm planned comparisons to compare various land restoration options, including planting basins – a simple soil and water conservation practice where small pits are dug and crops planted within them, as well as agroforestry and tree planting options.

KEY QUESTION FOR THE PLANTING BASIN PLANNED COMPARISON

Which planting basin designs and associated management practices improve yields and reduce soil erosion for differing farm and farmer circumstances?

This planned comparison compared different sized planting basins, as well as the impact of manure and mulch on crop production under different farmer contexts.

Planting Basins



NORMAL FARMER PRACTICE

DIFFERENT SIZE PLANTING BASINS

Manure application



APPLICATION WITH AND WITHOUT MANURE IN PLANTING BASINS

Crop rotation

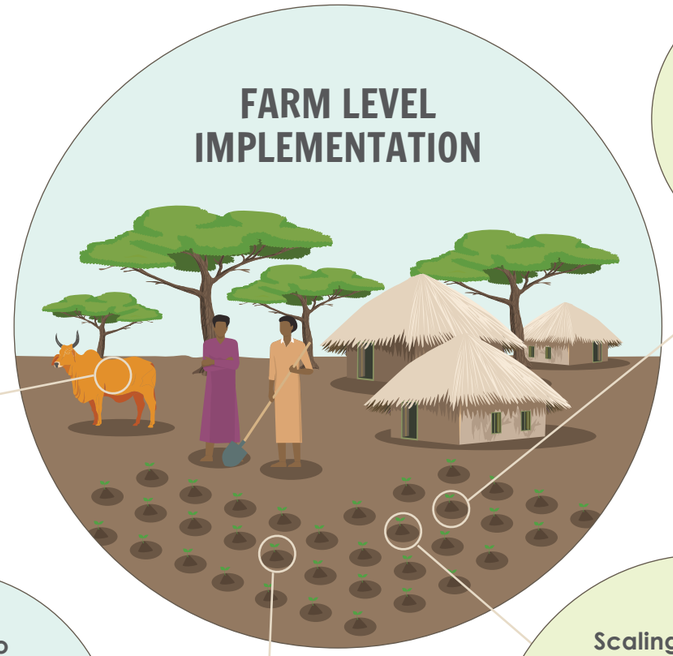


ROTATION OF CEREALS AND LEGUMES

Contexts to compare

- Soil type (texture)
- Slope of the land
- Terraced or not/ any other SWC measures on the farm
- Amount, rate and type of manure used
- Crops planted
- Land-use history
- Erosion status

FARM LEVEL IMPLEMENTATION



Farmers usual planting practice
e.g., oxen and plough, hand hoe

Application of manure (with or without)
Crops: Maize or legumes (e.g., beans, cow peas)

Farmers also started experimenting with different sized basins and that, as a result of feedback from the farmer CoPs, 3x3 ft basins were also added to the planned comparison

Planting practice 1x1 ft planting basins

Planting practice 2x2 ft planting basins

Planting practice 3x3 ft planting basins
in addition 6x2 ft were included

Scaling innovations
One innovation that is increasingly being promoted in Kitui and Makueni counties is the use of planting basins, which concentrate water at the crop root zone, thereby lengthening the period of moisture availability for the crop

What the planned comparison measures

- Maize (grain and stover) and legume yield
- Who was involved in the labour (hired, family, men, women etc.)
- Quantity and cost of inputs
- Soil erosion
- Farmers' assessment of overall costs and benefits
- Local indicators of soil quality

Impact and learning from rotation of cereals and legumes

Maize yield

The 2X2 and 3X3 ft basins increased yields up to three times, with the greatest effects observed in Kitui and Makueni counties



The 6X2ft basins, which were only practiced in Makueni, further increased maize yields compared to farmer practice



Planting basins

The estimated area of land restored through implementation of planting basins is approximately 1,000 ha



Green gram yields were between 2-4 times higher in planting basins in Kitui compared to farmer practice



Cowpea yields were over four times higher in planting basins in Kitui and two times higher in Makueni compared to farmer practice

Legumes

Common bean grain yields were two times higher in 2X2X1.5 ft planting basins in Kitui and Machakos compared to farmer practice

AGROFORESTRY AND TREE PLANTING COMPARISON

KEY QUESTION

This planned comparison was designed to help farmers identify the tree planting approaches that confer the best chances of survival of the planted seedlings with minimum investments for them, given their values, interests and resources.

Objectives

The objective was to compare tree survival on farm when seedlings are planted in different hole sizes with varying soil treatments (manure only; manure and mulch or mulch only) compared to common farmer tree planting methods which are usually without manure or mulch. Farmers also recorded is they watered the seedling or protected it from browsing.

The comparisons involve each farmer testing these soil treatments in two sizes of planting holes with various tree species. For example, one household received seven mango seedlings, of which they would experiment with the planting and management practices.

45cm diameter x 45cm depth (or 1.5ft diameter and 1.5ft depth - small)

and 75cm diameter x 45cm depth or 2.5ft diameter and 1.5ft depth - big)

To determine how seedling planting and management practices influence tree survival and growth (vis-à-vis the costs associated with the practices, such as labor) across different farm contexts.

Contexts to compare

- **Farm niche -** Within or outside, the cropping fields and the homestead
  - External boundary
  - Internal boundary
  - Scattered in cropland
  - Woodlot
  - Home compound
  - Along terraces
  - Pasture/grassland
  - fallow/bushland
- **Soil characteristics:** Type; soil depth; level of degradation
- Household wealth category
- Slope
- Erosion status/level of degradation

Responses to measure

- Tree survival (yes/no),
- Cause of mortality, if known (drought, fire, grazing and insects)
- Tree height to the longest tip,
- Labor cost (hired), man-days (family),
- Cost/amount of inputs (manure/compost/mulch)
- Farmer's assessment of each treatment in terms of cost, labour, effectiveness
- Farmer's perception of growth under each treatment

Impact

2000 households engaged in Agroforestry/Tree Planting

Over **5000** seedlings of six species thrived from the 2016 planting. Over **7500** tree seedlings thrived from the 2017 planting. And over **11,000** seedlings thrived from the 2018 planting

Given that these trees were planted across various niches in the farms, it is estimated the area restored by tree planting by summing the active area cultivated by the **1,400** farmers engaged in the 2017 tree planting to about **3,000** acres

In Machakos, Makueni, Kitui counties

Increased tree cover with **> 20,000** seedlings of seven tree species planted in home gardens, croplands and terraces

Using planting basins increased yields **2-5 times** for legumes and cereals

Over **75%** of farmers already engaged in the Planting Basin Planned Comparison in Kenya expressed excitement to continue to expand the number of basins on their farm. Farmers are reporting increased food security and income from increased yields



“When I started with 200 basins in a corner of my farm, the idea was to compare the maize yields in the planting basins with our normal practice of farming. But in 2016, when we all lost our entire crops except those in the basins, I decided to switch and make more for myself. I have now covered half of my two acres with basins. Last season, during yet another drought, many of us with the basins were able to feed our neighbours who were not part of the project. They came to get some ears of maize every day. And even at harvesting period, I still got 270 kilograms, which kept us going until the following planting season. I didn’t need the government hand-out anymore. Now others come to us to teach them how to do their basins.”

Veronica Ngau, Kalawa, Makueni County



MANGO TREES PLANTED WITH FARMYARD MANURE HAD THE HIGHEST SURVIVAL RATE. AS DID TREES PLANTED WITHIN CROPLAND, AS PART OF HOME GARDENS OR ALONG TERRACES. MANGO PRODUCTION IS IMPORTANT FOR INCOME GENERATION, AS RECENT GOVERNMENT INVESTMENT IN PROCESSING PLANTS CAN SUPPLY AN IMMEDIATE AND LOCAL MARKET FOR THIS PRODUCT

PASTURE REHABILITATION, COMMUNITY-BASED RANGELAND MANAGEMENT AND TREE PLANTING / AGROFORESTRY IN ETHIOPIA



The planned comparison on fruit and multipurpose trees was primarily designed to support farmers to select better moisture conserving practices that suit their condition and ensure tree survival and growth at an affordable cost.

In Ethiopia, almost 200 farmers across four woredas (Boset, Samre, Tsaeda Emba and Gursum) have engaged in active tree planting, comparing the influences of different watering regimes and management practices on tree survival. Over 2000 trees were planted with an average of over 90% survival. Farmer Managed Natural Regeneration is also underway as are community-based exclosures to promote revegetation and restore land.

KEY QUESTION FOR THE PLANNED COMPARISON

Which approaches to strengthening community governance of rangelands are likely to be most effective in which contexts?

What the planned comparison measures

- **Seedling survival:** count of survived seedlings
- **Seedling growth:** height and collar diameter
- Rehabilitation of pasture exclosures across six districts

Farmer Managed Natural Regeneration (FMNR)



Fruit and multi-purpose tree agroforestry



Mulching and watering



Contexts to compare

- **Soil type:** sandy loam, loam and clay soils
- Fruit tree species
- **Location:** farm or homestead (based on the availability of land and location of water source)

Impact and lessons learned in Ethiopia

- In general, increased farm size had a negative effect on tree seedling survival in all woredas with the exception of Gursum which had increased tree survival with increased farm size
- The availability of labour increased tree seedling survival across all four woredas
- As soil quality ranking increased so did the likelihood of tree seedling survival (quality was reported by the farmer as low, medium to high)
- Watering with 5 liters of water every ten days increased tree survival
- Results indicate that farmers identified 12 contextual factors that influence the suitability of land restoration options to local context:
  - Soil erosion
  - Soil types
  - Soil depth
  - Slope of the field
  - Field location along a slope
  - Field size
  - Livestock management system
  - Land tenure system
  - Labour
  - Gender
  - Technology
  - Skills





LESSONS LEARNED

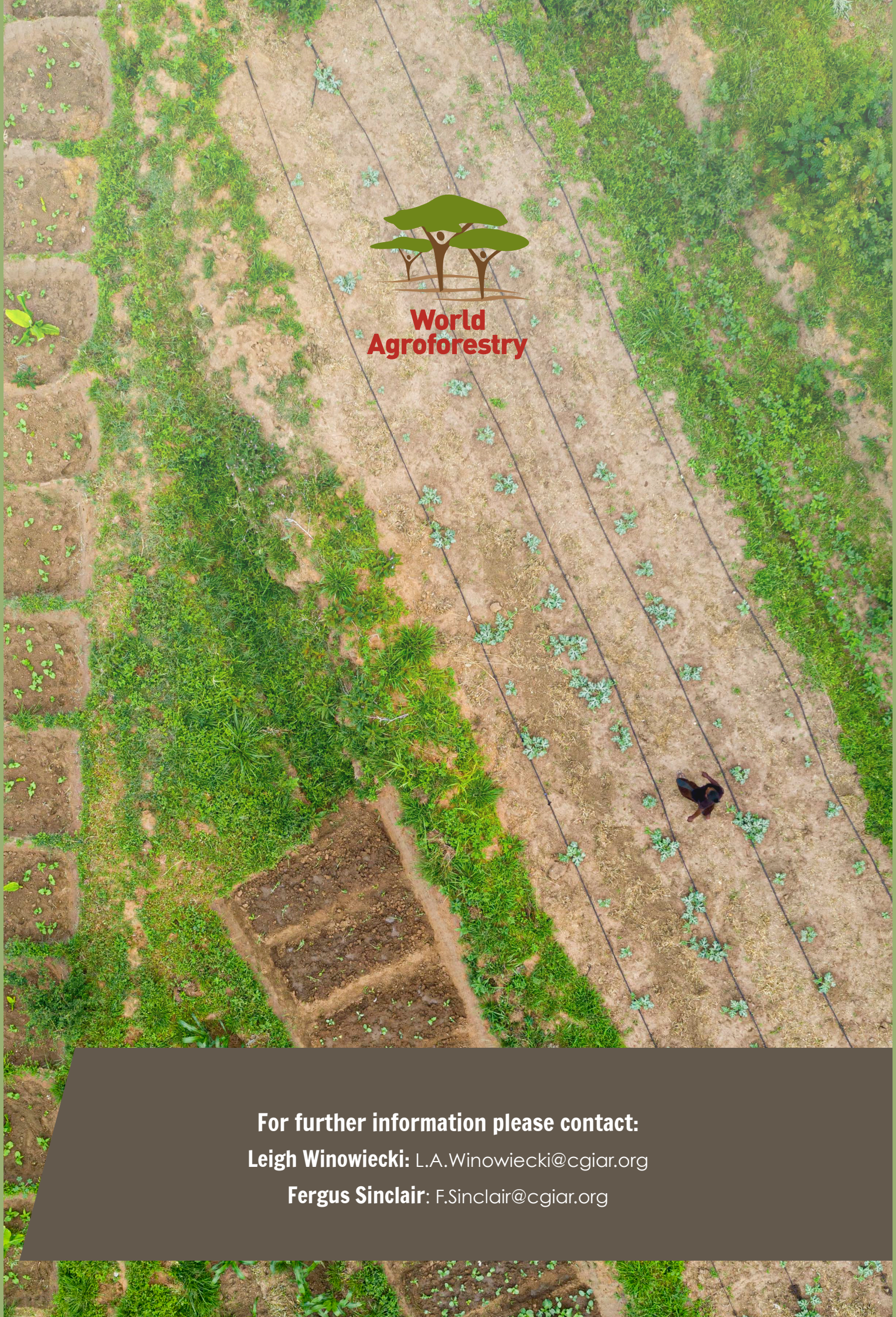
- Land restoration is key to improving agricultural production and livelihoods
- Implementing planned comparisons empowers the farmers to decide which option to test and encourages farmer innovation
- Participatory identification of the challenges facing farmers ensures relevant and locally appropriate restoration options to be tested
- Regular interactions with farmers and stakeholders from protocol development to training on options and monitoring of performance of options is key to successful implementation and scaling
- Monitoring of the performance of each options produces the evidence base for understanding what works where and for whom
- The research in development approach allows for scaling of context-specific options to large number of households across large areas
- In order to implement the research in development approach, stakeholders need to be open to doing things differently - a shift in behaviour is critical for success
- Communities of practice between and within farmers, NGOs, government and researchers are an effective way to stimulate knowledge sharing both within and between stakeholder groups

VALUE OF THE RESEARCH IN DEVELOPMENT APPROACH

Large-scale impact requires evidence-based innovations to be widely adopted across multiple contexts. The research in development approach used by ICRAF and partners generate this information, by testing and validating options using a farmer-centered approach to understand what works best where and for whom. This is essentially integrating research design into implementation while providing real-time feedback from and with farmers in order to scale land restoration.

VALUE OF THE PLANNED COMPARISONS

- The planned comparison illustrates the fundamental farmer-centered approach
- Farmers implement the planned comparisons on their farms with technical support, and the farmers experiment and innovate with various land restoration options to see what works best for their context
- These planned comparisons applied in multiple contexts allow for confident targetting and scaling of restoration options



World Agroforestry

For further information please contact:

Leigh Winowiecki: L.A.Winowiecki@cgiar.org

Fergus Sinclair: F.Sinclair@cgiar.org