Building sustainability in food systems: Opportunities for Regenerative Agriculture and Agroecology

Regenerative Agriculture and Agroecology in Kenya
Workshop, 22-24 July 2024, Safari Park, Nairobi, Kenya

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Outline

- Drivers of changing food systems
- Sustainable farming
- Transition pathways of agricultural systems
- Approaches towards Sustainable Farming
- Practices in Regenerative Agriculture and Agroecology
- What is needed to drive RegAg and Agroecology?

Drivers of changing food systems

- Growing world population
- Urbanization
- Climate change
- Increased pressure on natural resources

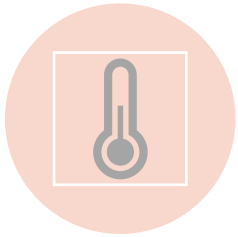
The global challenge

HUNGER

MALNUTRITION

BIODIVERSITY LOSS

RURAL POVERTY



CLIMATE CHANGE

Dawn of the call for sustainability

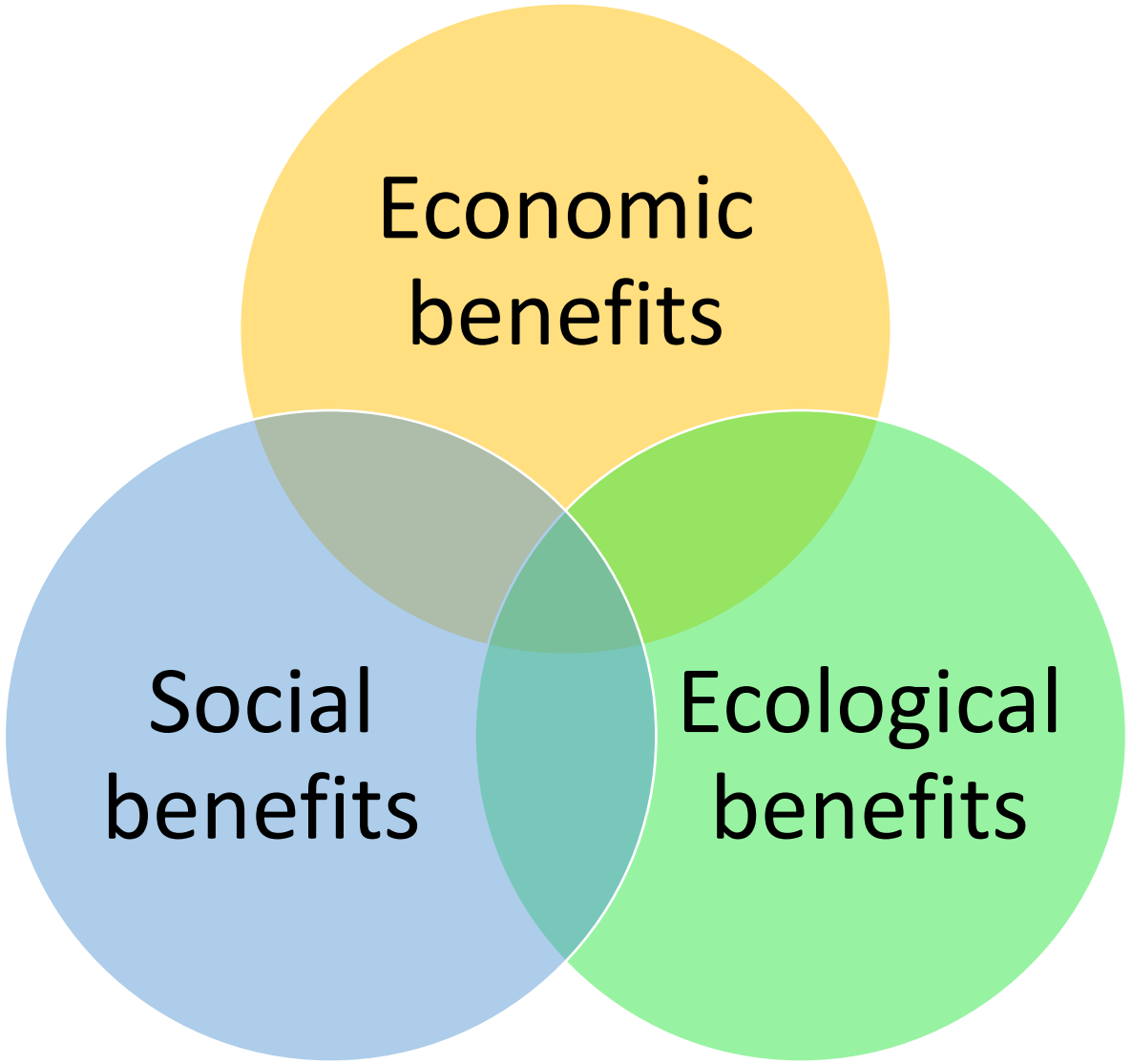
- Green revolution- push for increased use of inorganic fertilizers and pesticides
  - Associated with environmental concerns
- Africa union target to attain 50kg fertilizer use
  - Availability, Access, Affordability
- Yet our soils lose an equivalent of 50kg/ha of nutrients annually
- Organic manure available can only cover 10% of cropland
- Recent AFSH summit shift and embracing use of both organic and inorganic fertilizers
- The growing interest, investments and private sector investment in providing sustainable solutions is a timely promise that a shift to sustainability can be achieved
- Transition to sustainable food systems is needed that takes into consideration the contexts and opportunities

Sustainable Farming

The world is demanding sustainable farming to deal with the many problems

Benefits of sustainable farming:

- Economic benefits
- Ecological benefits
- Social benefits



Sustainable food systems

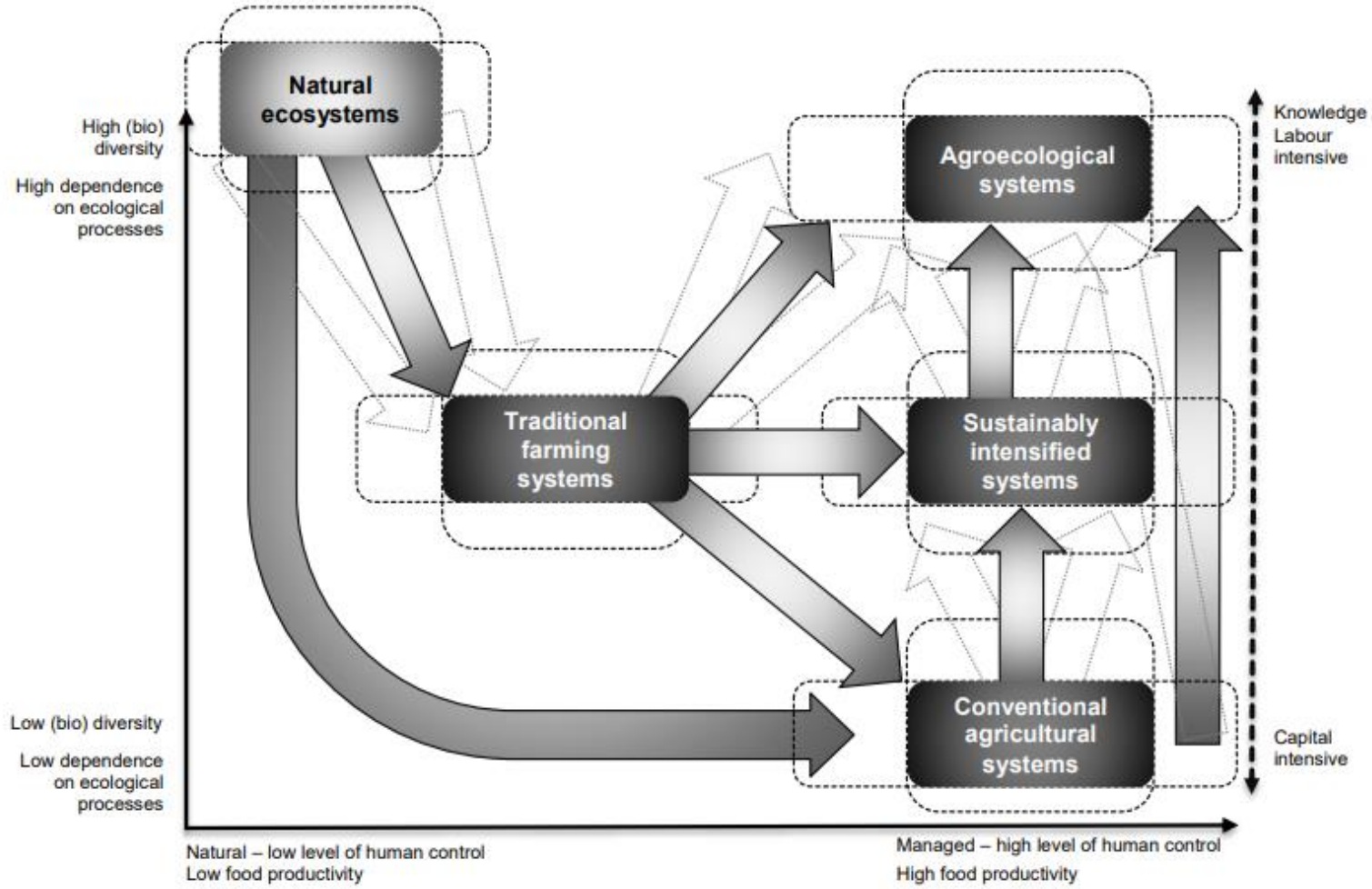
Exhibit 1: Characteristics of sustainable food system				
ASPECTS	**ENVIRONMENTAL**	**NUTRITIONAL**	**ECONOMIC**	**SOCIO-CULTURAL**
AGRICULTURE	Follow sustainable agriculture practices. Promote resilience of the system of production. Develop and maintain diversity.	Promote different varieties of food. Produce food that is full of nutritional elements.	Develop appropriate cultivation techniques. Promote self-sufficiency through local production.	Maintain traditional agriculture practices and promote local varieties.
FOOD PRODUCTION	Reduce the impact of production, processing and sale.	Preserve nutrients along the food chain.	Reinforce the local food systems. Produce food at affordable prices.	Produce culturally acceptable food.
CONSUMPTION	Reduce the environmental impact of food consumption.	Promote a diversified balanced and seasonal diet.	Promote economic accessibility to a varied diet.	Safeguard food traditions and culture. Meet local tastes and preferences

Transition pathways of agricultural systems

- Low population
- Subsistence
- Hunting and gathering
- Low technological advancement

- Low population
- Subsistence
- Shifting cultivation
- Low external input systems
- Diverse farming system

Figure 4 Multiple transition pathways of agricultural systems



- Concern for sustainability
- Restoration of systems
- Sovereignty

- High population
- Rapid urbanization
- System simplification
- High external input systems
- High technology
- Commercialization
- Global market forces

Source: Adapted from HLPE Report 14

Approaches towards Sustainable Farming

- The approaches to sustainable agriculture have evolved/shifted over time
- Currently, talk is around Regenerative Agriculture, nature-based solutions, agroecology and climate smart agriculture
- Are these totally new or different approaches? NO
  - Goal is the same- sustainability

Differences are mainly:

- Emphasis/Entry points
- How to deliver the same
- Who is delivering the same
- Interests and funding

- The Constant in all this are the producers and consumers and their livelihoods!

Regenerative agriculture

- **Regenerative agriculture** is a ***conservation*** and ***rehabilitation*** approach to food and farming systems.
  - It focuses on ***topsoil regeneration***, increasing biodiversity, improving the water cycle, enhancing ecosystem services, supporting biosequestration, increasing resilience to climate change, and strengthening the health and vitality of farm soil.
  - Regenerative agriculture is not a specific practice. It combines a variety of ***sustainable agriculture*** techniques.

frontiers in Sustainable Food Systems

REVIEW
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What Is Regenerative Agriculture? A Review of Scholar and Practitioner Definitions Based on Processes and Outcomes

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Regenerative agriculture is an alternative means of producing food that
claim, may have lower—or even net positive—environmental and/or s
Regenerative agriculture has recently received significant attention fr
retailers, researchers, and consumers, as well as politicians and the mair
Despite widespread interest in regenerative agriculture, no legal or regulat
the term "regenerative agriculture" exists nor has a widely accepted defi
in common usage. This paper answers the research question: How
scholars and practitioners defined regenerative agriculture? We review
articles and 25 practitioner websites to characterize the term "regenerati
Our review revealed that there were many definitions and descriptions

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Definitions focused more **on:**

- **Processes** (i.e., prescribing a set of agricultural principles and/or **practices** that constitute regenerative agriculture)
- **Outcomes** (i.e., outlining a set of metrics that regenerative agriculture aims to or is expected to enhance)
- Both **processes and outcomes**

The term "regenerative agriculture" has been **used interchangeably with other terms**, suggesting that there may be overlap in research, practice, and policy-making with some of these other forms of agriculture

Other Terms Used to Refer to Regenerative Agriculture

Some other terms were commonly used synonymously with, or adjacently to, the term "regenerative agriculture." These terms included "agroecological farming" "alternative agriculture," "biodynamic agriculture," "carbon farming," "nature inclusive farming," "conservation agriculture," "green agriculture," "organic regenerative agriculture," and "sustainable agriculture."

Agroecology

- Agroecology is a holistic and integrated approach that simultaneously **applies ecological and social concepts and principles** to the design and management of sustainable agriculture and food systems.

- It seeks to optimize the interactions between plants, animals, humans and the environment while also addressing the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced.

- Agroecology is concurrently **a science, a set of practices** and **a social movement**

- It has evolved in scope from a focus on fields and farms to encompass the entirety of agriculture and food systems.

Practices in Regenerative Agriculture and Agroecology

Principles	Practices
Minimum tillage	Zero-till, reduced tillage, conservation agriculture
Build soil carbon	Compost, green manures, animal manure, Biochar
Protect/cover the soil	Mulch, green cover crops, crop residues, permaculture
Sequester carbon	Agroforestry, silvopasture, tree crops, Biochar
Rely more on biological nutrient cycles	Animal manure, Compost, green manures, maintain living roots in soil, inoculation of soils, reduced reliance on mineral fertilizers, organic agriculture, permaculture, BSF, vermicomposting
Foster plant diversity	Diverse crop rotation, Intercropping, polyculture, multi-species cover crops, agroforestry, multi-storey gardens
Integrated nutrient management	Organic/inorganic integration, Use of N-fixing crops, use of biofertilizers
Integration of livestock	Rotation grazing, holistic grazing, pasture cropping, silvopasture, range management, enclosures
Minimize use of pesticides	Diverse crop rotations, multispecies cover crops, agroforestry, IPM, use of biopesticides and botanicals, pheromones, traps
Encourage water percolation	Biochar, compost, green manures, animal manures, soil and water co
Water management	In-field water management, Drip and micro-drip irrigation, planting basins and pits, ripping, riparian restoration, planting basins and pits, tied ridges, organic manures, mulch
Conserve soil and reduce land degradation	Terraces, grass strips, afforestation, agroforestry, rangeland enclosures and reseeding, landscape restoration

No single practice: Bundle!

Outcomes of Sustainable farming approaches

- To improve ecosystem health
- To improve soil health (structure, soil organic matter, fertility, biodiversity)
- To improve or increase yields
- To increase biodiversity
- To improve water health (hydrology, storge, reduce pollution)
- To increase carbon sequestration
- To reduce green house gas emissions
- To improve animal welfare
- To maintain or improve farm productivity
- To improve crops health and /resilience
- To improve food access and/or food security
- To improve food nutritional quality and/or human health
- To improve food safety
- To improve the social and/or economic well being of communities
- To increase profitability
- To create a circular system and/or reduce waste
- Social inclusion and equity

Practices contribute to multiple impact areas

The impact areas and outcomes offer unique entry points for different people, goals and agroecologies

Pulleman et al (2023)

Evidence of Regenerative Agriculture and Agroecology Practices

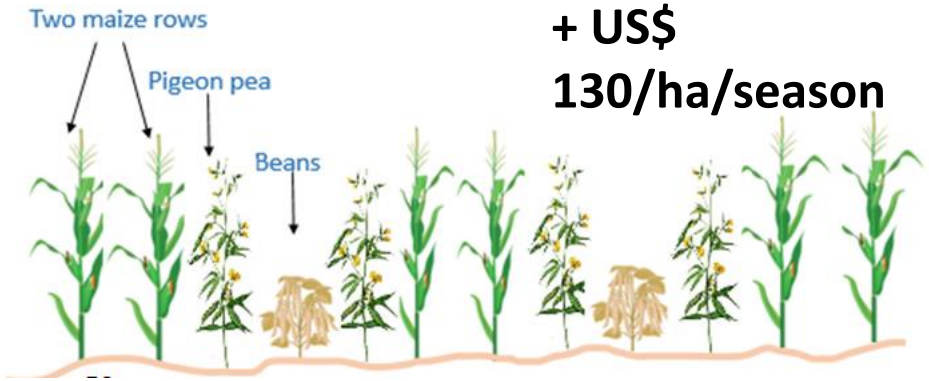
Conservation of genetic diversity

- Conservation of genetic diversity is key for nutrition and climate resilience
- A partnership to support to maintain Community seedbank (CSB)
- Vihiga Nutrition and Community Seedbank CBO, an umbrella organization comprising of 10 farmer groups/sublocations
- Diverse crops preserved: indigenous vegetables, millets, sorghums, cowpea, beans
- Community training and empowerment

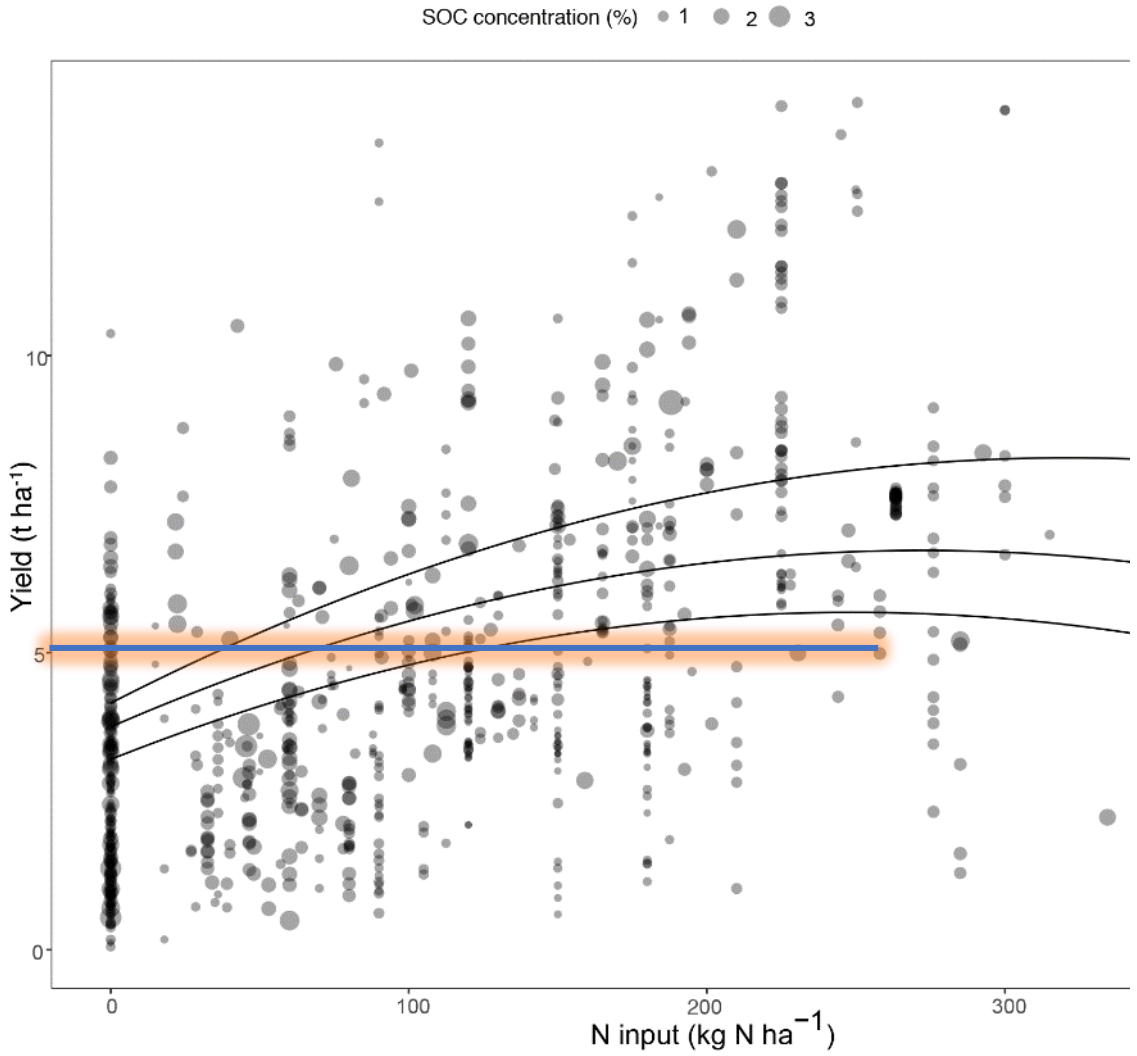
Sustainable systems means diverse foods and healthier diets

Cropping systems: Strip cropping for climate adaptations

- Legumes are gendered crops, and key to nutrition
- Multiple crops grown together increase LER
  - USD 130/ha/season more
- Diverse food options
- Insurance against total crop loss
- N-fixation
- Ecological benefits associated with intercropping



Protecting SOC reduces fertilizer input requirements



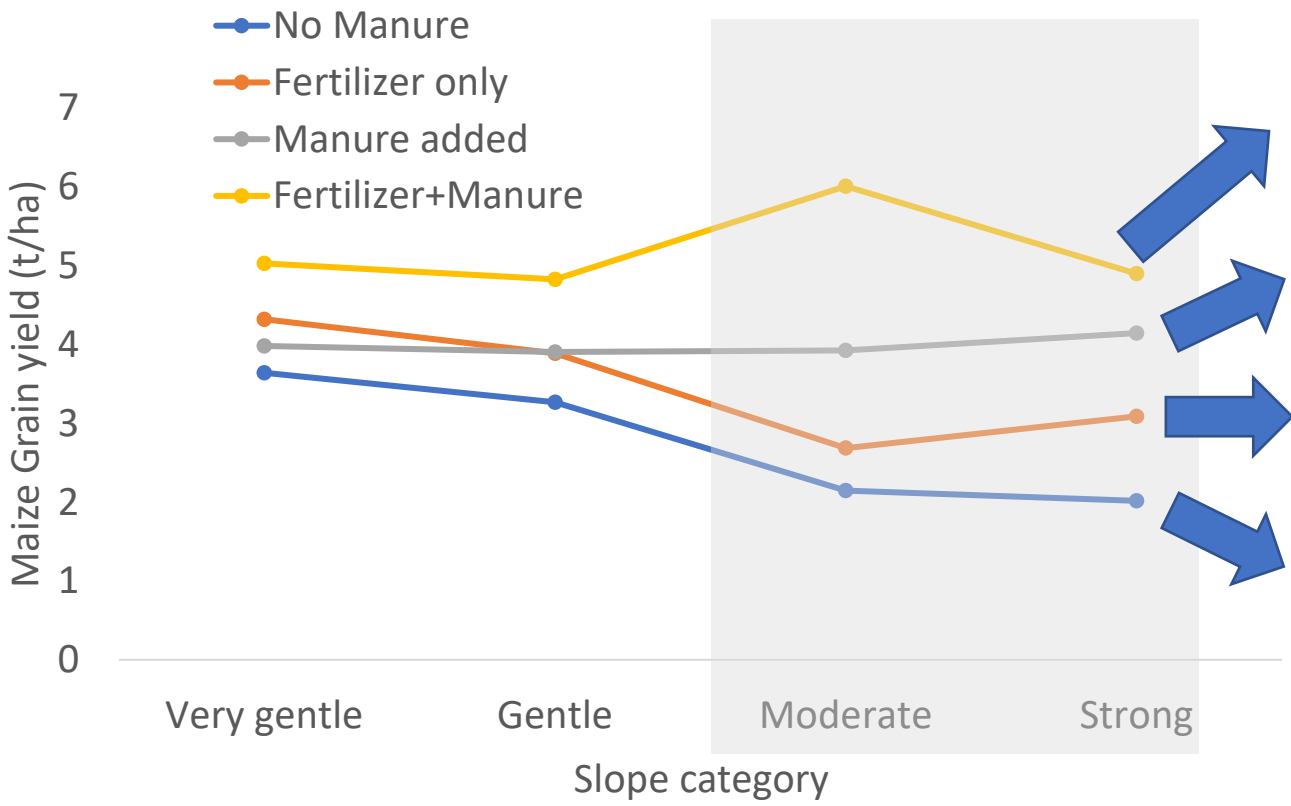
- Yields are high at high SOC soils
- To get same yields, more N is needed where SOC is low
  - If SOC is preserved, there are large savings in fertilizer inputs, for the same yield

Oldfield et al. SOIL, 5, 15–32, 2019

Fertilizer use efficiency and soil health are improved with uptake of conservation practices

Africa soils looses an equivalent of 50kg nutrients per year, yet AU has set targeting to increase fertilizer use to 50kg per ha. It is a zero-sum game unless soil erosion is addressed!

Sloping fields are especially in degradation state



Manure combined with fertilizer improves yield across soils

Organic resources is a key requirement in degraded soils

Response to fertilizer is limited on degraded soils

Yield decrease with degradation status

Fertilizer and manure should not be a substitute to conservation. We need both and a bundle of bundle of complementary practices

Conservation agriculture

- CA reduce erosion by 30-90%.

Practice	Yield change (t/ha)
Conventional ISFM	+0.404
Ripping	+0.618
Ripping+residues	+1.125

Water infiltration, soil structure, soil penetration, erosion control, productivity

PERIODIC TABLE OF FOOD INITIATIVE

PERIODIC TABLE OF FOOD INITIATIVE

Meta-Data for Linking Food Composition with Planetary Health

Standard food item data

+

Ecological Meta-data

Socio-cultural Meta-data

Economic Meta-data

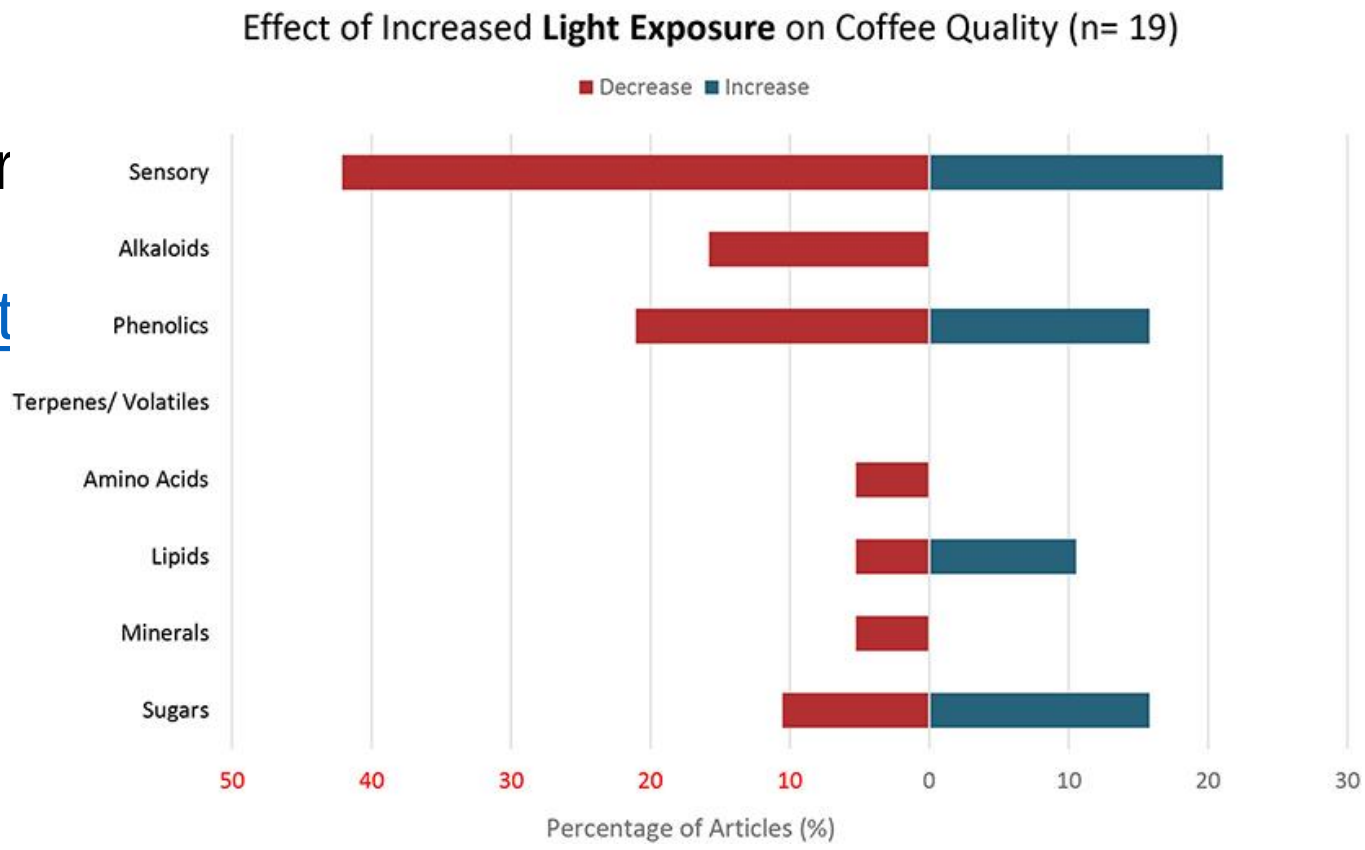
Health Meta-data

Regenerative Agriculture Module

Case for agroforestry and coffee quality

- Several studies found coffee quality increased under moderate to high canopy cover and shade (45–70% shade) (Ahmed et al., 2021; Decazy et al., 2003; Läderach et al., 2011; Bote and Vos, 2017).

- Can this evidence across systems help drive adoption of RegenAg and Agroecology?



Diversifying cropping systems for resilience

- Identification of priority native tree species for silvopastoral systems
- Support on best seed sources for each tree species
- Training on use of decision support tools for species selection and agroforestry design, includes economic considerations
- In design, considers interactions between different species and the main crop

Supporting restoration of degraded lands to reduce soil erosion and improve soil fertility

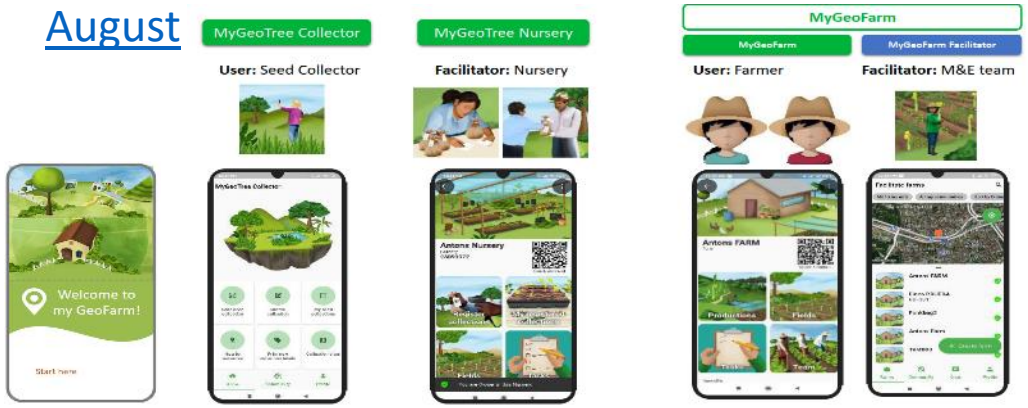
Landscape restoration in East Africa

Kenya

MY FARM TREES
RESTORATION FOR RESILIENCE

Piloting **block chain enabled digital incentive** to small holders

[Evaluation of native tree seed systems and paper published in August]



2,000,000 US$

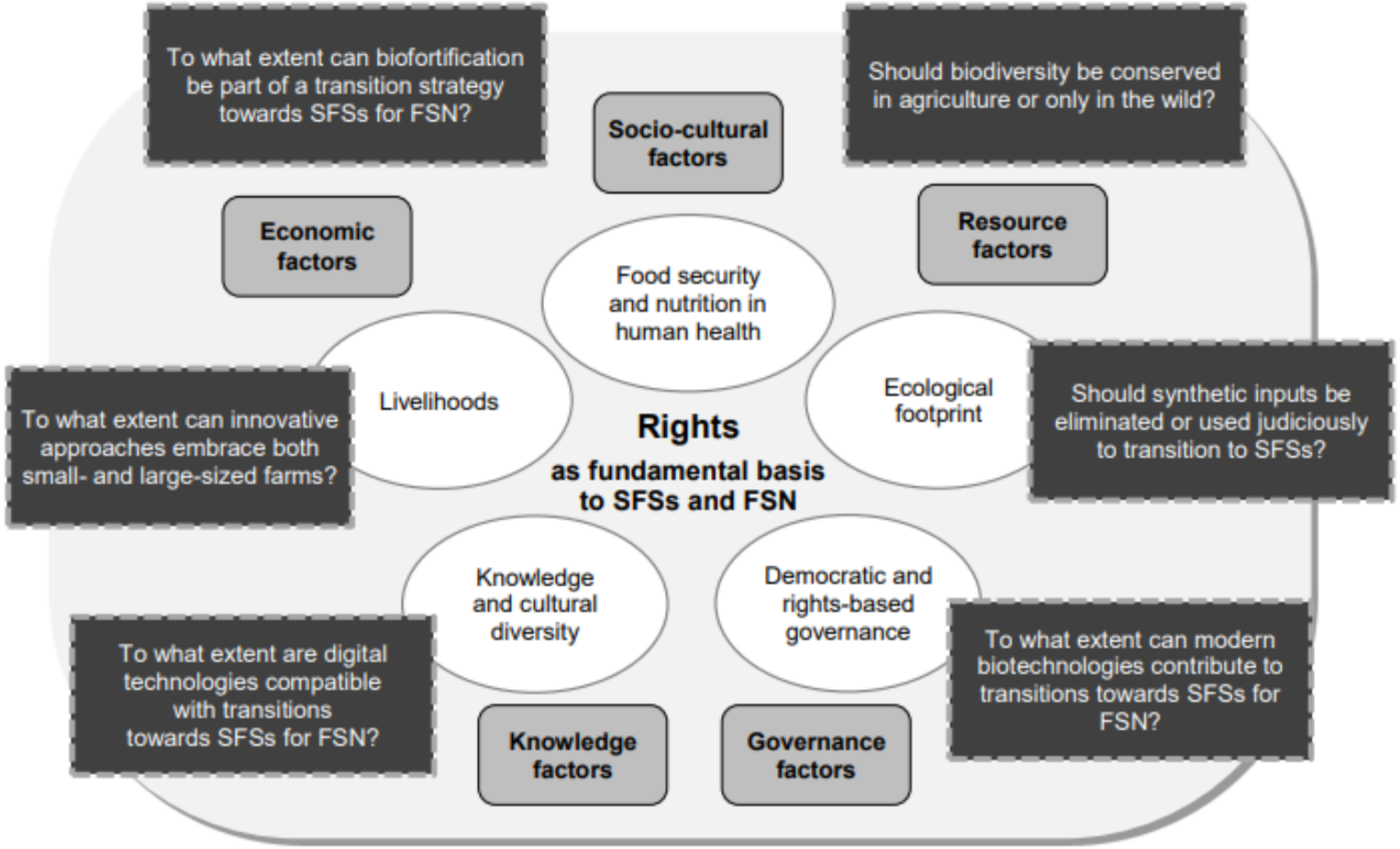
Nature + Initiative

Understanding smallholder farmers decision making in tree diversification

Evaluating ecosystem service delivery of native trees for pollination services to small holder crops

gef IUCN

Dimensions of food systems, barriers to transition towards SFS and controversial issues

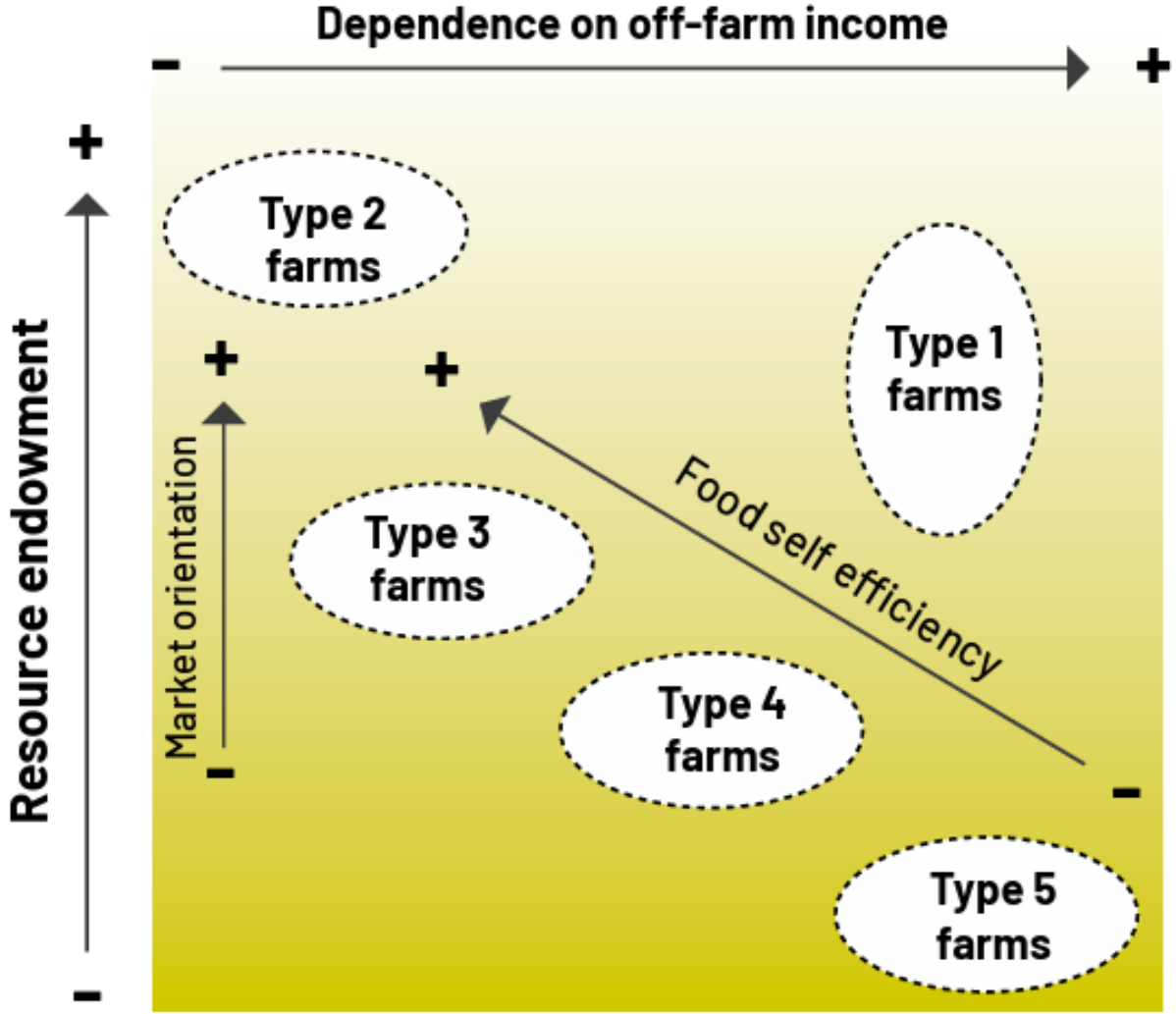


Note: Dimensions of transitions are shown in ellipses, groups of drivers acting as barriers in rounded rectangles and illustrative controversial issues discussed in the following sections of this chapter, posed as questions, in sharp cornered rectangles.

Source: HLPE Report 14

Planning the transition to Regenerative Agriculture and Agroecology

- A clear strategy is required by:
  - Developing a vision for success and defining clear goals in a participatory manner
  - Identifying different regenerative agriculture practices that are tailored to local context
  - Dealing with diversity of farming contexts
    - Agroecological and socio-economic
    - Farm typologies
- Tools to use for targeting and priority setting
  - Assessing trade-offs relevant for decision making



Monitoring and Evaluation

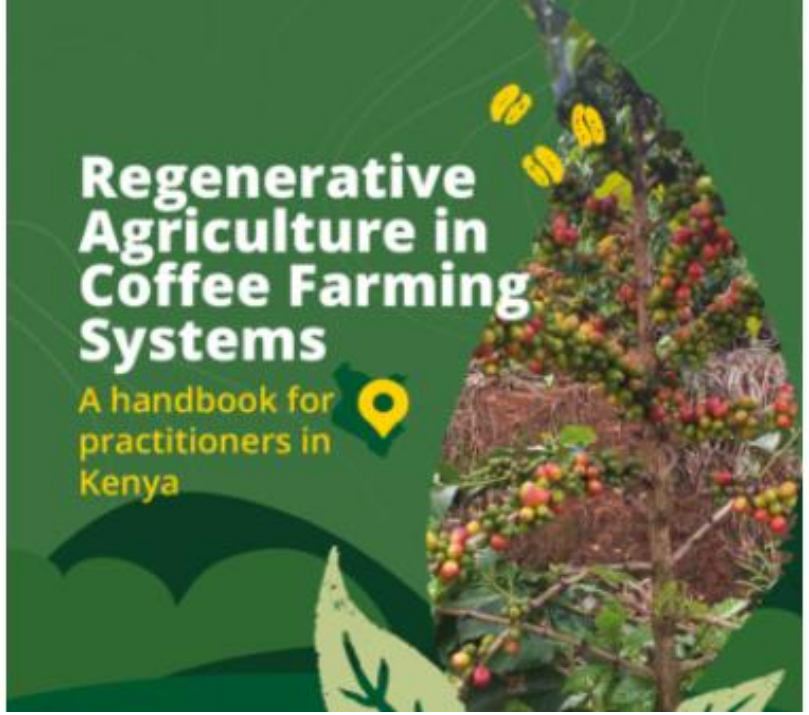
- Scale
  - Plot
  - Farm
  - Landscape
- Vision
  - Short vs long term
- Extent of use/adoption of the practices

Parameters

- Productivity
- Soil health
- Biodiversity (Above and below ground flora and fauna)
- Agrochemical use
- Carbon footprint
- Quality of coffee
- Input use efficiency
- Efficiency in labour
- Farm resilience (income, quality of life)
- Gender dimensions

What is needed to drive RegAg and Agroecology?

- Co-design of the RegAg/Agroecology interventions (producers and consumers at the center)
- Science and research to quantify environmental, agronomic, economic and social outcomes (indicators, matrices)
- Technical advice and capacity strengthening of value chain actors
- New value chain partnerships to create incentives/markets for agroecology and regenerative products
- Appropriate technologies/practices that enhance crop and soil health
- Refinement of scaling and delivery approaches including use of digital tools for precision agriculture
- Support access to finance and incentives for the transition to RegenAg/Agroecology
- Enabling policy at all levels to support transition to RegenAg/Agroecology


Regenerative Agriculture in Coffee Farming Systems
A handbook for practitioners in Kenya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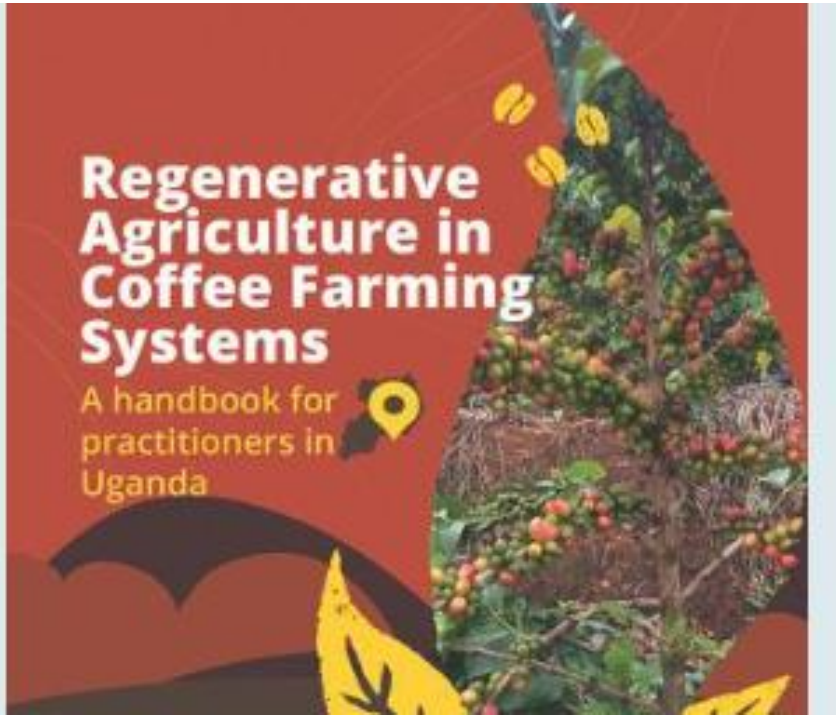
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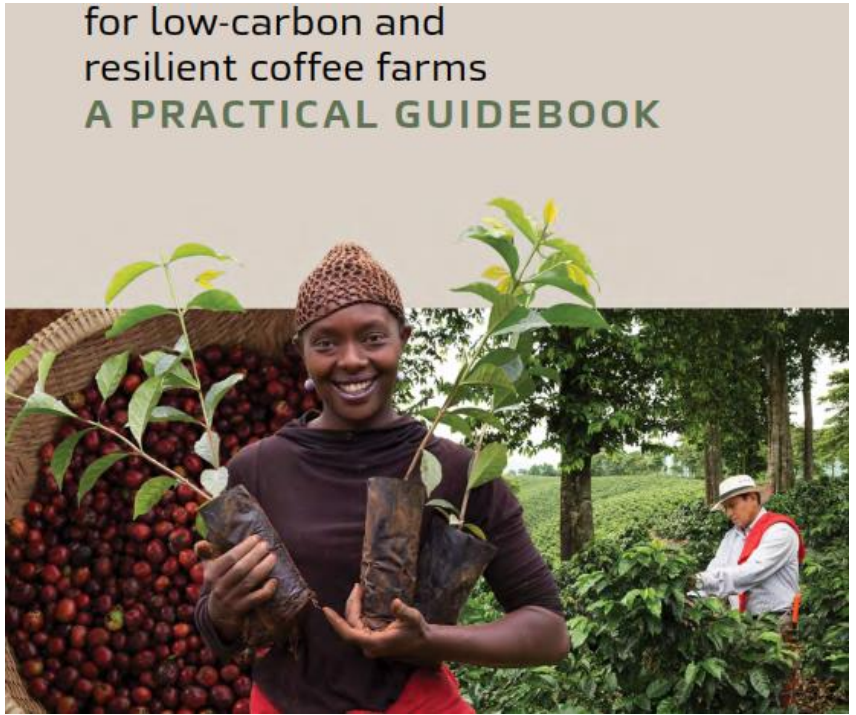
for low-carbon and
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A PRACTICAL GUIDEBOOK

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idh transforming markets

CGIAR

INITIATIVE ON
Diversification in East and Southern Africa

Thanks you!