



DATA ATLAS FOR CLIMATE-SMART AGRICULTURE IN KENYA



CITATION:

Lamanna C, Steward P, Kamau HN, Nowak A, and Rosenstock TS. 2020. Data Atlas for Climate-Smart Agriculture in Africa. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

ACKNOWLEDGEMENTS:

This book was produced as part of the USDA Enhancing Capacity for Low Emissions Development (EC-LEDs) Program project “Building Capacity for Resilient Agriculture Planning Africa” granted to World Agroforestry (ICRAF) and the International Center for Tropical Agriculture (CIAT). The Evidence for Resilient Agriculture (ERA) Database on which this book is based has been supported by the CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS), the European Commission (EC), the United Nations Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD) and the Center for International Forestry Research (CIFOR).

CONTENTS

INTRODUCTION

- 3 What is CSA?
- 4 CSA Practices/Technologies
- 7 Evidence for Resilient Agriculture (ERA)
- 9 Kenya: Agroecological Zones
- 11 How to Use the Data Atlas

THE ATLAS BY AGROECOLOGICAL ZONES

12 Arid Zone

- 13 Cereals
- 14 Vegetables

15 Semi-Arid Zone

- 16 Cereals
- 19 Legumes
- 21 Vegetables
- 22 Fiber and Food, Cash Crops
- 23 Seeds and Oils
- 24 Meat-Milk, Fisheries

25 Humid Zone

- 26 Cereals
- 28 Legumes
- 29 Starchy Staples
- 30 Vegetables and Fruit
- 31 Poultry, Meat-Milk, Fisheries

32 Sub-Humid Zone

- 33 Cereals
- 37 Legumes
- 40 Starchy staples
- 42 Fiber and Food, Cash Crops
- 43 Vegetables
- 44 Meat-Milk, Poultry, Fisheries

45 Tropical Highlands Zone

- 46 Cereals
- 50 Legumes
- 53 Starchy staples
- 54 Fiber and Cash Crops
- 55 Meat-Milk, Poultry, Fisheries

WHAT IS CLIMATE-SMART AGRICULTURE?

Climate-smart Agriculture (CSA) is an approach to food security that seeks to:

- sustainably increase agricultural **productivity** and incomes,
- adapt and build **resilience** to climate change, and
- reduce and/or remove greenhouse gas emissions (**mitigation**) where possible. (FAO 2012)



Productivity:

Increasing yields
and
income



Resilience:

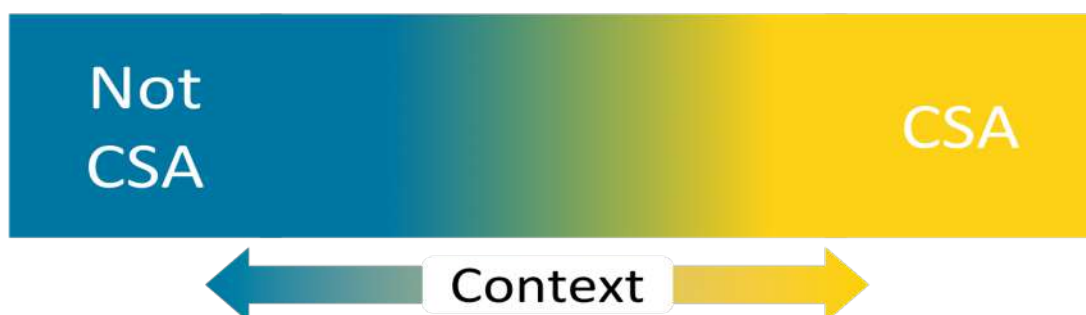
Diversification,
building soil health,
yield stability



Mitigation:

Storing carbon,
reducing greenhouse
gas (GHG) emissions

Many farm management practices can be considered climate smart. However, the impact of adopting a CSA practice/technology will depend on the context - that is the farming system, the climate, the soil type, the social and economic conditions, and the political environment. Examples of CSA practices/technologies are provided in the next pages.



A man in a dark jacket and light blue shirt stands in a field, holding several large, orange sweet potatoes in both hands. The background shows a dirt path and a hillside with sparse vegetation under a blue sky with clouds.

CLIMATE-SMART CROPS

PRACTICE	DESCRIPTION
Organic Fertilizer	addition of manure, compost, or biosolids to soil
Inorganic Fertilizer	application of chemical fertilizers such as NPK or DAP to crops
Mulching	addition of plant material to soil surface to retain moisture and reduce weeds
Green Manure	growing non-crop plants to improve, usually as a rotation. plants are often plowed back into the soil.
Crop Residue	retaining plant material on the soil surface, or incorporated into soil after harvest
Crop Rotation	Growing one or more crops in sequence on the same land, often rotating with a leguminous crop to improve soil health
Intercropping	Growing one or more crops together in the same field at the same time, often with legumes, planted at the same time or in sequence
Improved Seeds	use of improved seed varieties such as drought tolerant, high yielding, early maturing, or hybrid varieties
Reduced Tillage	reducing soil disturbance with direct seeding, dibble stick, ripping, or no-till
Reduced Irrigation	Water saving practice, irrigating less than what plants require
Water Harvesting	use of zai pits, terraces, basins, bunds, ridges to collect water that would otherwise be lost



CLIMATE-SMART AGROFORESTS

PRACTICE	DESCRIPTION
Alleycropping	Intercropping woody plants or tree with crops, often in rows, to shade and fertilizer the crops.
Boundary Planting	Planting trees along the border of a farm or field to break the wind and/or prevent soil erosion.
Multistrata	Growing multiple types of trees and crops together, such as trees, bananas and crops, or shade coffee. Common in humid areas.
Parklands	Allowing scattered trees in agricultural land for shade or soil health. Common in the Sahel.
Silvopasture	Grazing animals underneath of trees or retaining trees on grazing lands.
Tree Pruning	Pruning or coppicing agroforestry trees to reduce shading, competition with crops, create mulch, or livestock fodder
Tree Fallows	Planting or retaining woody species on fallow land to improve soil health.



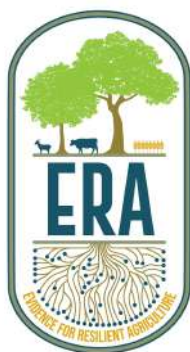
CLIMATE-SMART LIVESTOCK

PRACTICE	DESCRIPTION
Feed Supplement	Improving diet quality of livestock by adding forages, supplements, agroforestry fodders, to the regular diet.
Feed Substitution	Changing a portion or all of the basal diet of an animal with another feed, such as herbaceous fodder, crop residues, etc.
Concentrates	Concentrated feeds often produced from crop wastes such as maize bran, molasses, cotton seed cake, etc.
Crop Residues	Feeds created from crop remains, such as maize stover, often produced on farm
Herbaceous Fodder	Feeds from grasses, wild legumes, or other non-woody plants
Agroforestry Fodder	Feeds from parts of agroforestry shrubs or trees including leaves, or seed pods.
Feed Manures	Addition of non plant-based materials like chicken manure to an animal's diet
Breed Improvement	Improving animal breeds through cross breeds or naturally improved breeds like Sahiwal, Zebu X Friesian, etc.
Pasture Management	Improving diet quality of livestock by managing grazing, introducing forages and legumes, agroforestry fodders, etc.

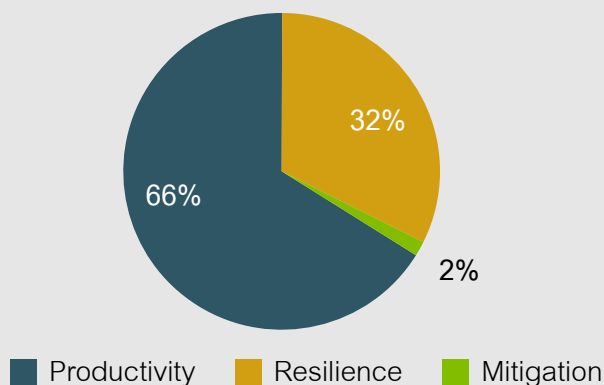
EVIDENCE FOR RESILIENT AGRICULTURE (ERA)

Thousands of studies have been published on agricultural innovations in Africa, but those data are generally difficult to access. To make those data accessible, we conducted a systematic review of the impact of more than 100 potential CSA practices on over 50 indicators of productivity, resilience and mitigation in Africa (Rosenstock et al. 2015). The result is a powerful database combining information from more than 1700 studies of CSA in Africa.

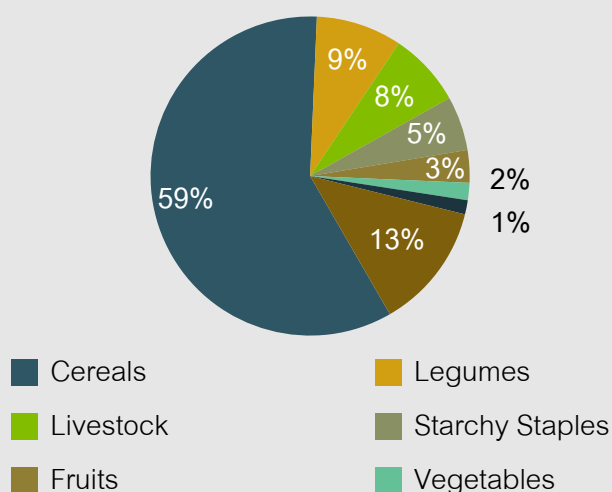
A SIMPLE ILLUSTRATION OF THE SYSTEMATIC REVIEW PROCESS



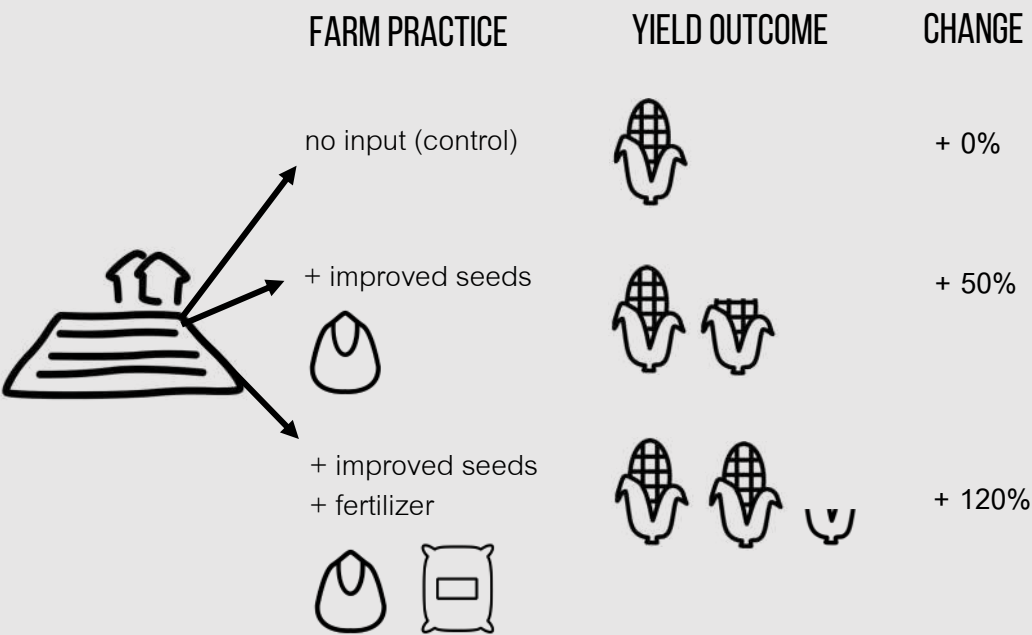
CSA PRACTICES INCLUDED IN ERA,
BY PILLAR (%)



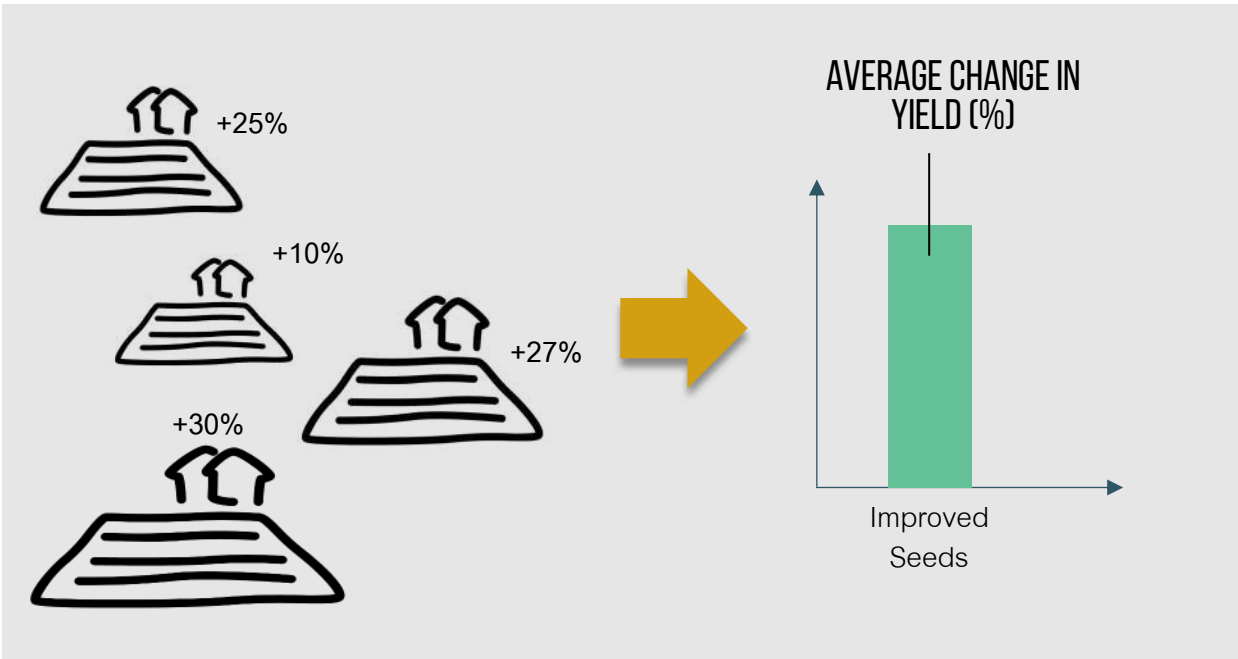
CSA PRACTICES INCLUDED IN ERA,
BY COMMODITY (%)



ERA contains data on the impact of practicing climate-smart agriculture on indicators of productivity, resilience, and mitigation at farm level:



This evidence becomes even stronger when we combine outcomes from many different CSA experiments on different farms in different places through a process known as **meta-analysis**:

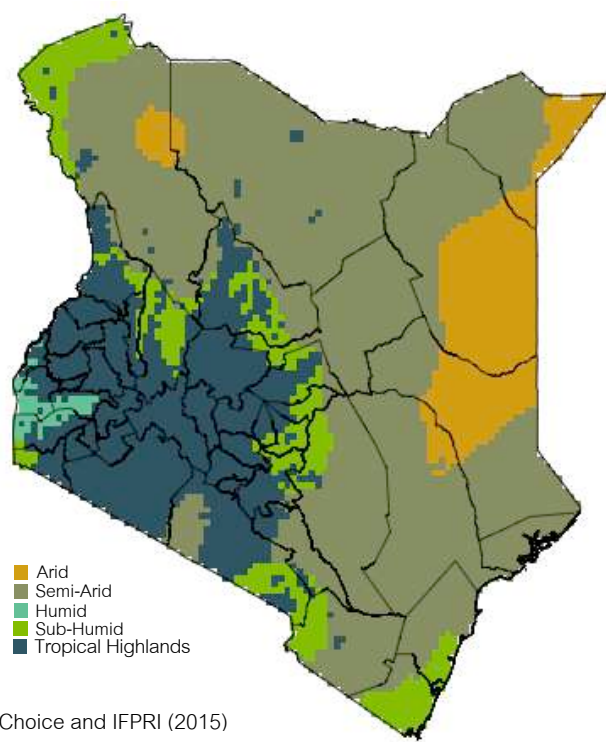


The results of combining evidence from many studies on CSA practices is what we present in the rest of this booklet.

AGRICULTURE IN KENYA:

AGROECOLOGICAL ZONES

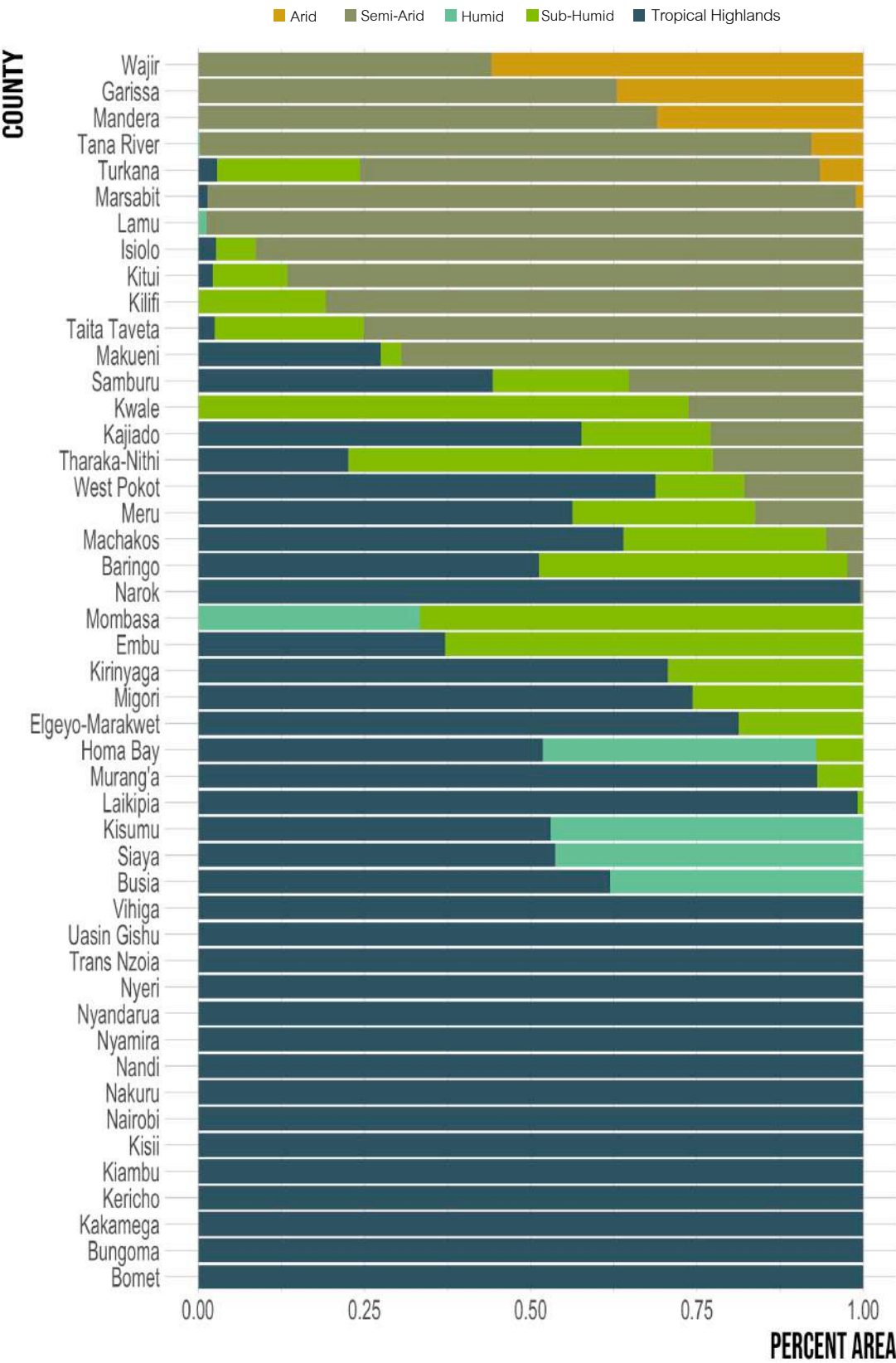
Within Kenya, there are five major agroecological zones, ranging from Arid to Humid and the Tropical Highlands. Each zone experiences different temperature and rainfall patterns, and often different seasonality of rainfall (HarvestChoice and IFPRI, 2015).



Source: adapted from HarvestChoice and IFPRI (2015)

Zone	Length of Growing Season	Temperature
Arid	< 70 days/year	warm
Semi-Arid	70 - 180 days/year	warm
Sub-Humid	180 - 270 days/year	warm
Humid	> 270 days/year	warm
Tropical Highlands	may be arid to humid	>1200 m elevation, cool







Each county may have one to up to three distinct agroecological zones (AEZs). Many of the highland counties such as Nyeri, Kericho, or Kiambu have just one major AEZ, whereas Samburu, Meru, and Tharaka-Nithi cover three major AEZs.



HOW TO USE THE DATA ATLAS

The core of this book consists of data on the impact of climate-smart agriculture technologies on **productivity** (yield, economic returns), **resilience** (increases in soil health, resource use efficiency, diversification), and **mitigation** (storage of carbon or reduction in greenhouse gas emissions).

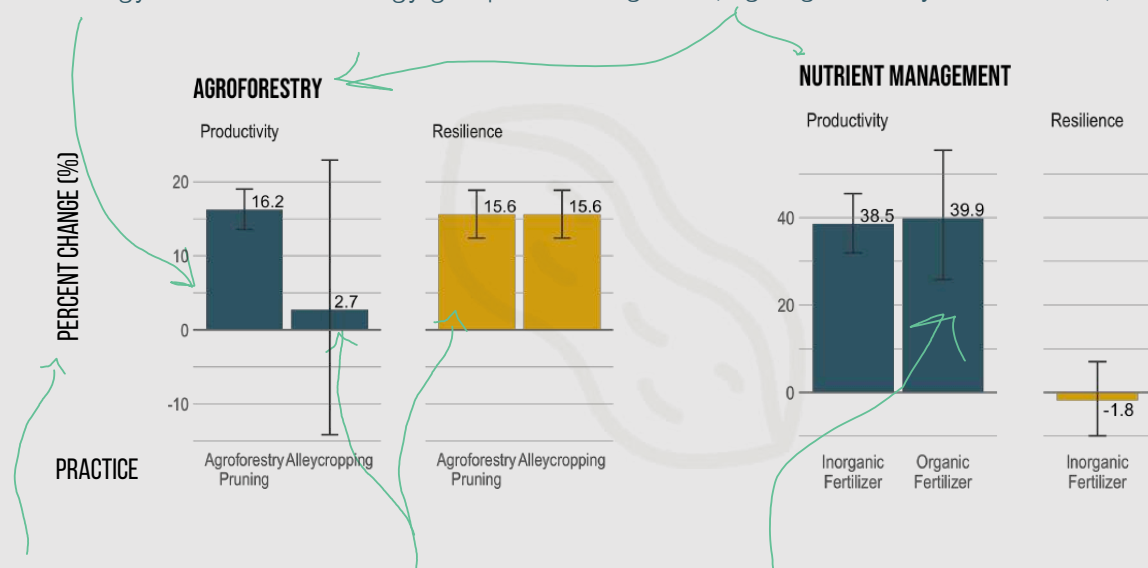
The book is organized first by agroecological zone (AEZ) and farming systems.

					
CEREALS	LEGUMES	STARCHY STAPLES	VEGETABLES / FRUIT	FIBER AND CASH CROPS	MEAT-MILK, POULTRY, FISH
Maize, Millet, Sorghum, Rice, Wheat	Beans, Cowpea, Pigeon Pea, Groundnuts, etc.	Potato, Sweet Potato, Cassava, Bananas, etc.	Tomato, Onion, Cabbage, Banana, etc.	Cotton, Coffee, Sugarcane, Tea, etc.	Cattle, Goats, Sheep, Poultry, Dairy, Fish, etc.

Each AEZ and farming system combination will have a series of graphs like this one below, which shows the impact of CSA practices compared to “business as usual”.

Each column stands for a specific CSA technology within the technology group

Technologies are grouped into broad categories (e.g., agroforestry, nutrient, etc.)

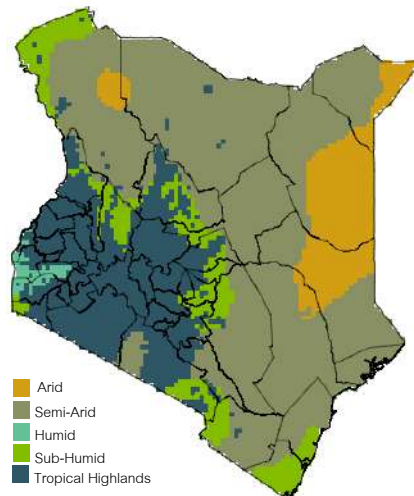


The y-axis shows the percent change in outcome when compared to a conventional practice; 100% = doubling!

A blue bar indicates an outcome for productivity; a yellow-mustard bar an outcome for resilience.

The line is the mean change for that CSA technology, and the yellow (error) bars show the uncertainty in the mean (the spread of values, min. to max.)

ARID ZONE



The arid zone covers the territory of various counties, including parts of Wajir (> 50% of the land area), Garissa, Mandera and Tana River in the north-east, as well as Turkana and Massabit in the north-west. The population ranges between 315,943 people in Tana River and 926,976 in Turkana (KNBS, 2019).

In Wajir, Garissa and Tana River, farming contributes more than 80% to the household income. Absolute poverty and food insecurity rates are high throughout the AEZ; in Wajir, they reach 84% and 72% of the population, respectively.

Here, dependency on relief food is high, as the acreage under food and cash crops is negligible (MALF, CIAT. 2018).

Agriculture in the arid zone is difficult due to frequent lack of adequate rainfall for crops. Crops and livestock that can thrive in this zone include drought and heat-tolerant varieties of millet, sorghum, cowpeas, and goats. Agricultural practices and technologies that make the best use of scarce water resources and improve generally low-nutrient soils in arid areas are ideal for increasing yield and resilience of arid farming systems.

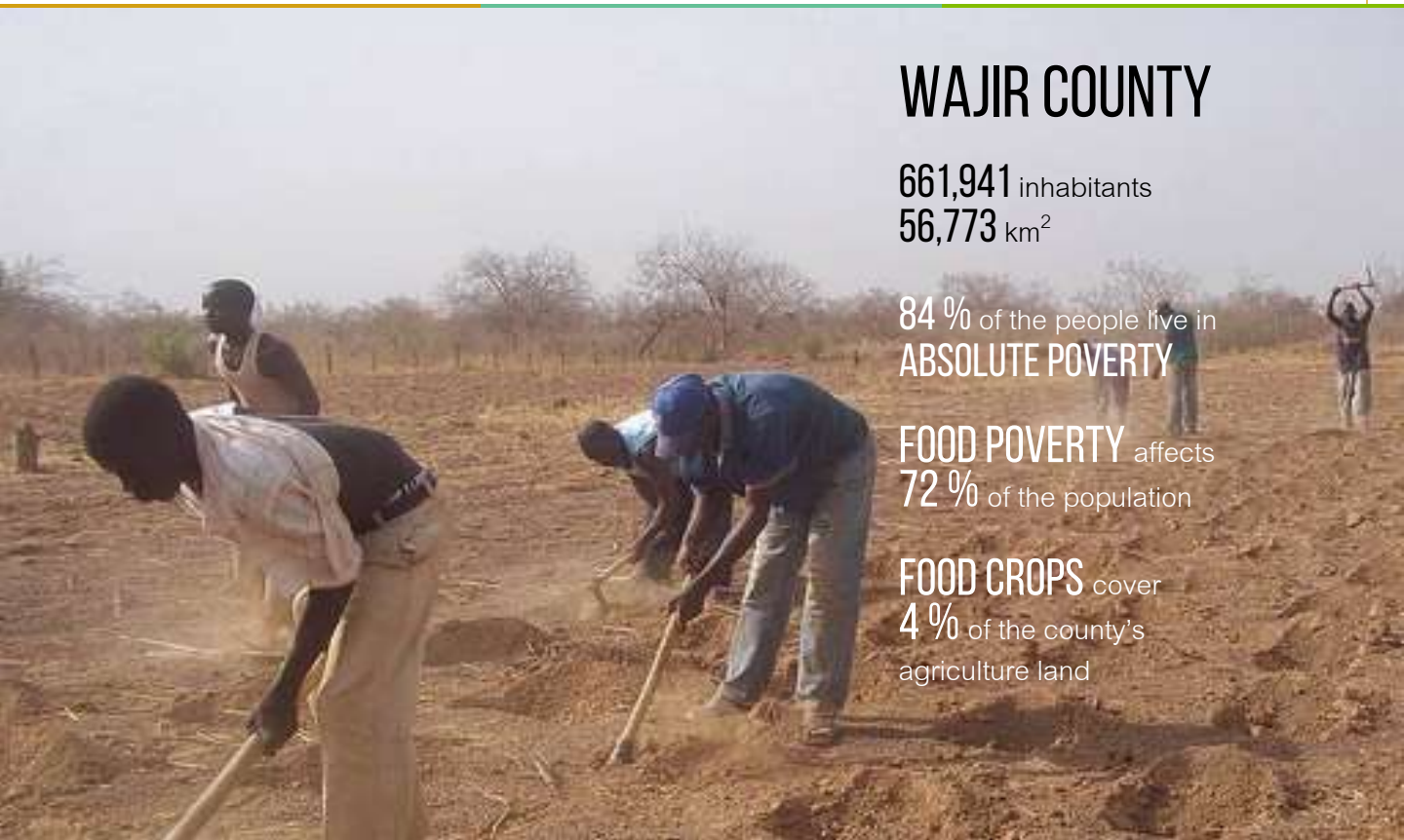
WAJIR COUNTY

661,941 inhabitants
56,773 km²

84 % of the people live in
ABSOLUTE POVERTY

FOOD POVERTY affects
72 % of the population

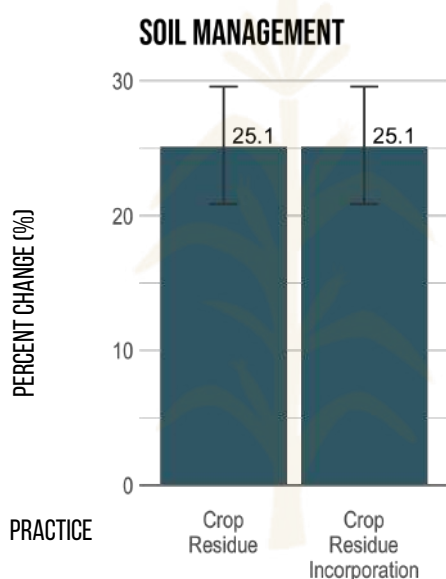
FOOD CROPS cover
4 % of the county's
agriculture land



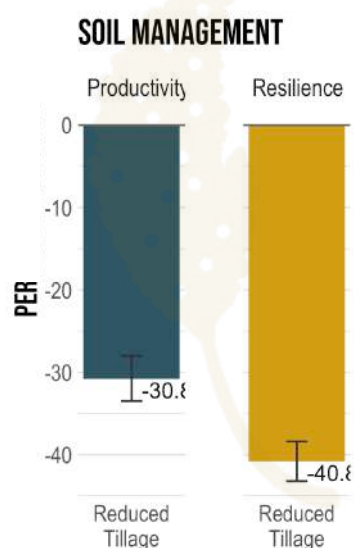
PRODUCTIVITY AND RESILIENCE OF FARM PRACTICES

The figures below show changes in productivity (dark blue) and resilience (orange) outcomes from business-as-usual practice for different production systems. The error lines show the spread of possible outcomes (from minimum to maximum).

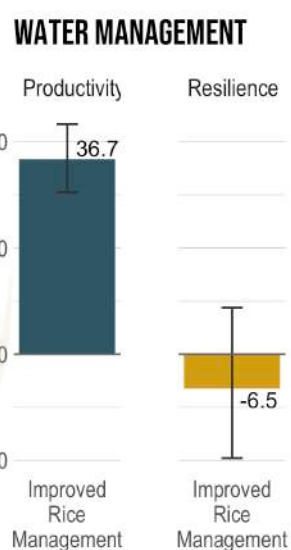
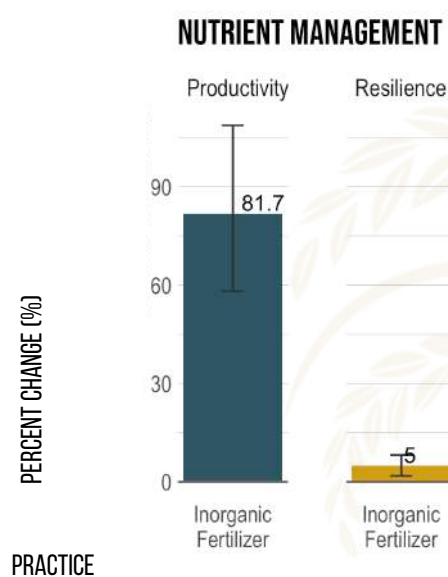
MAIZE



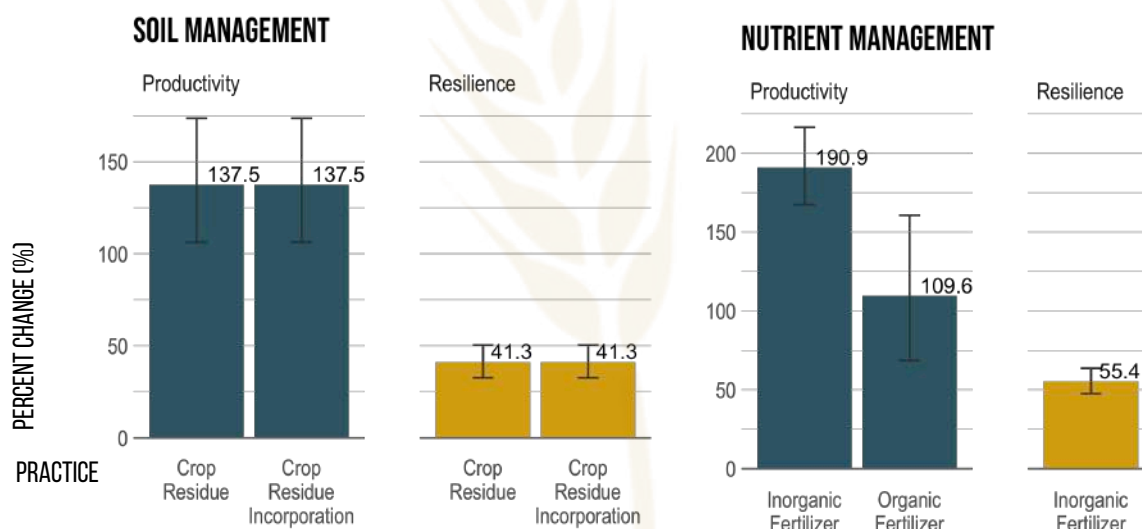
SORGHUM



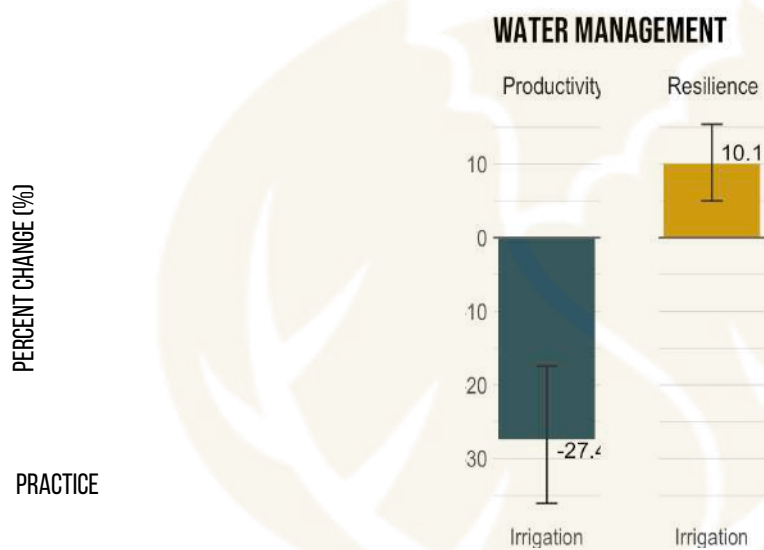
RICE



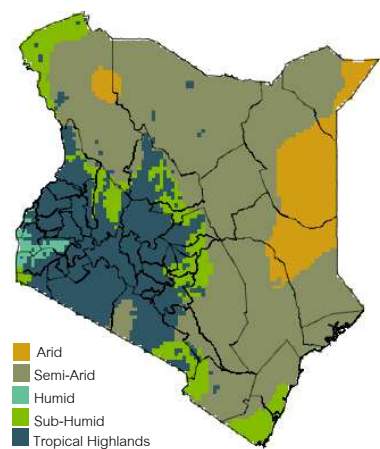
WHEAT



CABBAGE



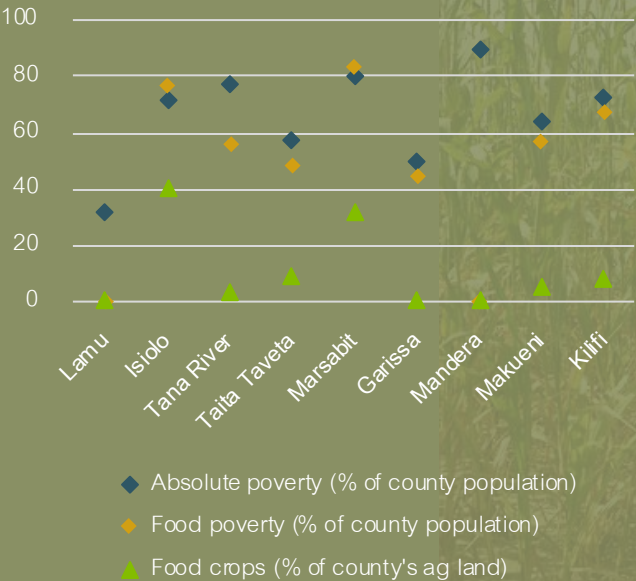
SEMI-ARID ZONE



Semi-arid lands cover almost half (45%) of Kenya’s counties. Eleven of these counties—Lamu, Marsabit, Isiolo, Tana River, Kitui, Kilifi, Taita Taveta, Makueni, Turkana, Mandera and Garissa—have more than 50% of their territory under this AEZ. Absolute poverty rates in this AEZ range between 32% (Lamu) and 89% (Mandera), with high inter-county variations. Food poverty is also widespread, ranging between 44% (Garissa) and 83% (Marsabit).

Infertile soils and moderate to low rainfall (<500mm annually) make semi-arid zones productive for livestock, particularly efficient small stock like goats. Water harvesting makes agriculture possible in these areas. Key value chains include dairy, meat from shoats and cattle, horticultural crops like tomatoes, French beans and staples like maize, sorghum, millet and pigeon peas. This zones are under constant threats of increasing temperature, moisture stress, droughts and floods.

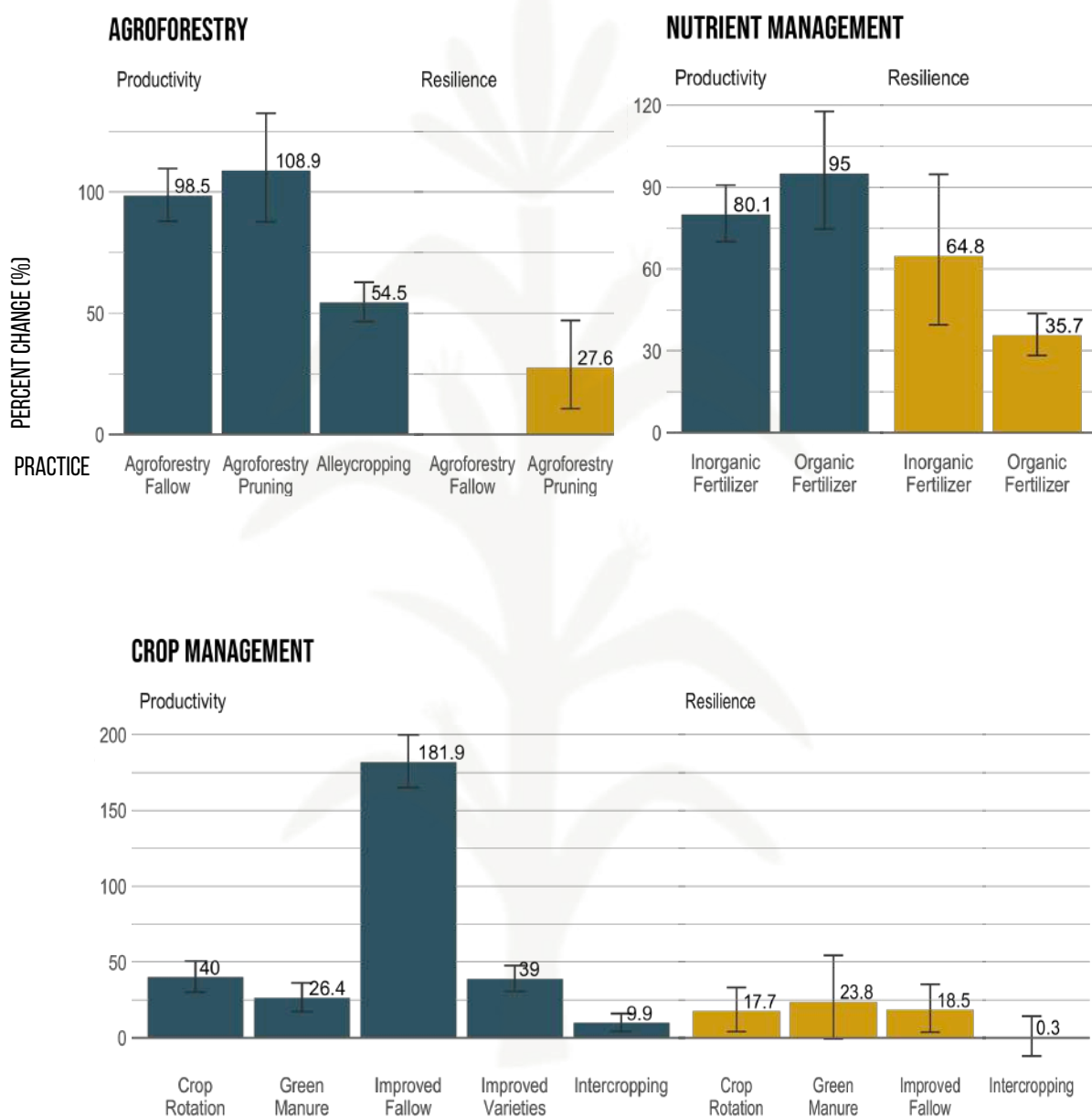
SELECT SOCIO-ECONOMIC DATA
IN THE SEMI-ARID ZONE



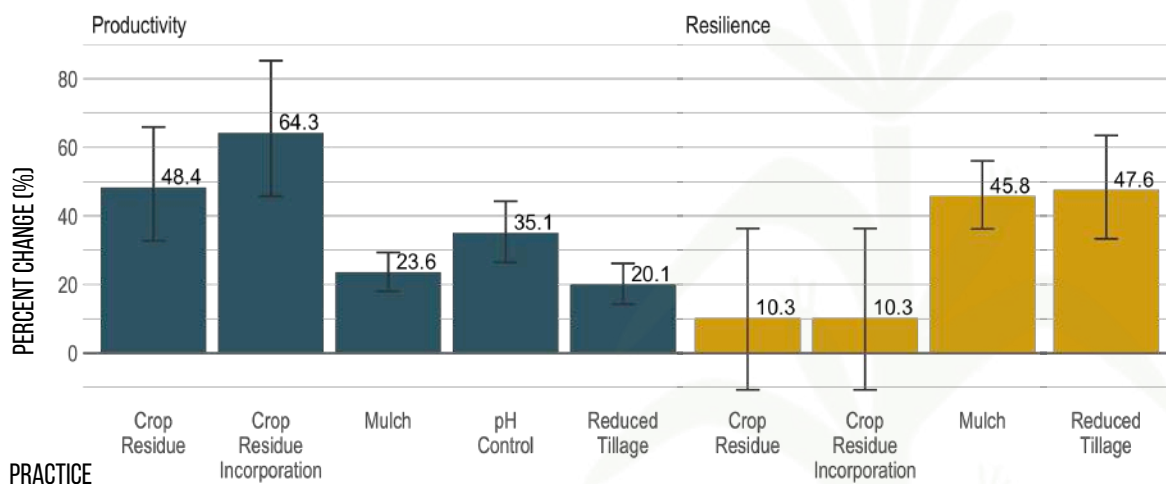
PRODUCTIVITY AND RESILIENCE OF FARM PRACTICES

The figures below show changes in productivity (dark blue) and resilience (orange) outcomes from business-as-usual practice for different production systems. The error lines show the spread of possible outcomes (from minimum to maximum).

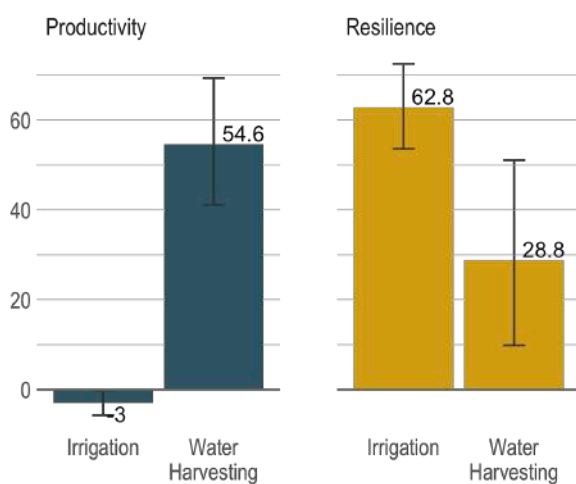
MAIZE



SOIL MANAGEMENT

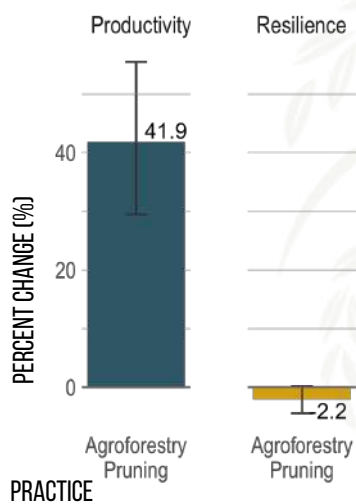


WATER MANAGEMENT

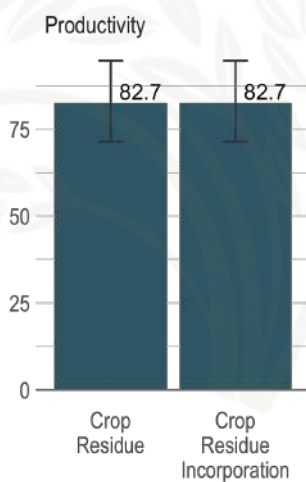


RICE

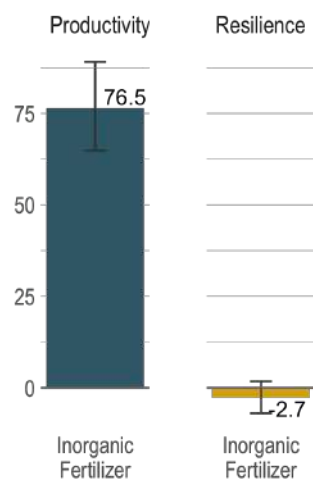
AGROFORESTRY



SOIL MANAGEMENT

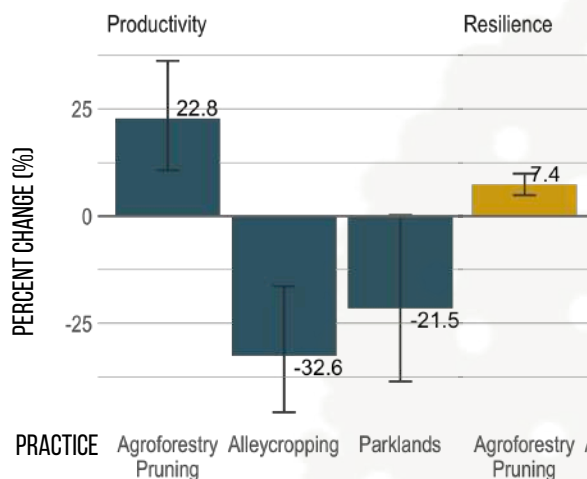


NUTRIENT MANAGEMENT

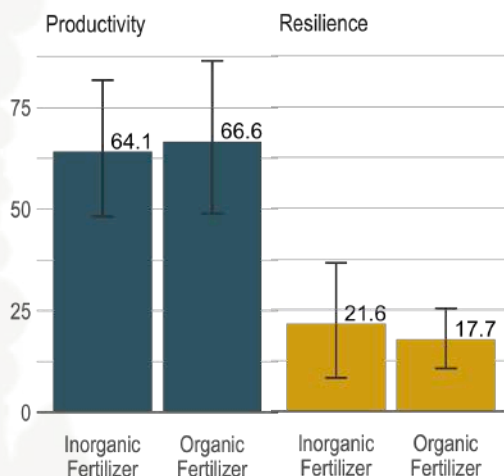


SORGHUM

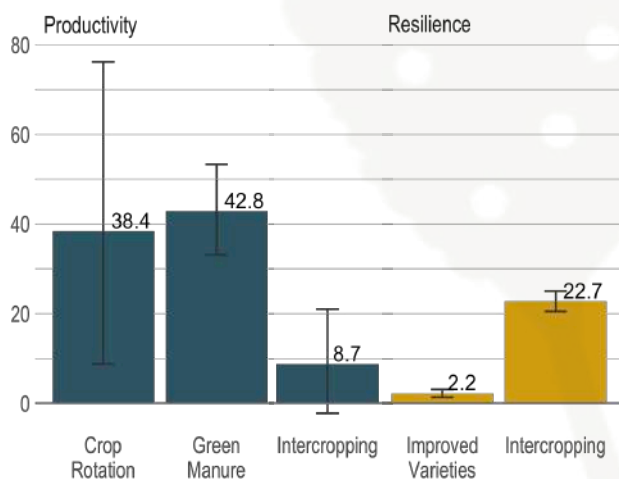
AGROFORESTRY



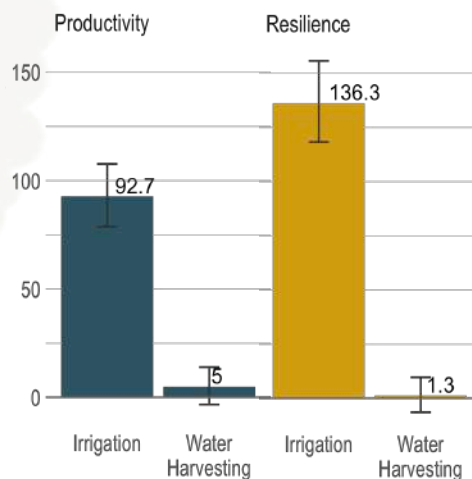
NUTRIENT MANAGEMENT



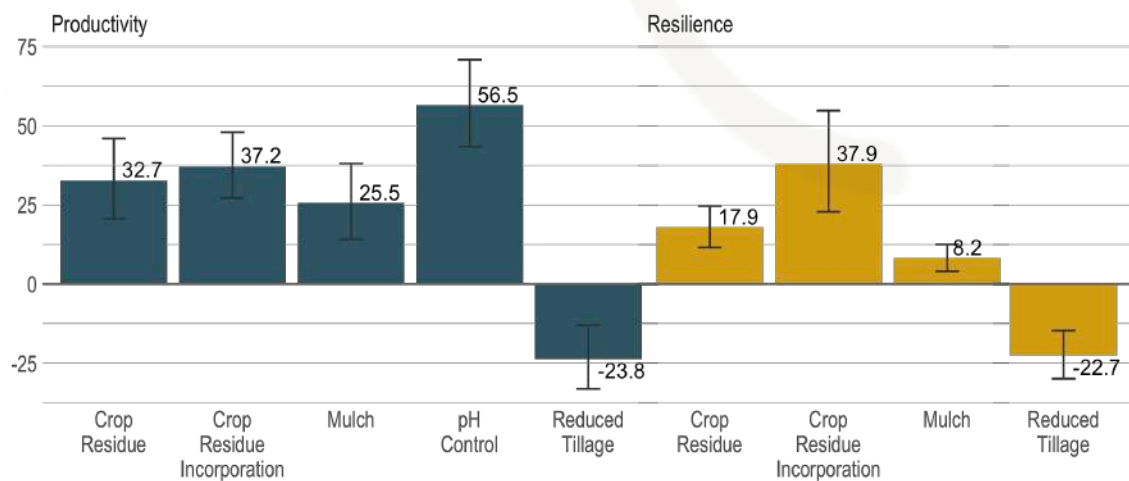
CROP MANAGEMENT



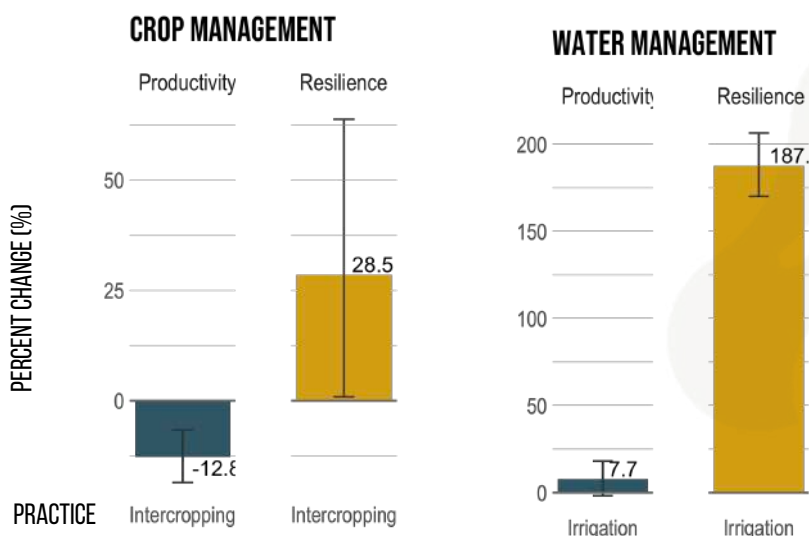
WATER MANAGEMENT



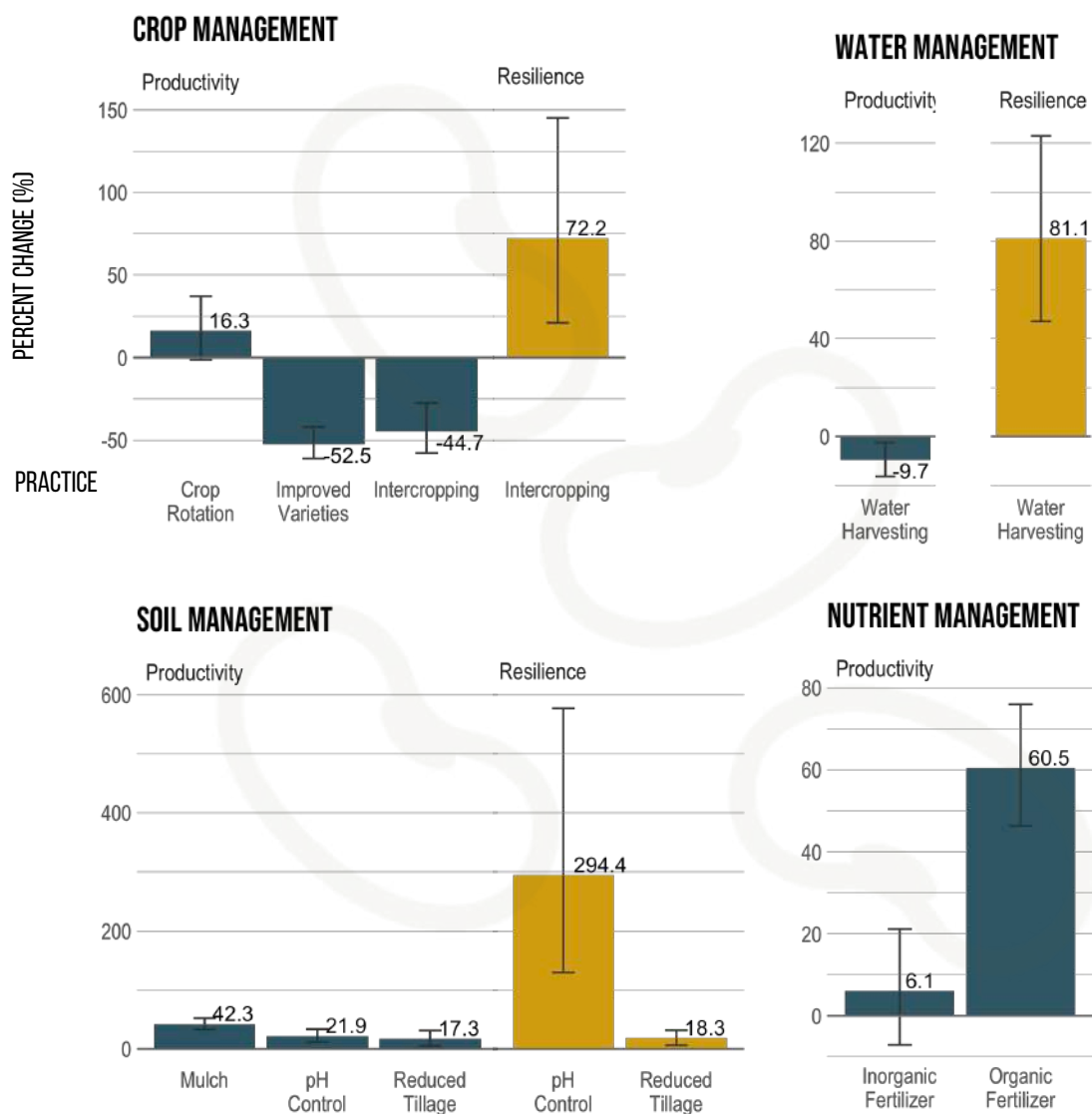
SOIL MANAGEMENT



COMMON BEAN

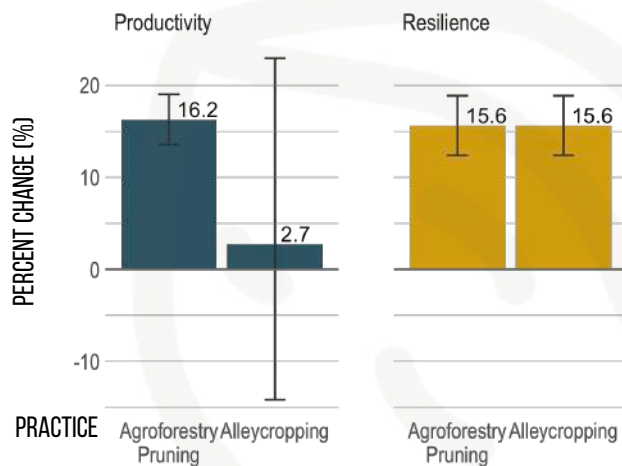


COWPEA

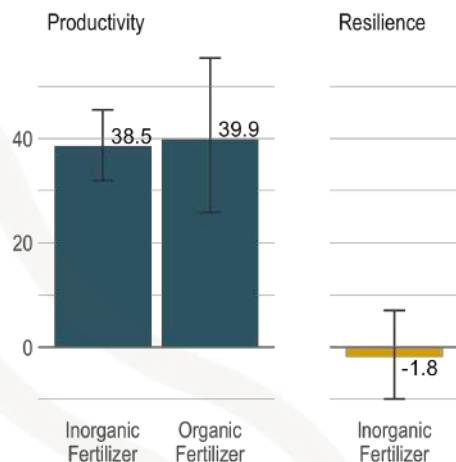


GROUNDNUT

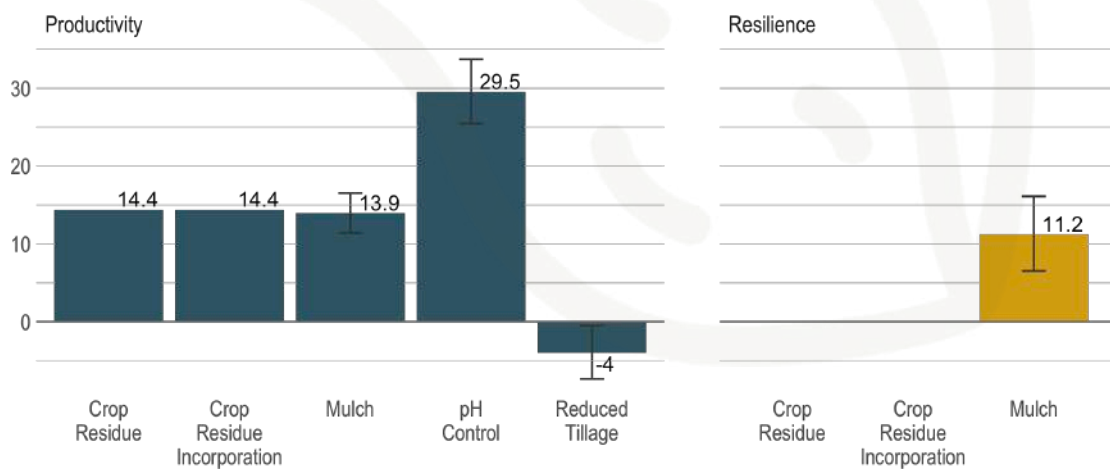
AGROFORESTRY



NUTRIENT MANAGEMENT

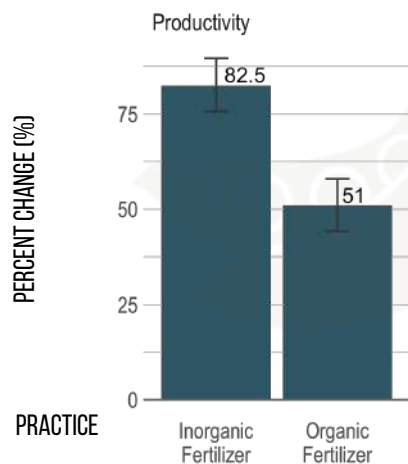


SOIL MANAGEMENT



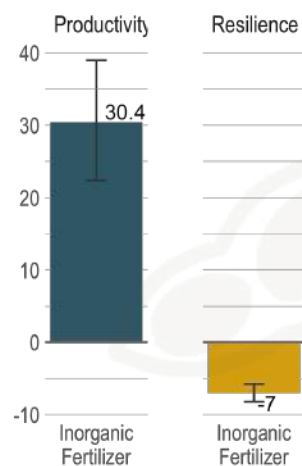
PIGEONPEA

NUTRIENT MANAGEMENT

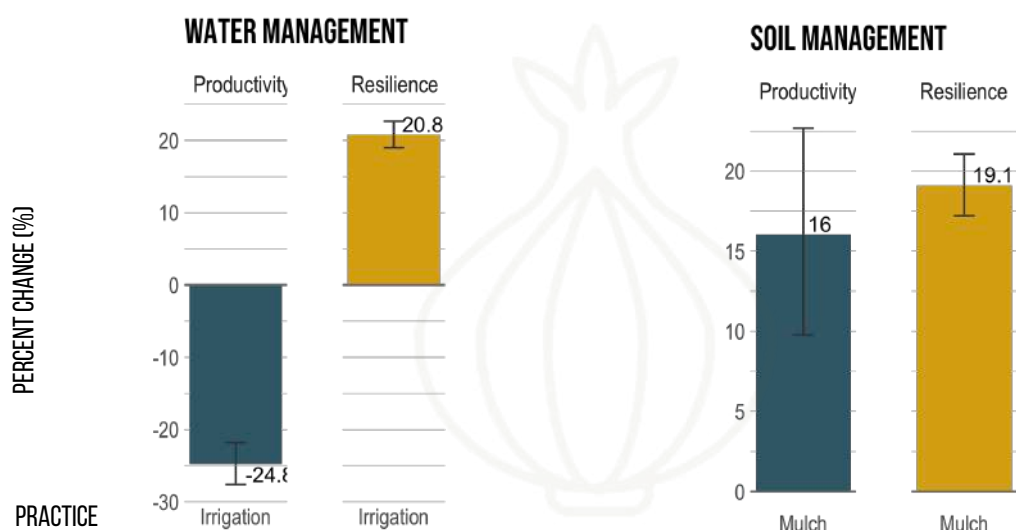


SOYBEAN

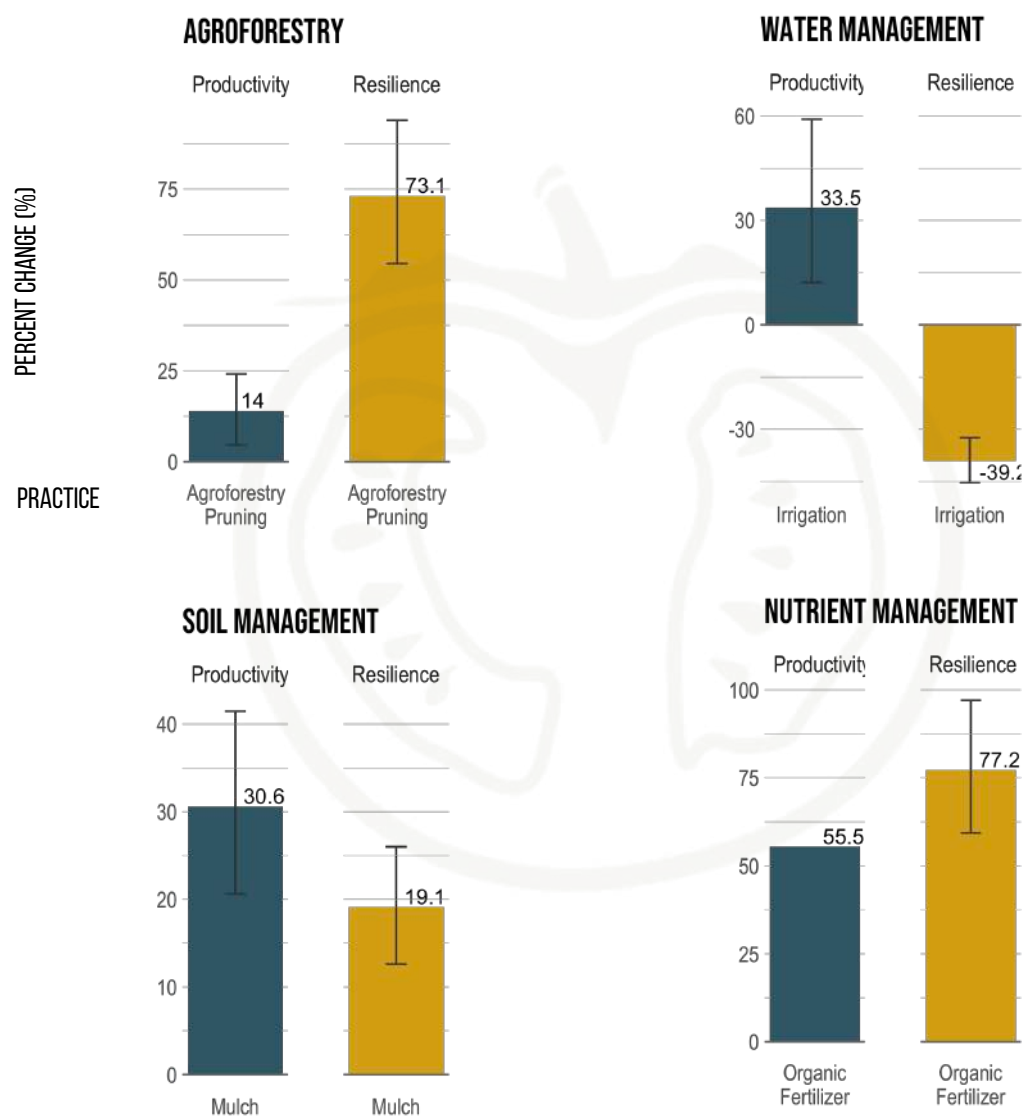
NUTRIENT MANAGEMENT



ONION

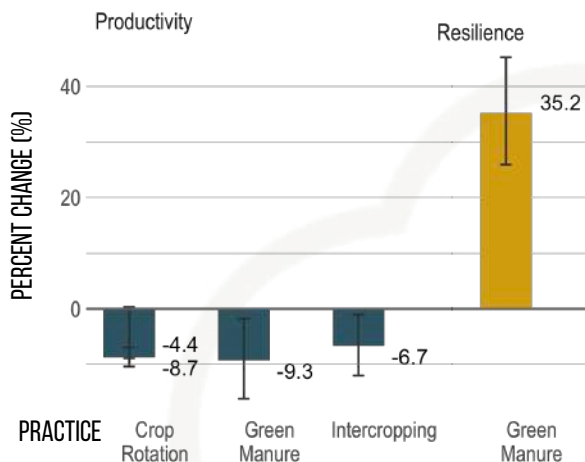


TOMATO

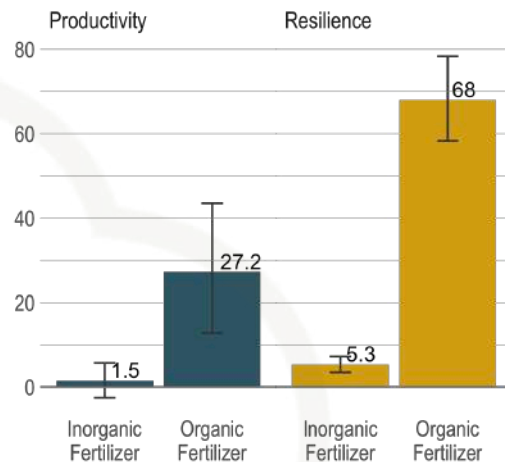


COTTON

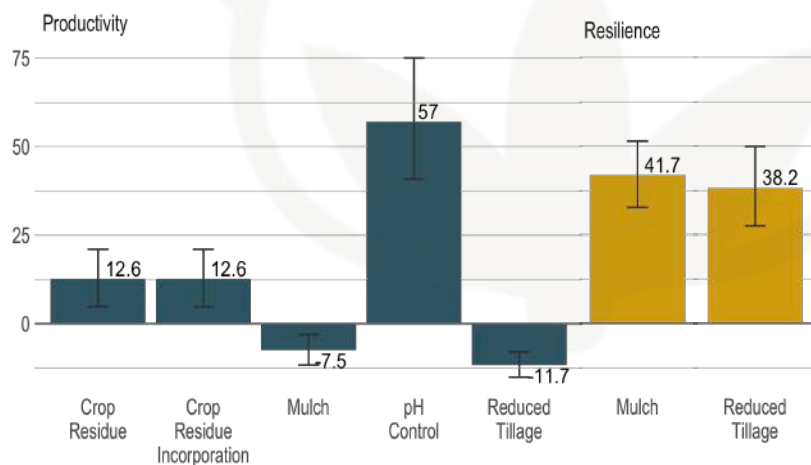
CROP MANAGEMENT



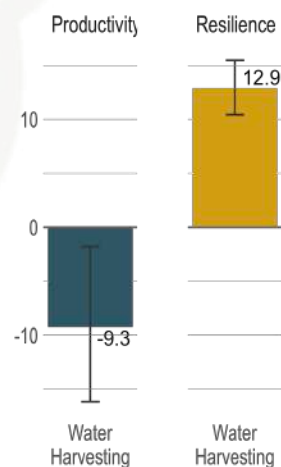
NUTRIENT MANAGEMENT



SOIL MANAGEMENT

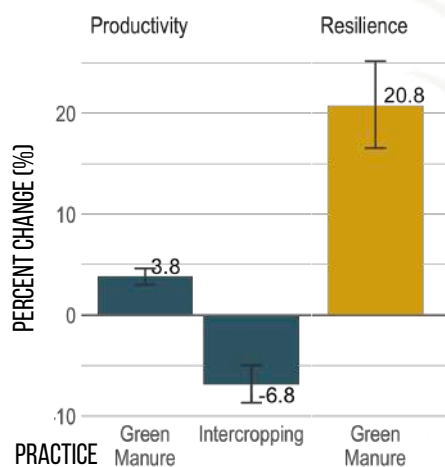


WATER MANAGEMENT

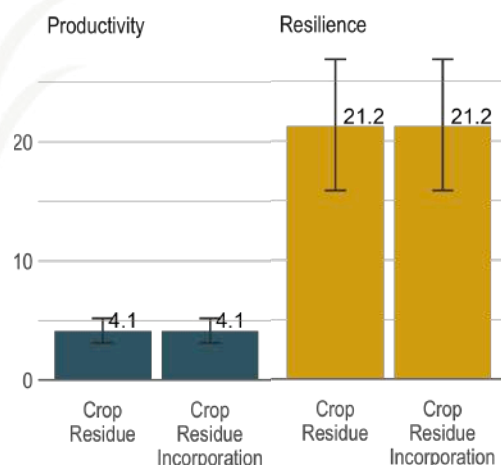


SUGARCANE

CROP MANAGEMENT



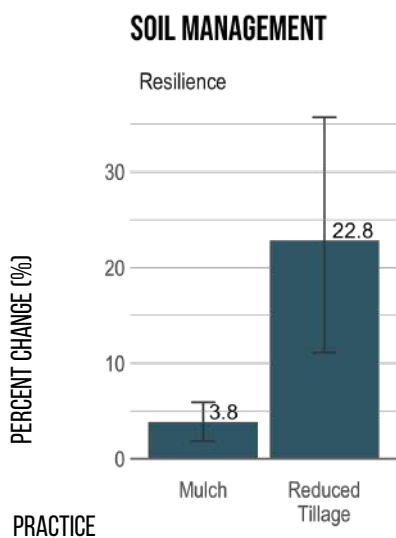
SOIL MANAGEMENT



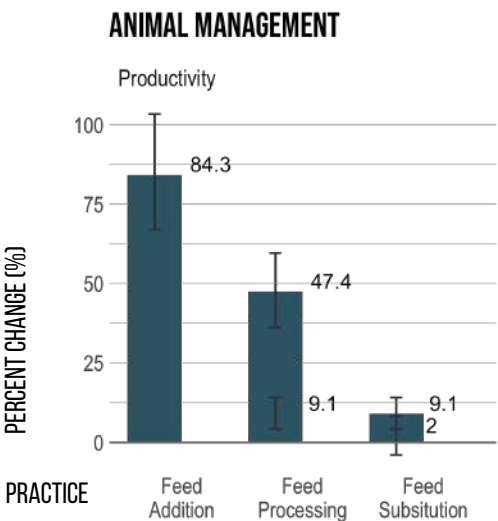
SESAME



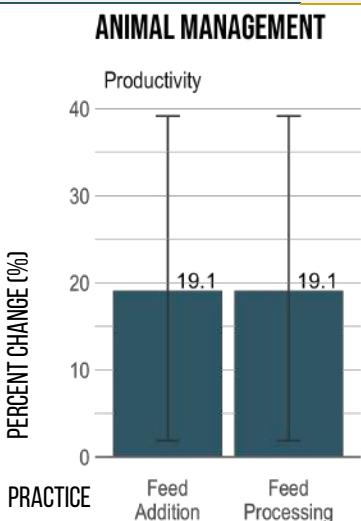
SUNFLOWER



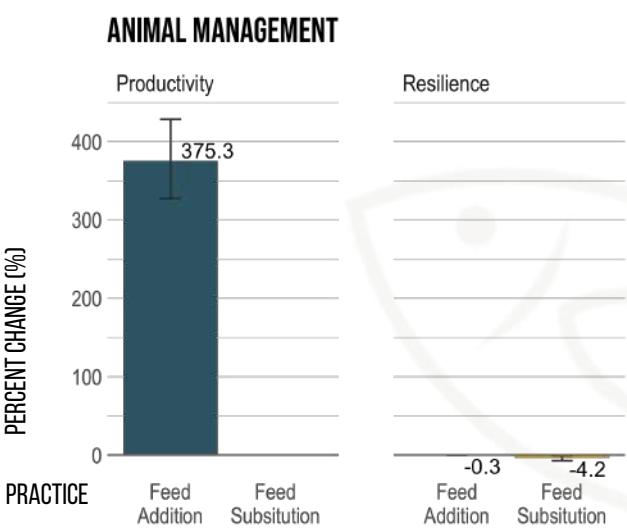
GOAT



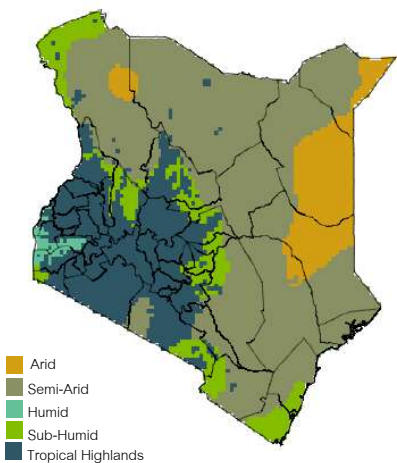
SHEEP



FISH



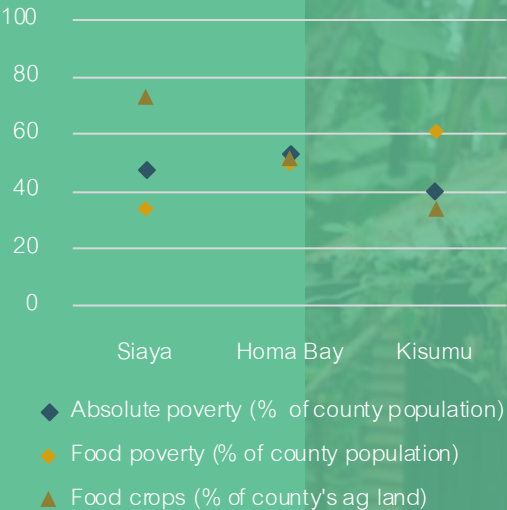
HUMID ZONE



The Humid AEZ extends over six counties in the west, including parts of Kisumu, Siaya, Homa Bay, Mombasa and Lamu. Homa Bay, Kisumu and Mombasa are among the counties with the highest population number and population density in Kenya (over one million inhabitants). Despite being an important agricultural production area, the incidence of poverty and food insecurity throughout the zone is significant. Absolute poverty rates range between 32% (Lamu) and 53% (Homa Bay), while food poverty incidence reaches 61% in Kisumu.

The AEZ experiences the longest growing season of any AEZ, with nearly year-round agricultural production possible. The farming area covers between 63 and 85% of the counties' land area. Tree- and forest-based farming systems are important in this zone, and many tree-crops are key commodities grown in this region. While abundant rainfall makes agriculture highly productive, erratic rainfall can produce flooding and erosion, and dry spells can severely impact humid growing systems which are not accustomed to drought.

SELECT SOCIO-ECONOMIC DATA IN THE HUMID ZONE

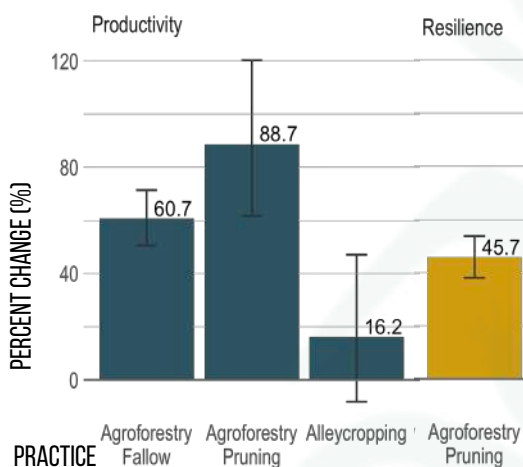


PRODUCTIVITY AND RESILIENCE OF FARM PRACTICES

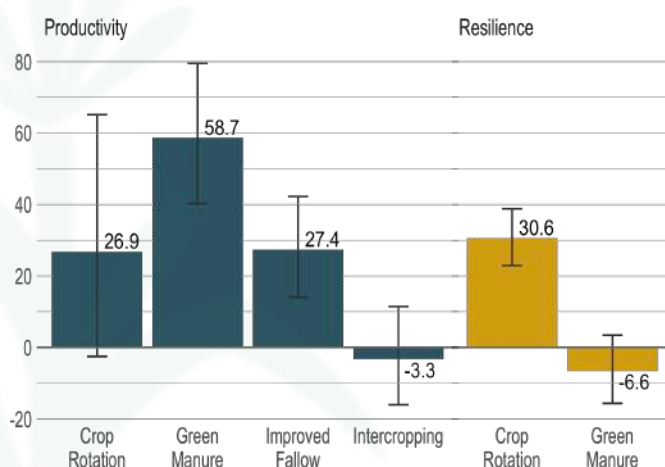
The figures below show changes in productivity (dark blue) and resilience (orange) outcomes from business-as-usual practice for different production systems. The error lines show the spread of possible outcomes (from minimum to maximum).

MAIZE

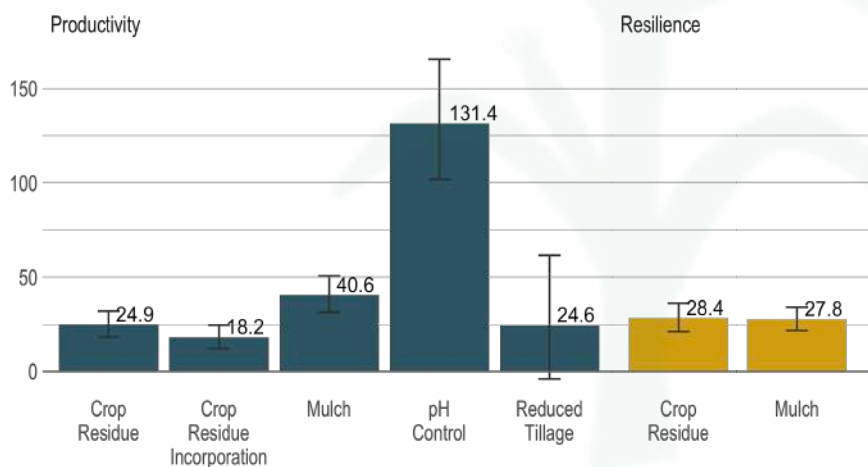
AGROFORESTRY



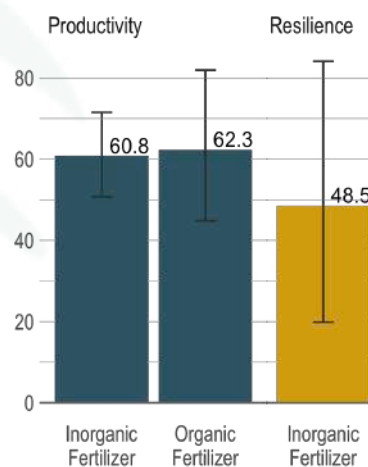
CROP MANAGEMENT



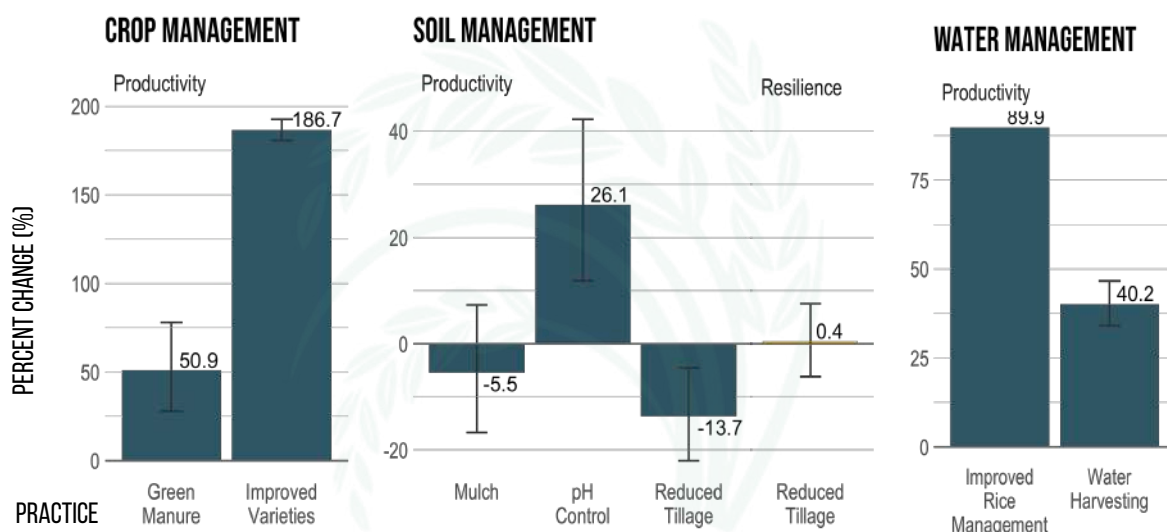
SOIL MANAGEMENT



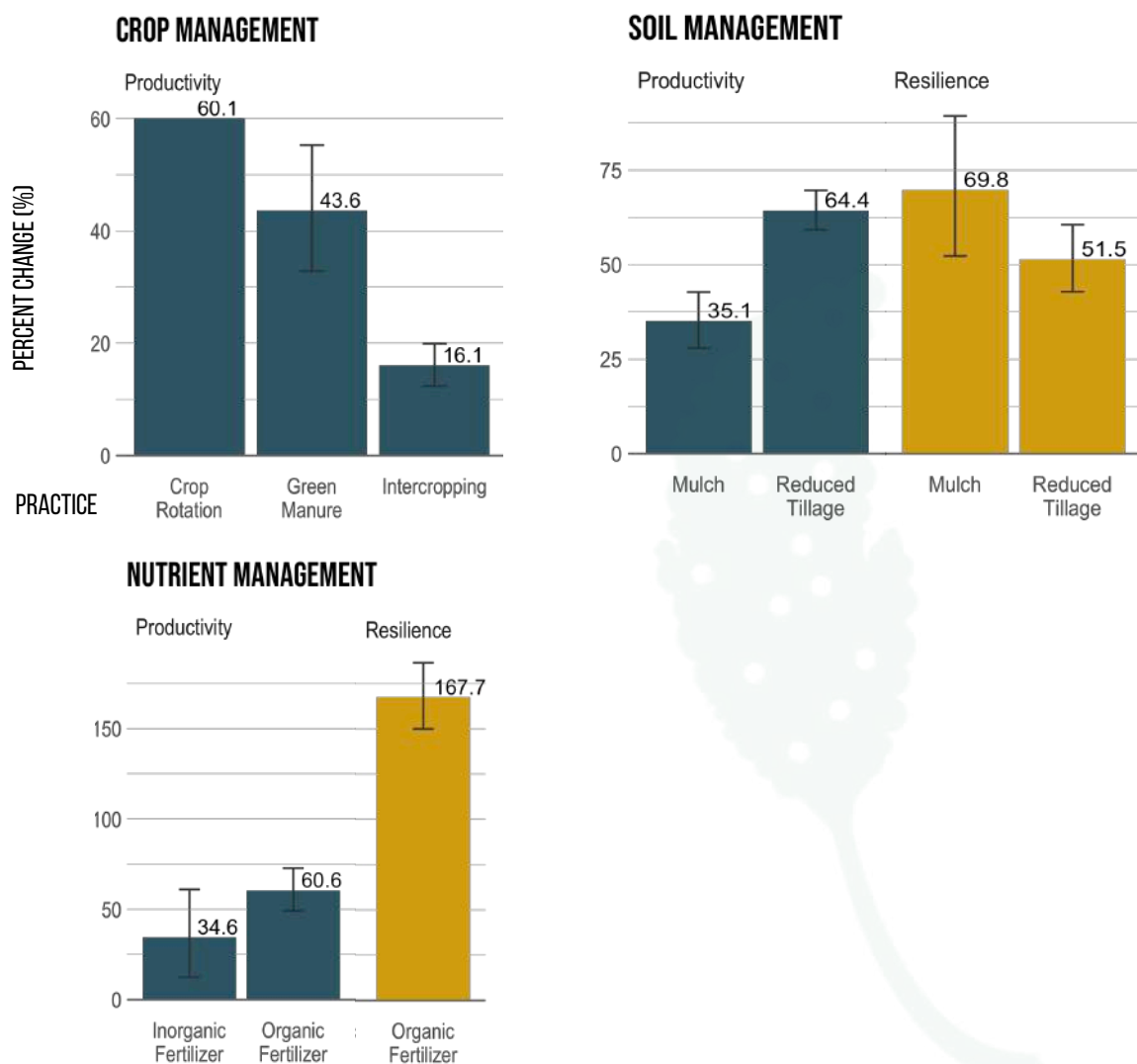
NUTRIENT MANAGEMENT



RICE

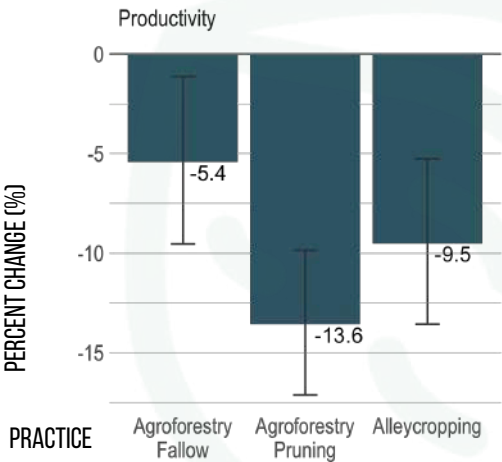


SORGHUM

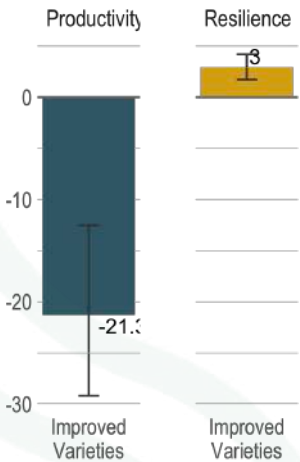


GROUNDNUT

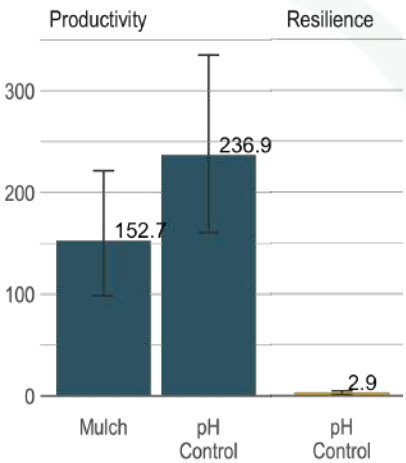
AGROFORESTRY



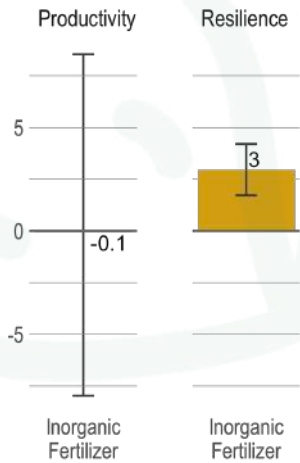
CROP MANAGEMENT



SOIL MANAGEMENT

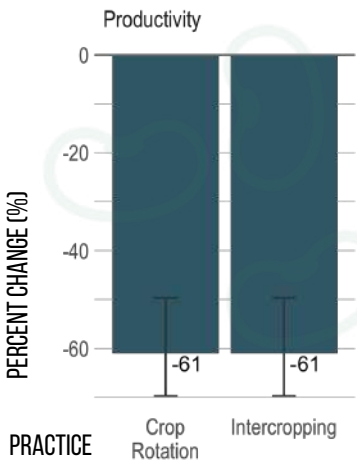


NUTRIENT MANAGEMENT



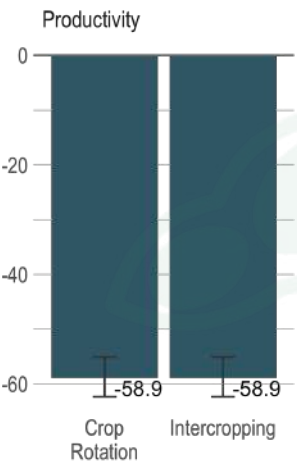
COWPEA

CROP MANAGEMENT

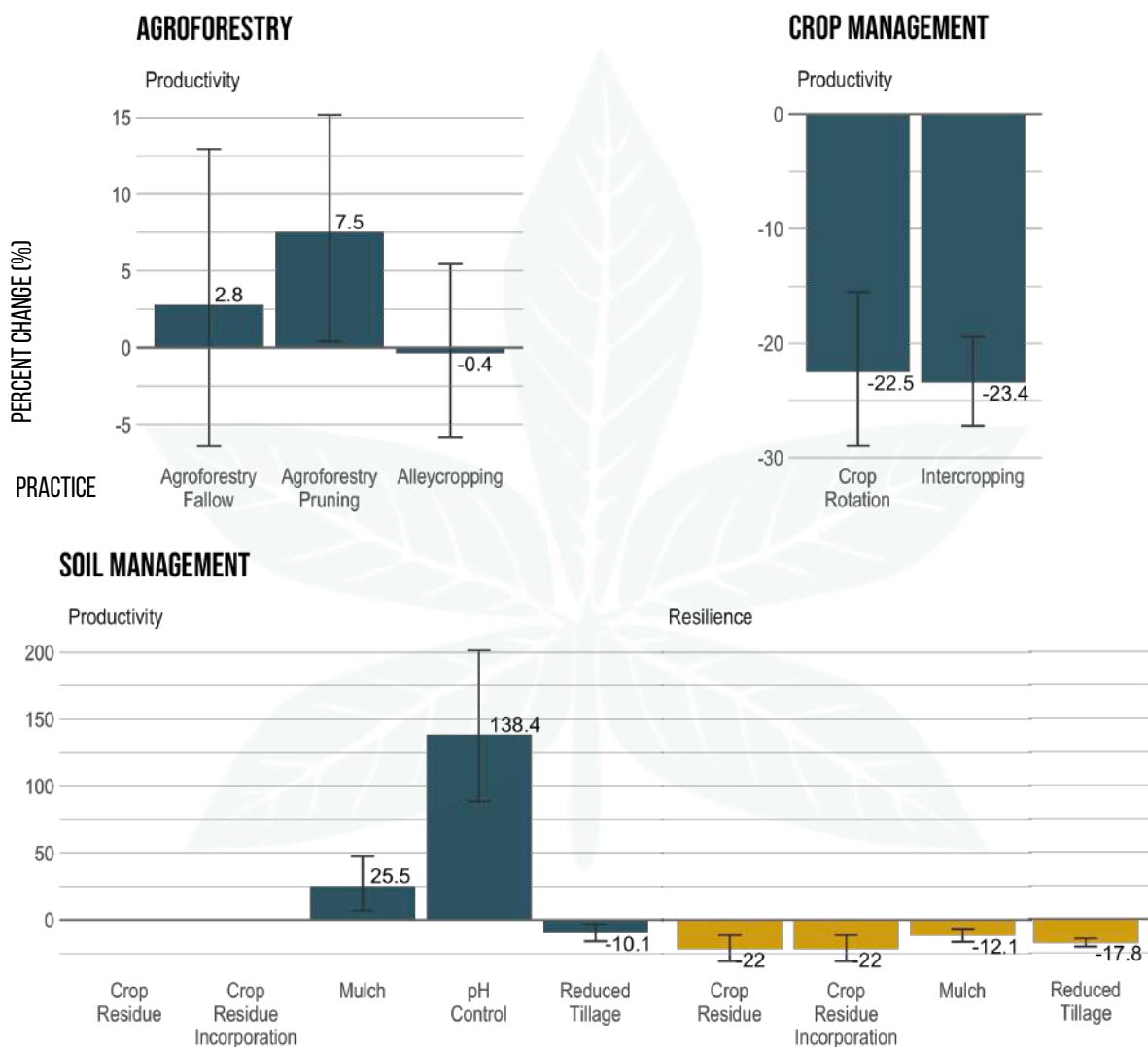


SOYBEAN

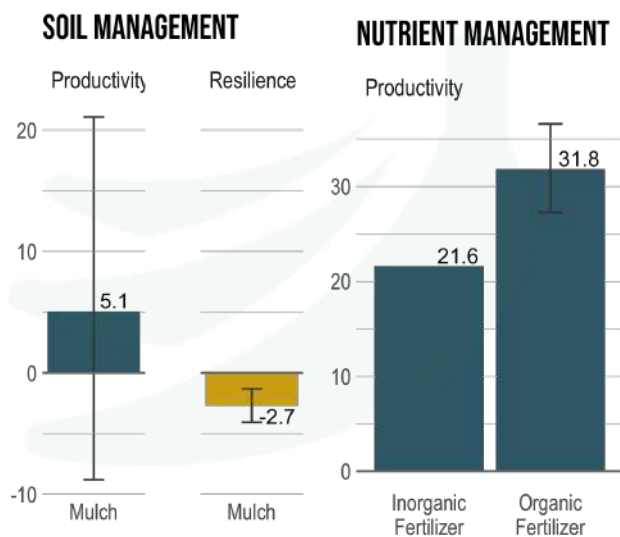
CROP MANAGEMENT



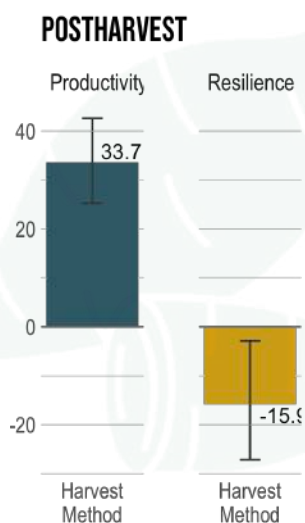
CASSAVA



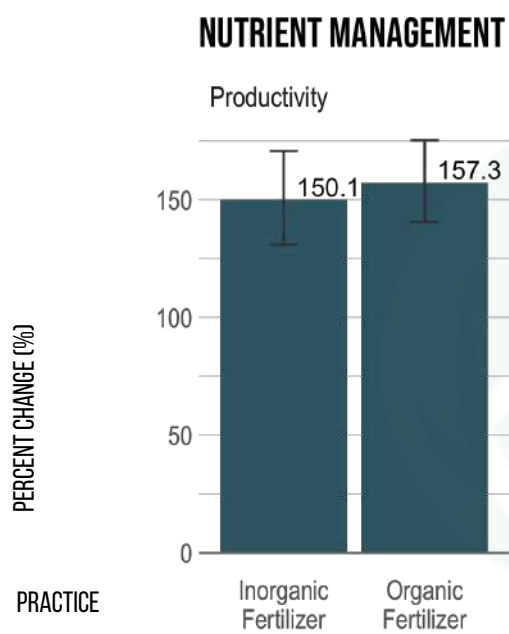
COOKING BANANA



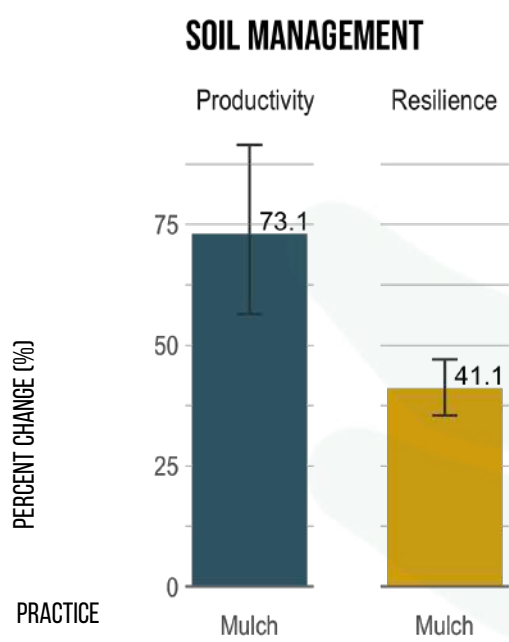
SWEET POTATO



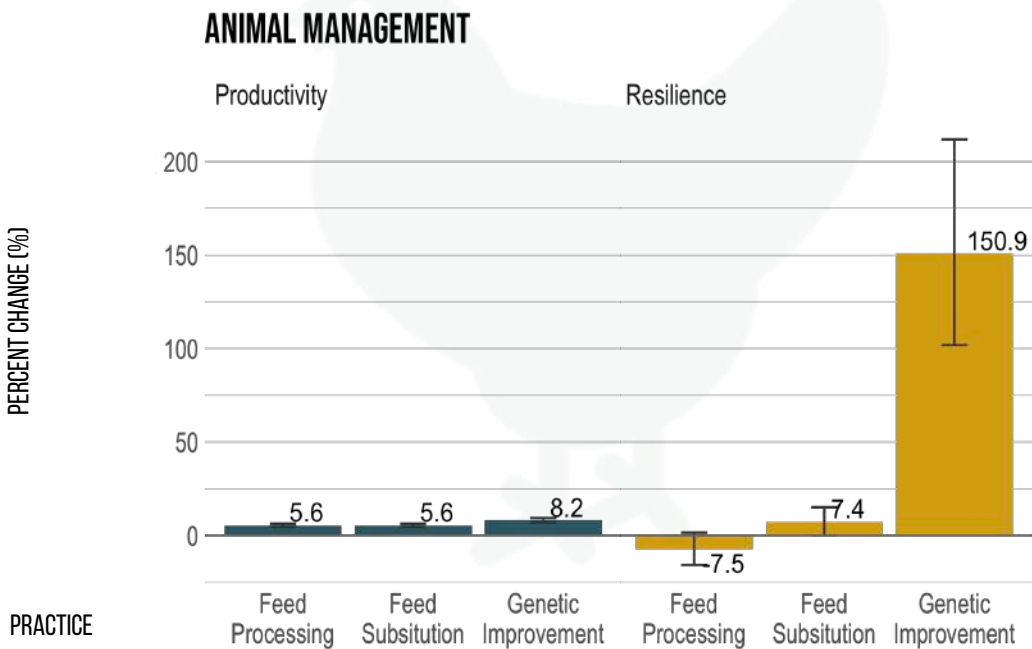
CABBAGE



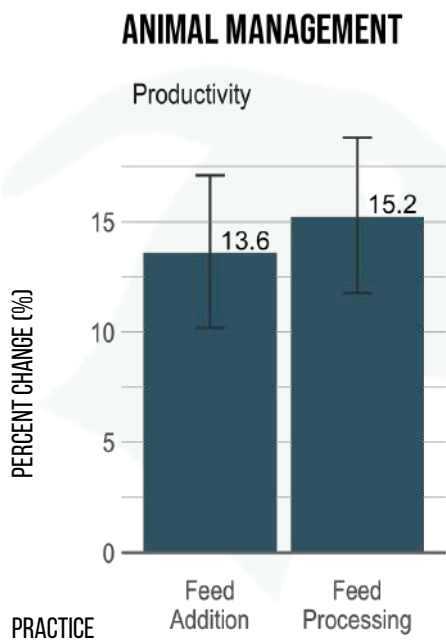
SWEET BANANA



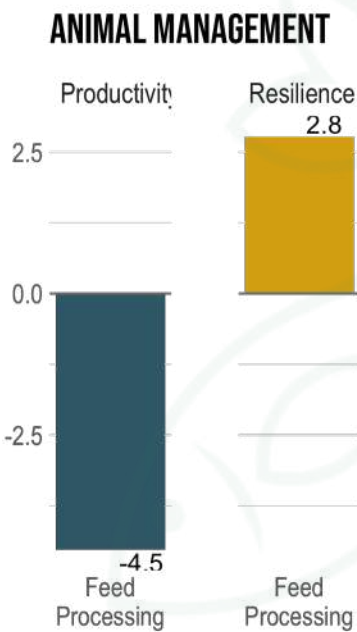
CHICKEN



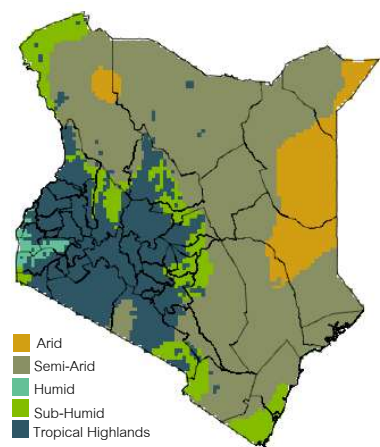
GOAT



FISH



SUB-HUMID ZONE



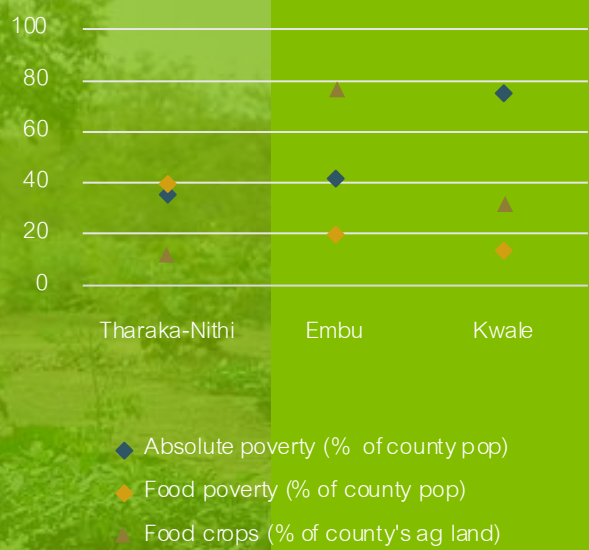
The Sub-Humid Zone covers land areas of twenty-two counties in Kenya, particularly Kwale, Embu and Tharaka-Nithi (over 50% of the land area in each of these counties falls within this AEZ). Kwale registers the highest incidence of absolute poverty (75%) and the lowest food insecurity rates (14%) in the area.

The AEZ experiences a much longer growing season than then Semi-Arid

Zone and is a key region for growing maize. A wide variety of crops do well in this Zone, including nutritionally important crops such as legumes and vegetables. Important cash crops such as cotton and sugar cane are also key elements of this agroecology. While the zone experiences higher rainfall, precipitation may be erratic, and both drought and flooding are a risk to production.



SELECT SOCIO-ECONOMIC DATA IN KEY HUMID ZONE COUNTIES

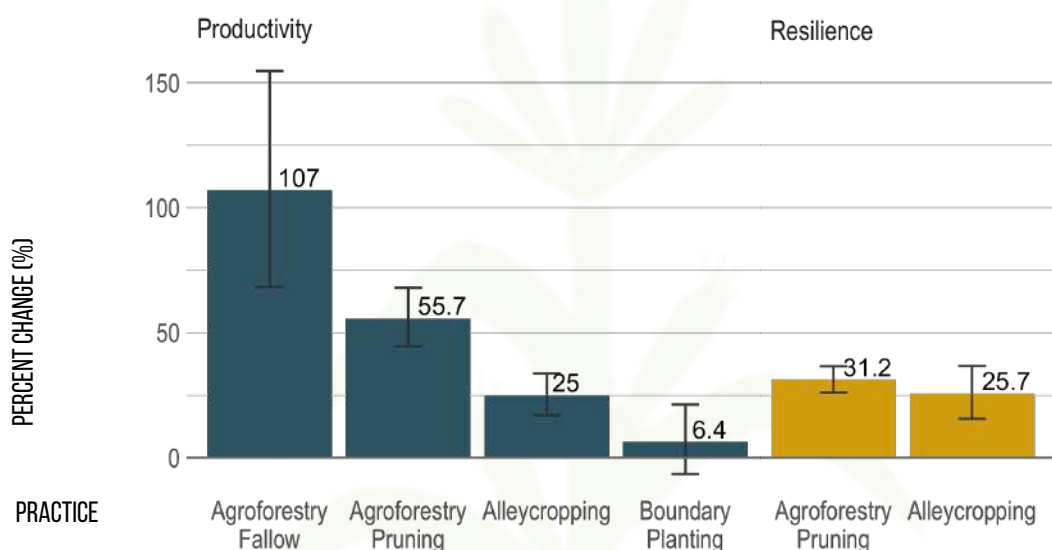


PRODUCTIVITY AND RESILIENCE OF FARM PRACTICES

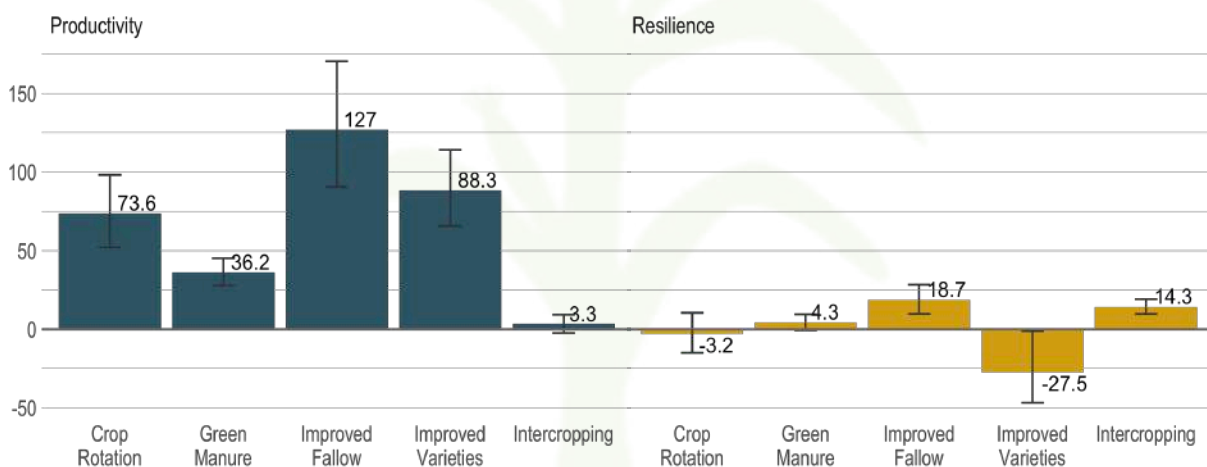
The figures below show changes in productivity (dark blue) and resilience (orange) outcomes from business-as-usual practice for different production systems. The error lines show the spread of possible outcomes (from minimum to maximum).

MAIZE

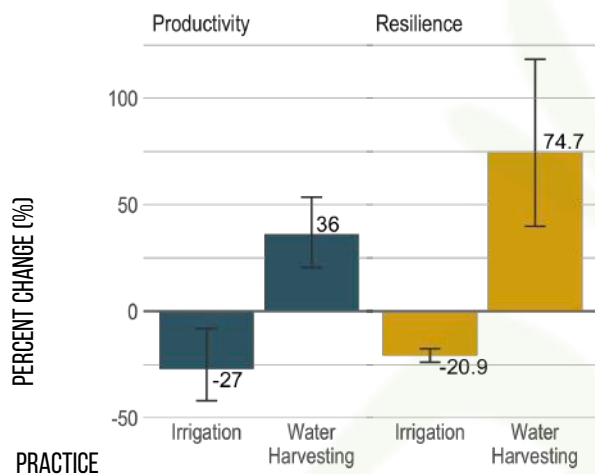
AGROFORESTRY



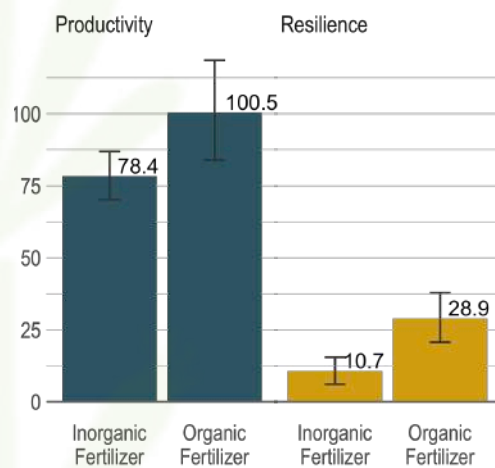
CROP MANAGEMENT



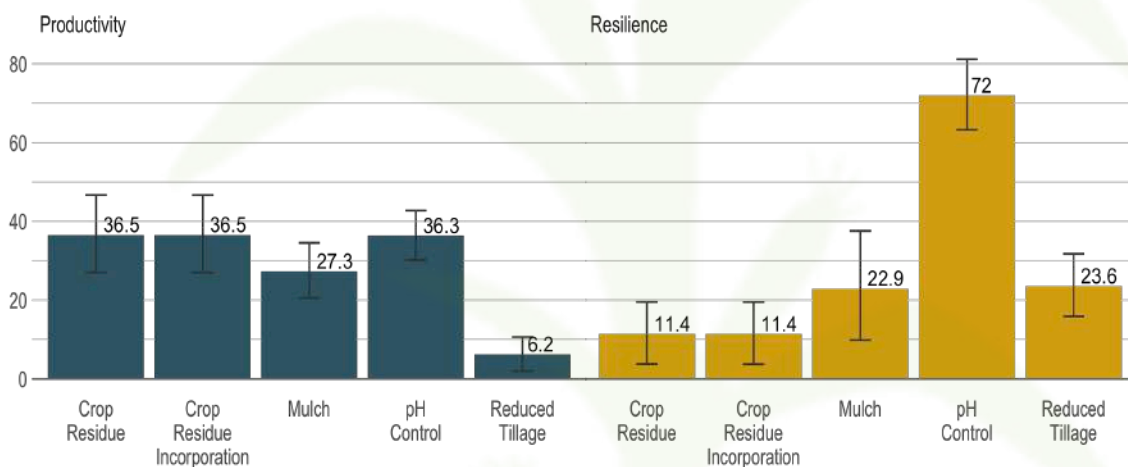
WATER MANAGEMENT



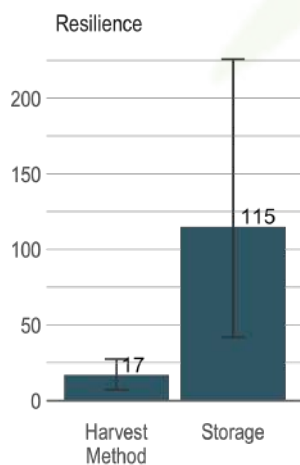
NUTRIENT MANAGEMENT



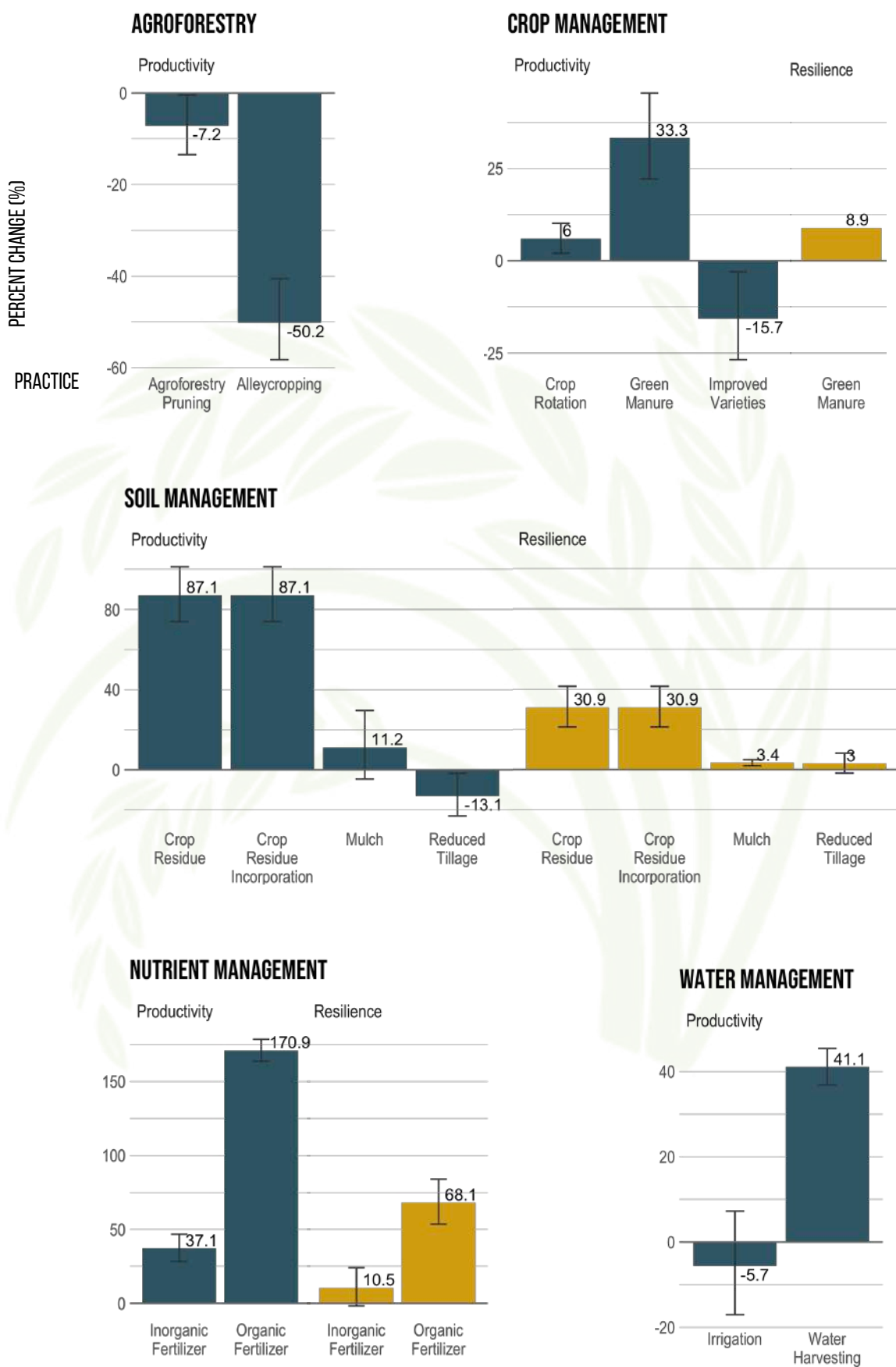
SOIL MANAGEMENT

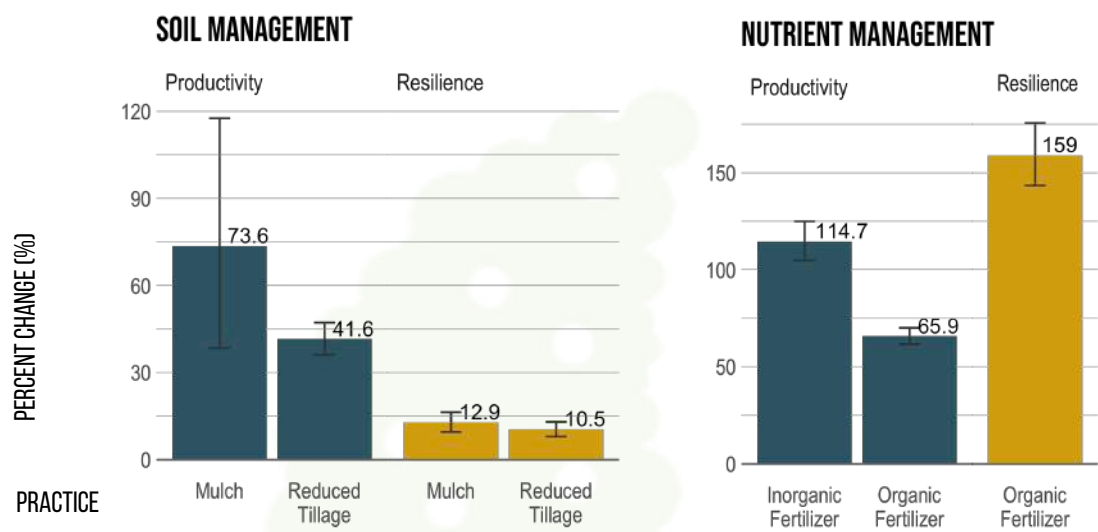


POSTHARVEST



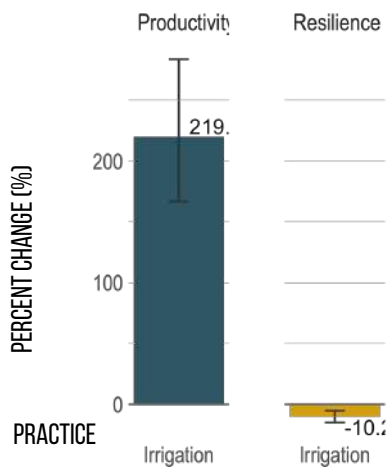
RICE





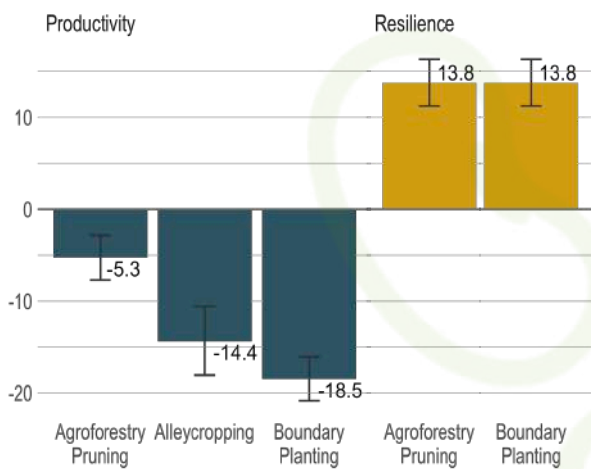
COMMON BEAN

WATER MANAGEMENT

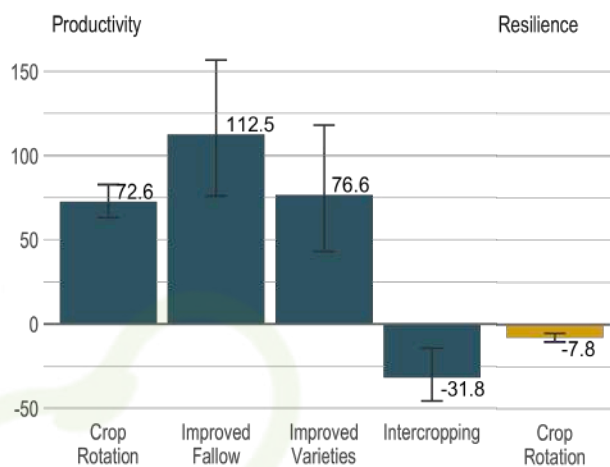


COWPEA

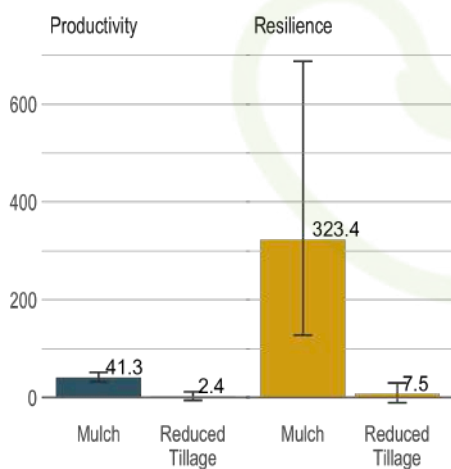
AGROFORESTRY



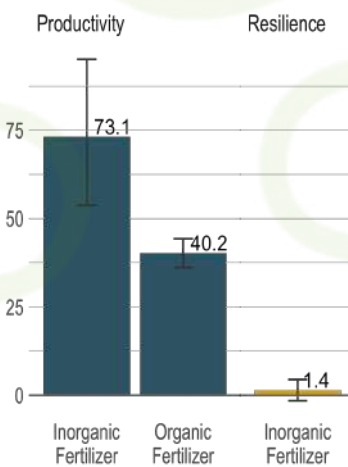
CROP MANAGEMENT



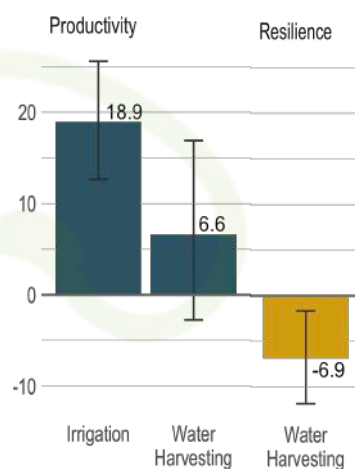
SOIL MANAGEMENT



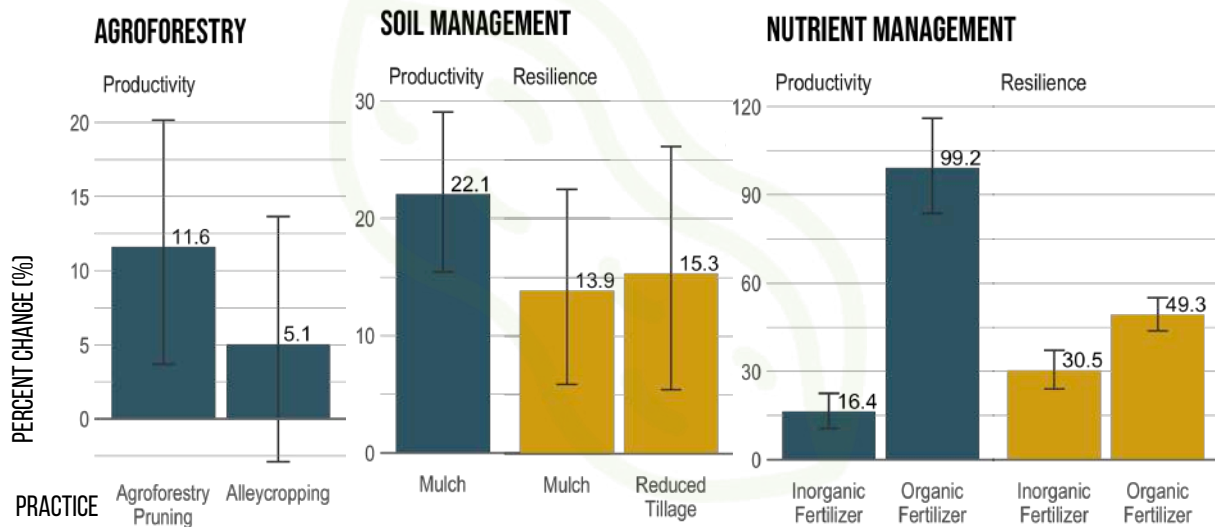
NUTRIENT MANAGEMENT



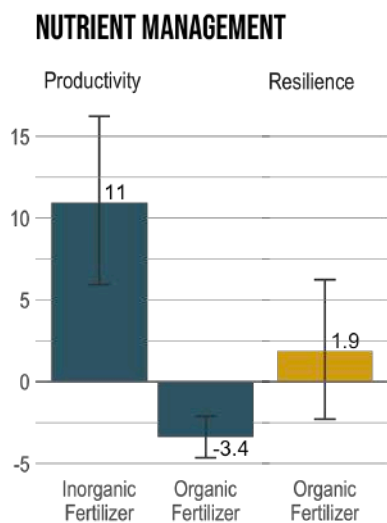
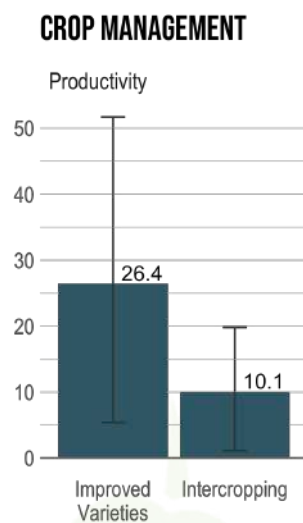
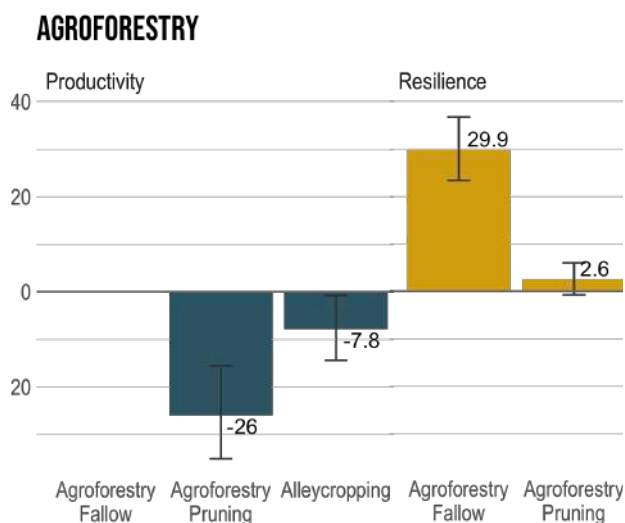
WATER MANAGEMENT



GROUNDNUT

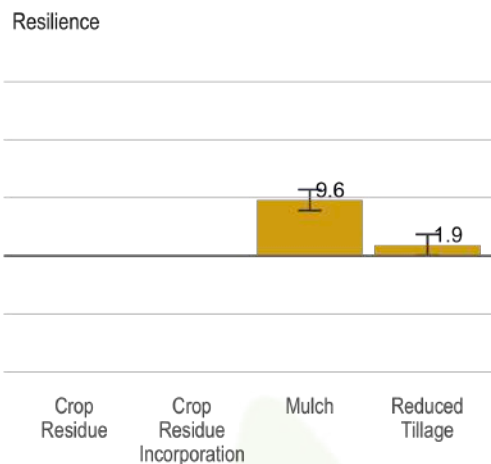
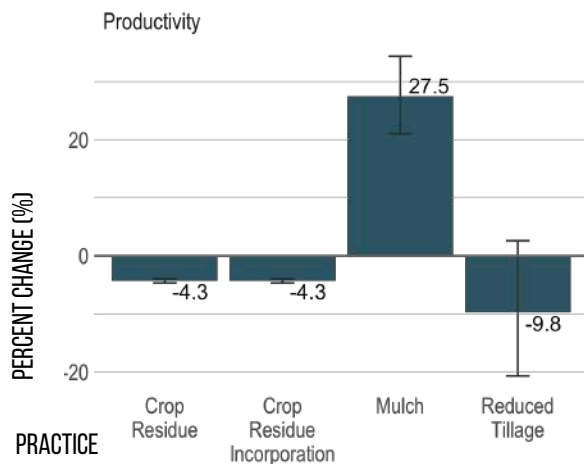


PIGEONPEA

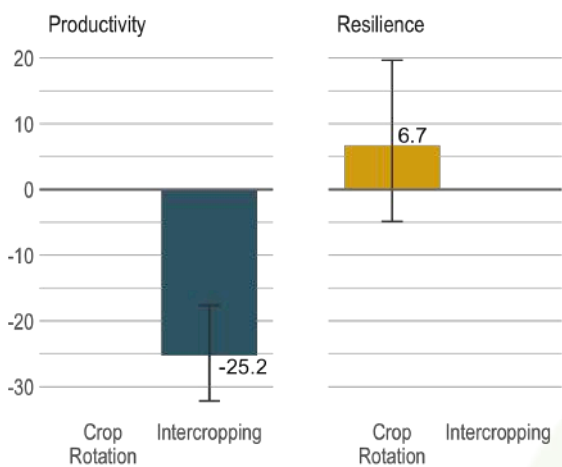


SOYBEAN

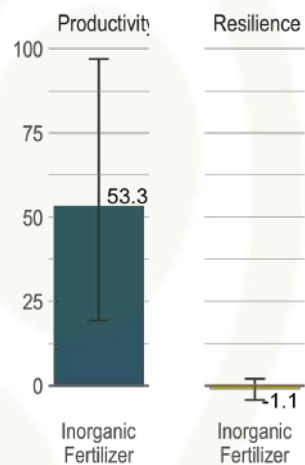
SOIL MANAGEMENT



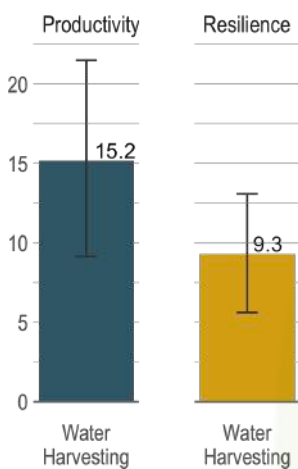
CROP MANAGEMENT



NUTRIENT MANAGEMENT

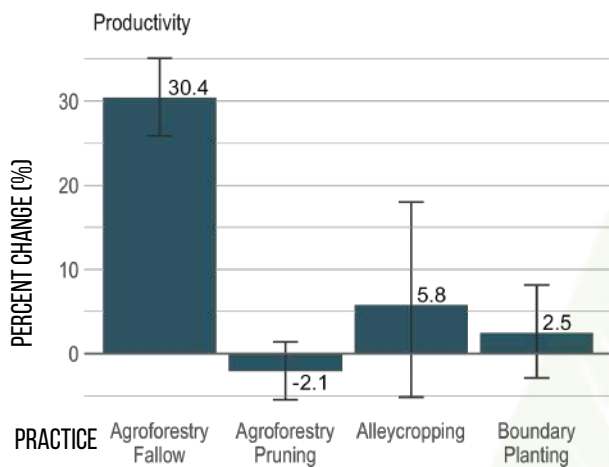


WATER MANAGEMENT

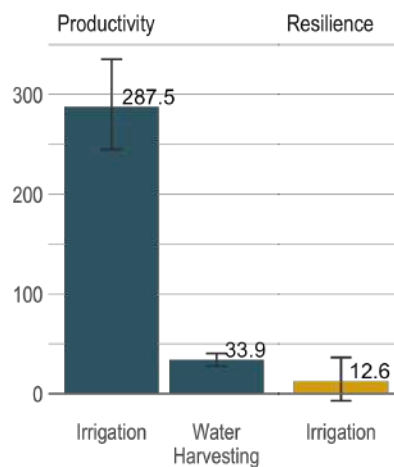


CASSAVA

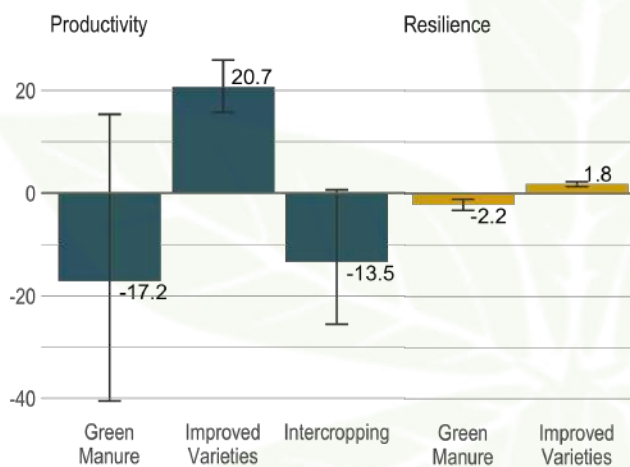
AGROFORESTRY



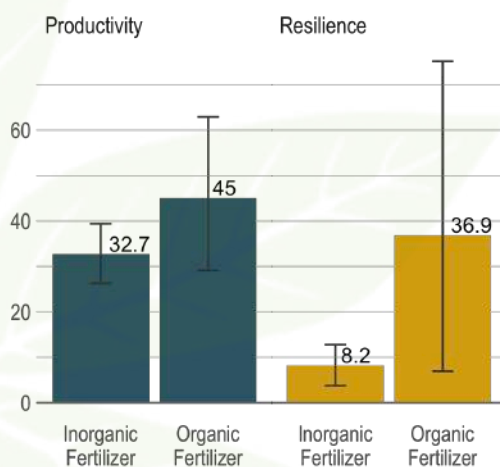
WATER MANAGEMENT



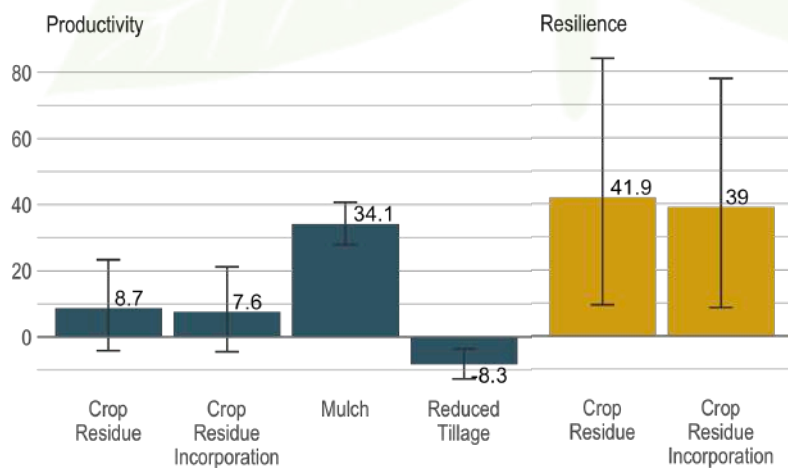
CROP MANAGEMENT



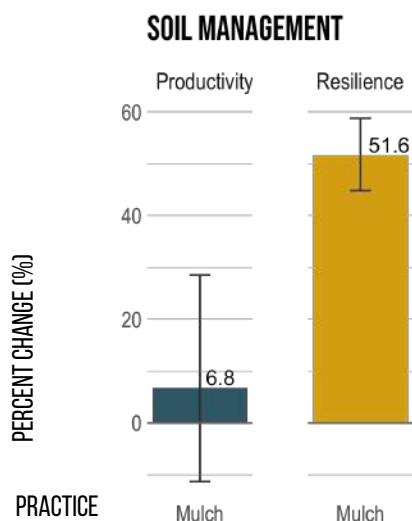
NUTRIENT MANAGEMENT



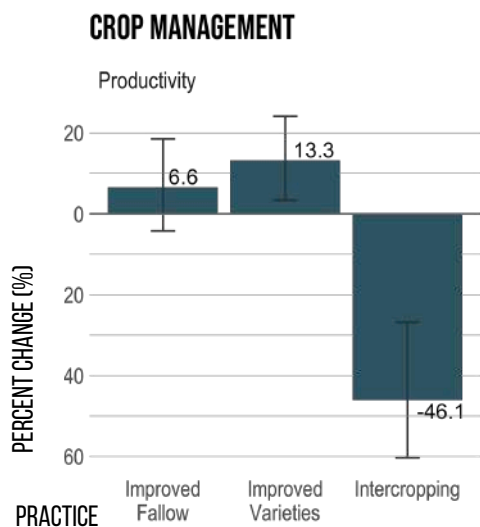
SOIL MANAGEMENT



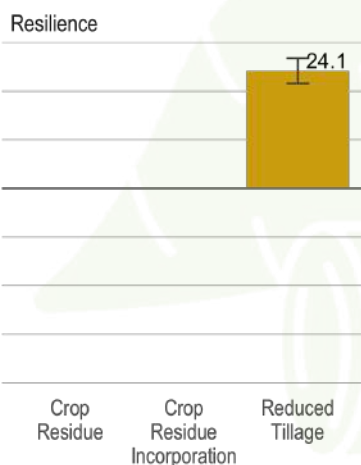
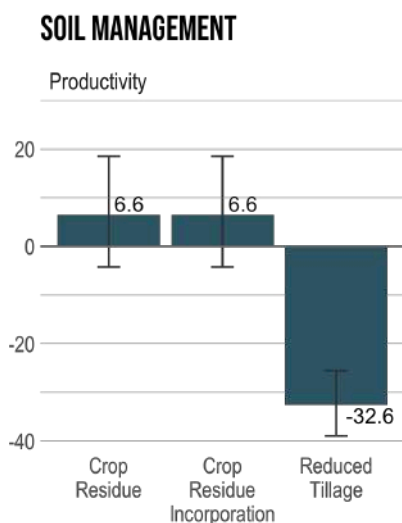
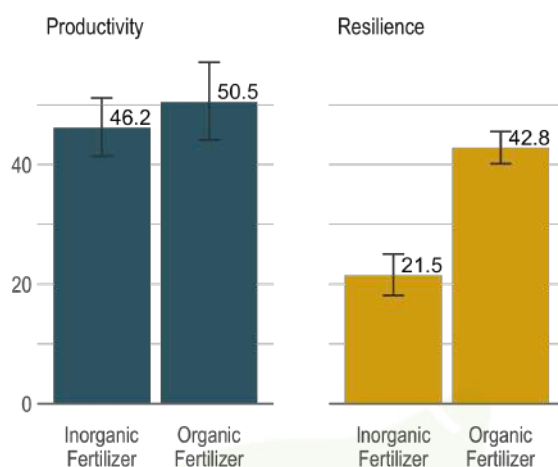
COOKING BANANA



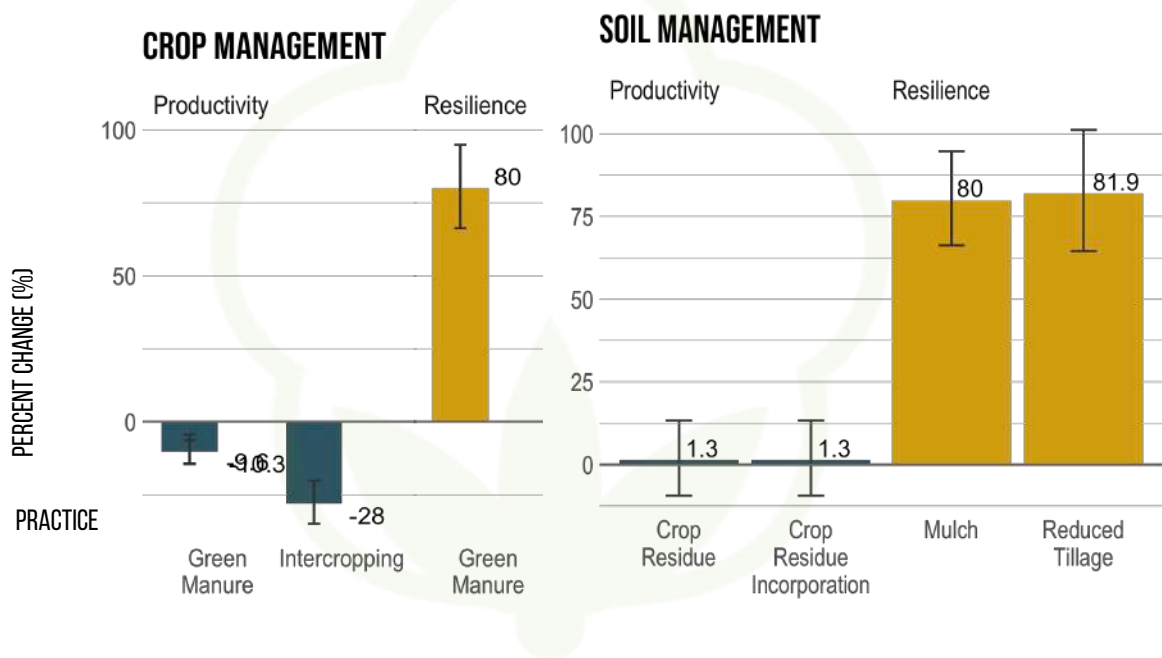
SWEET POTATO



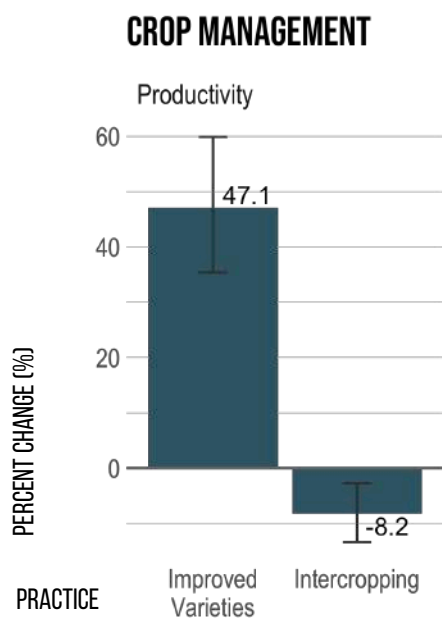
NUTRIENT MANAGEMENT



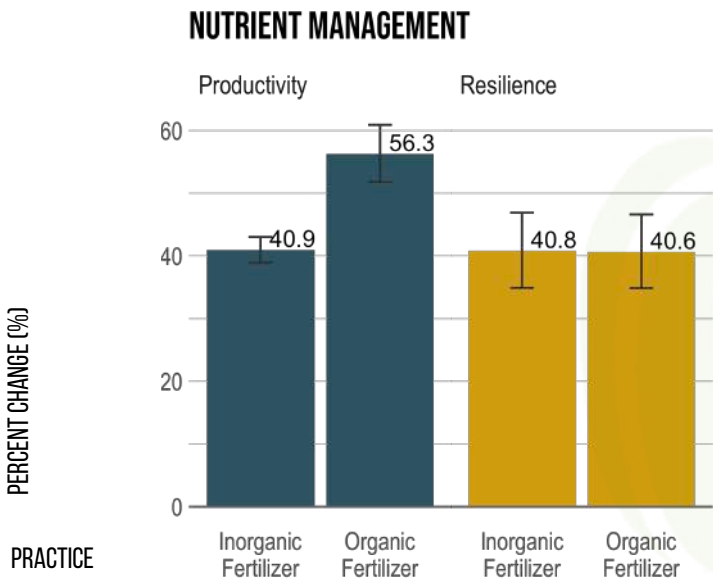
COTTON



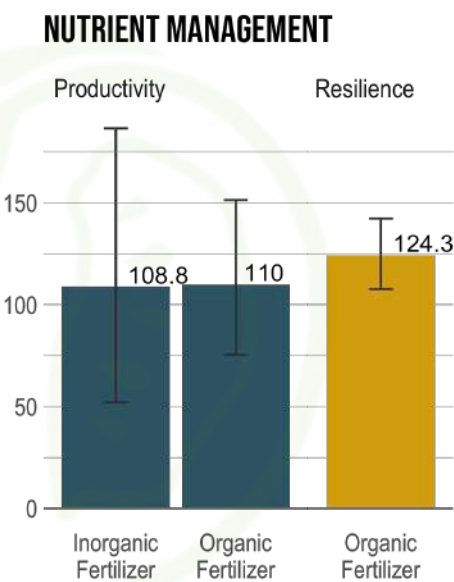
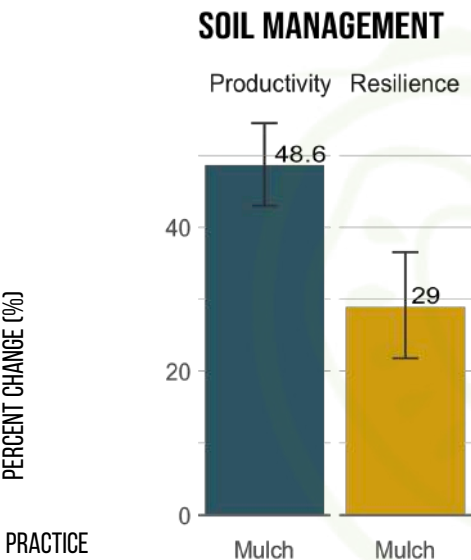
SUGARCANE



PUMPKIN

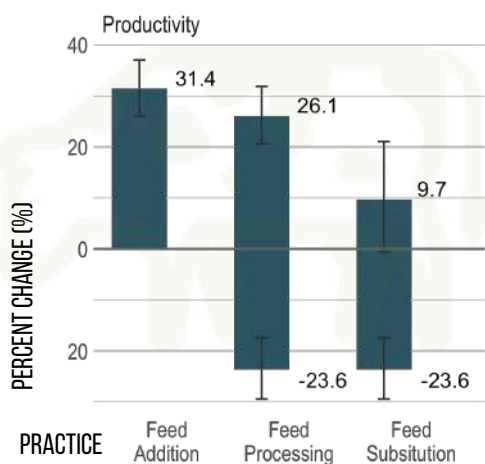


TOMATO



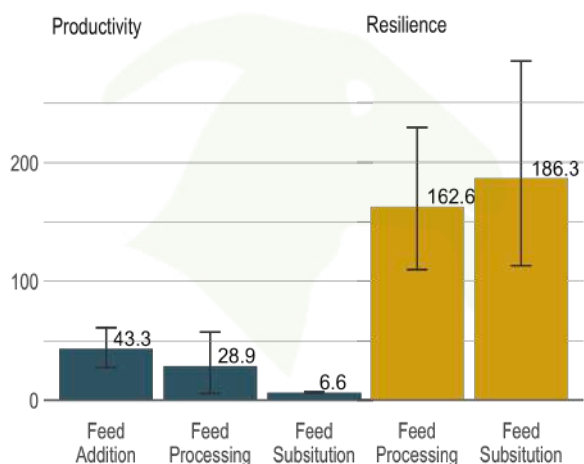
CATTLE

ANIMAL MANAGEMENT



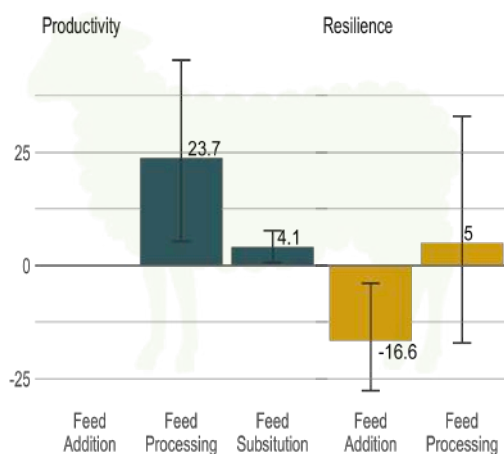
GOAT

ANIMAL MANAGEMENT



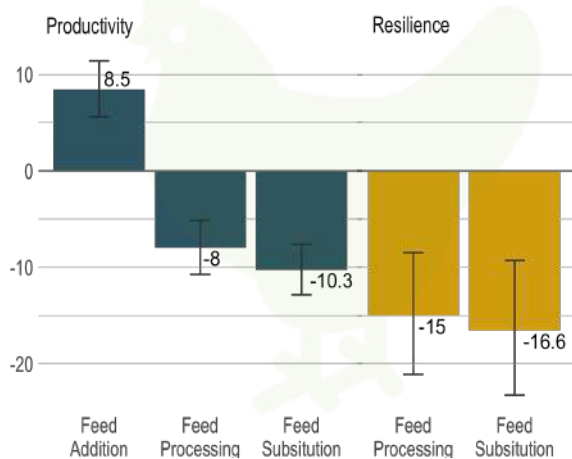
SHEEP

ANIMAL MANAGEMENT



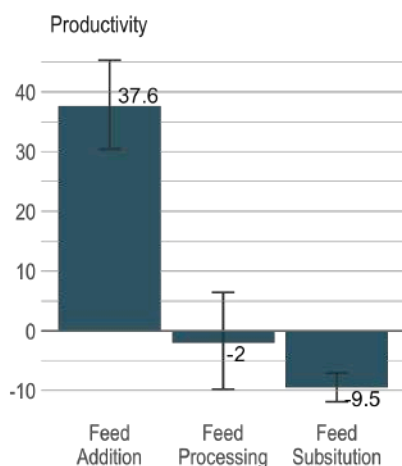
CHICKEN

ANIMAL MANAGEMENT

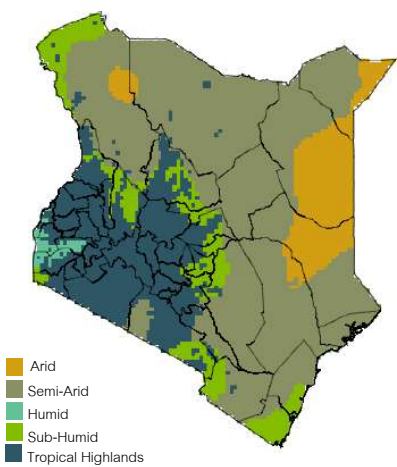


FISH

ANIMAL MANAGEMENT



TROPICAL HIGHLANDS

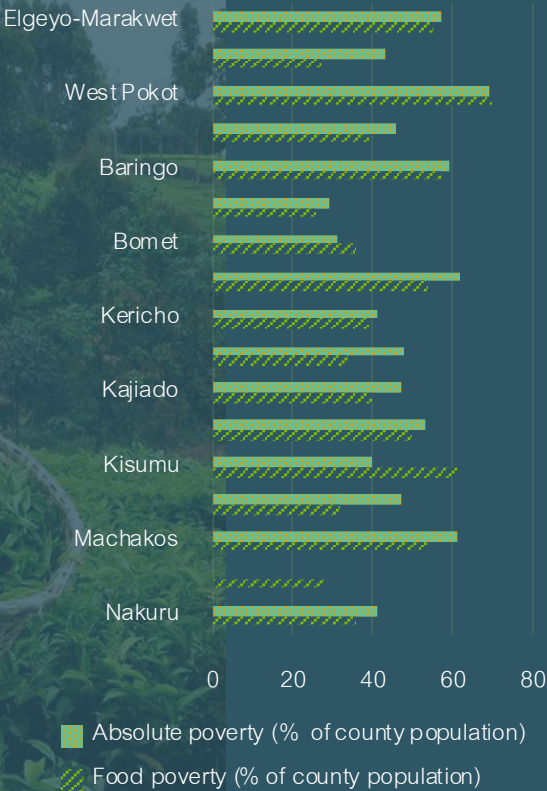


The Tropical Highlands is the most widespread AEZ in Kenya, covering lands in 40 out of 47 counties. Out of these 40, 30 counties have areas larger than 50% under the tropical highlands. Poverty and food insecurity rates vary significantly across counties. Absolute poverty ranges between 21% in Nyeri and 69% in West Pokot, while food poverty rates stretch between 27% in Laikipia and 70% in West Pokot.

Rich soils and abundant rainfall make the tropical highland agroecological zone highly productive for agriculture. Key value chains in this zone include staple crops such as maize, horticultural crops, tropical fruits including bananas and mango, cash crops such as tea and coffee, and dairy. However, the region is also at risk from increasing temperatures, drought, and heavy rains which cause landslides.



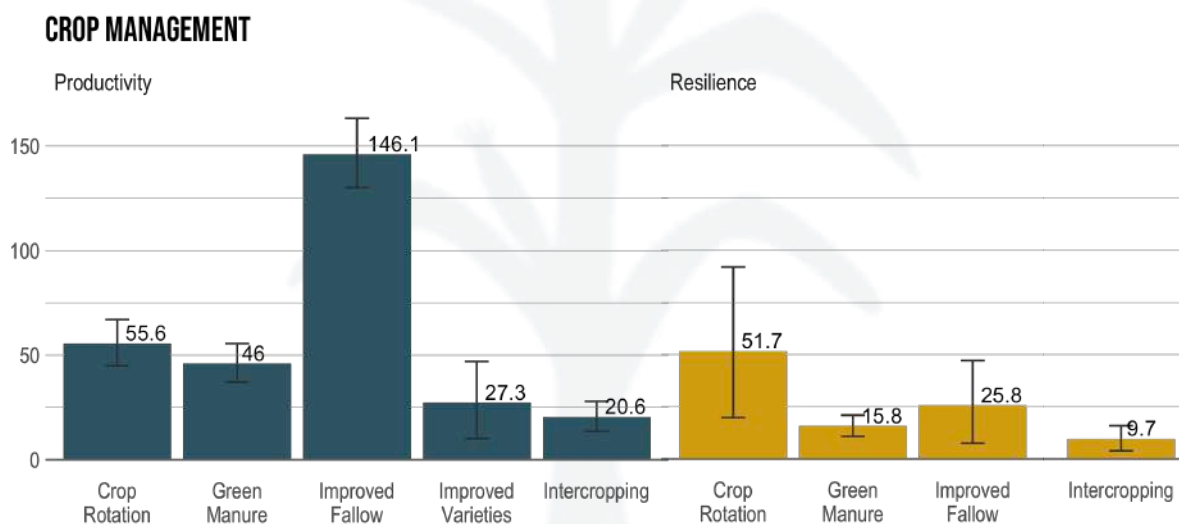
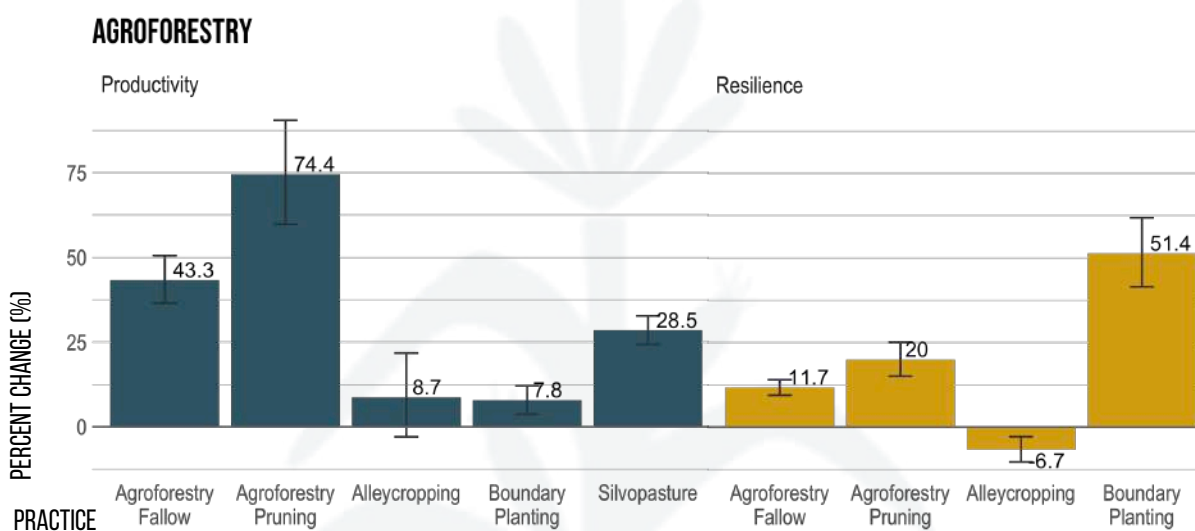
SELECT SOCIO-ECONOMIC DATA IN THE TROPICAL HIGHLANDS

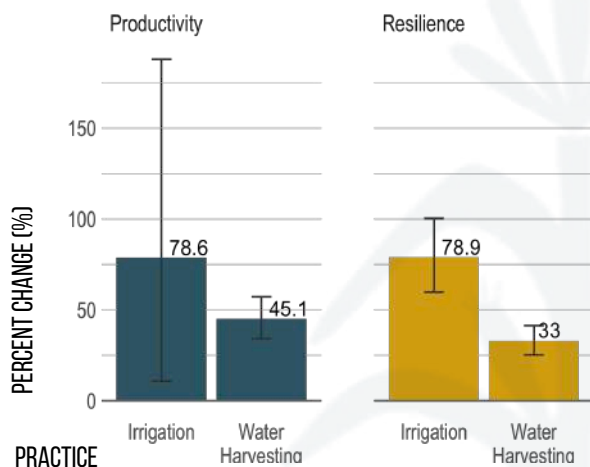
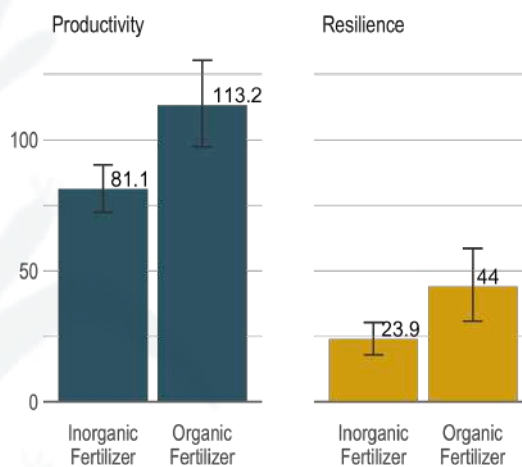
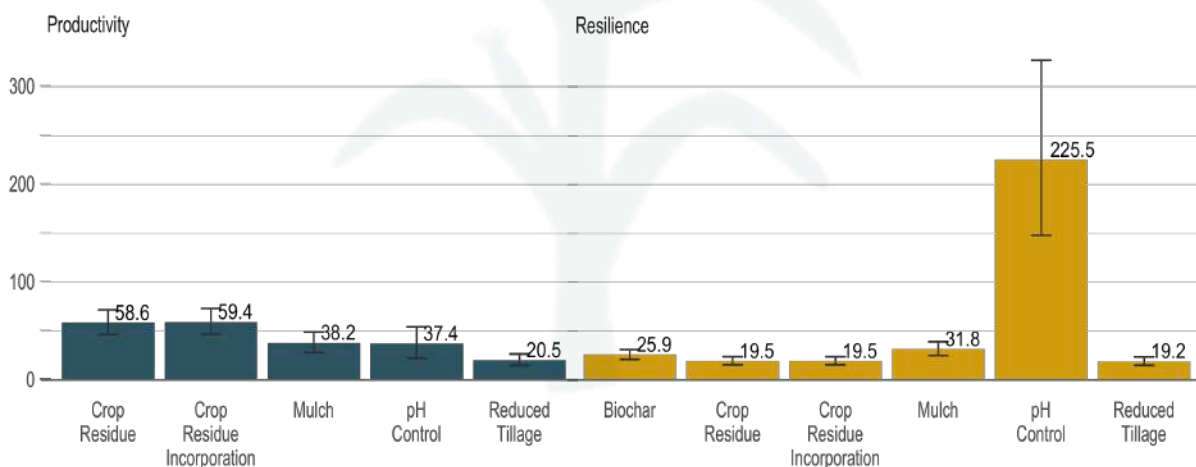
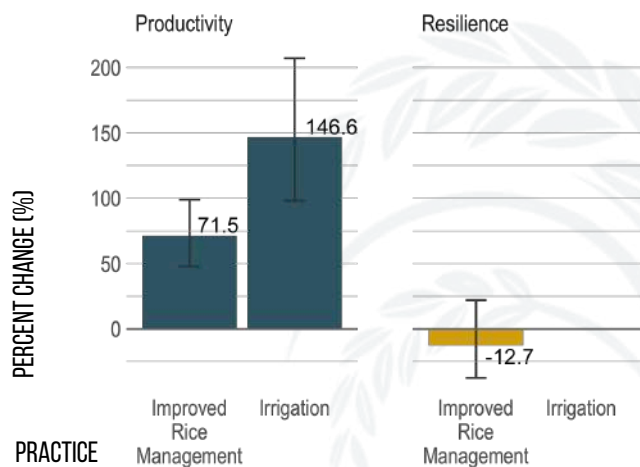
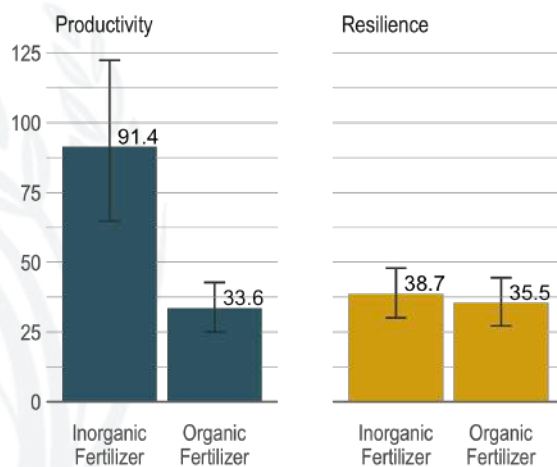


PRODUCTIVITY AND RESILIENCE OF FARM PRACTICES

The figures below show changes in productivity (dark blue) and resilience (orange) outcomes from business-as-usual practice for different production systems. The error lines show the spread of possible outcomes (from minimum to maximum).

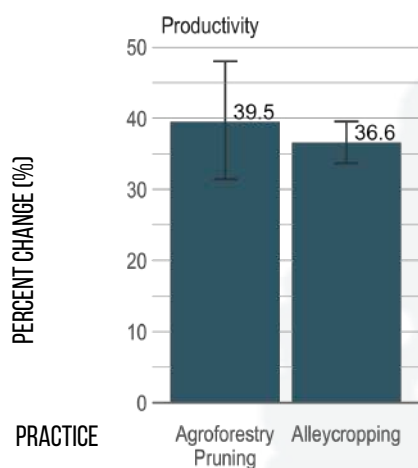
MAIZE



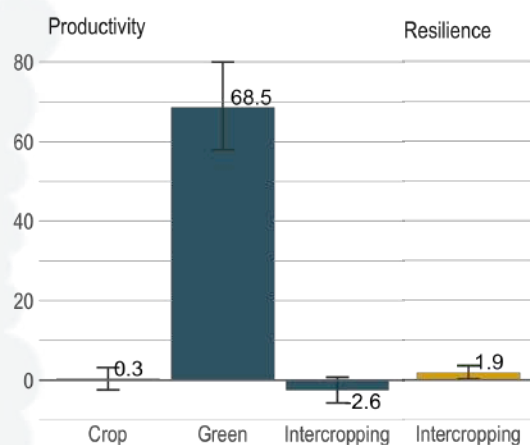
WATER MANAGEMENT**NUTRIENT MANAGEMENT****SOIL MANAGEMENT****RICE****WATER MANAGEMENT****NUTRIENT MANAGEMENT**

SORGHUM

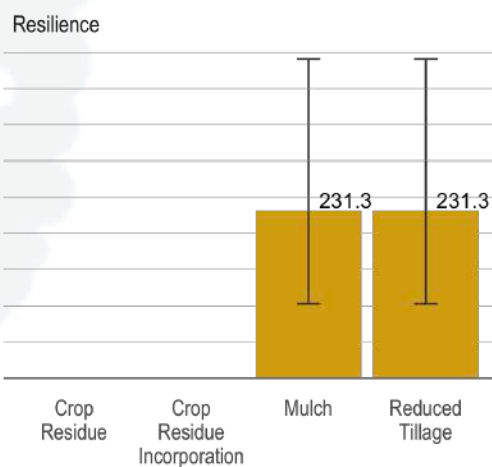
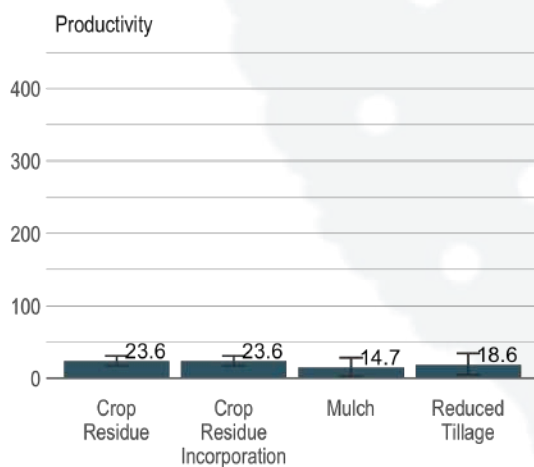
AGROFORESTRY



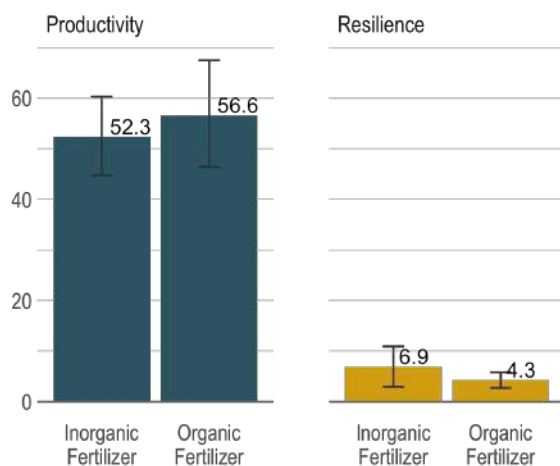
CROP MANAGEMENT



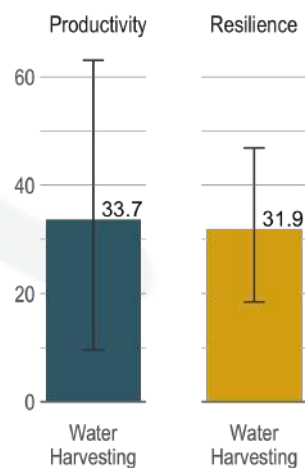
SOIL MANAGEMENT



NUTRIENT MANAGEMENT

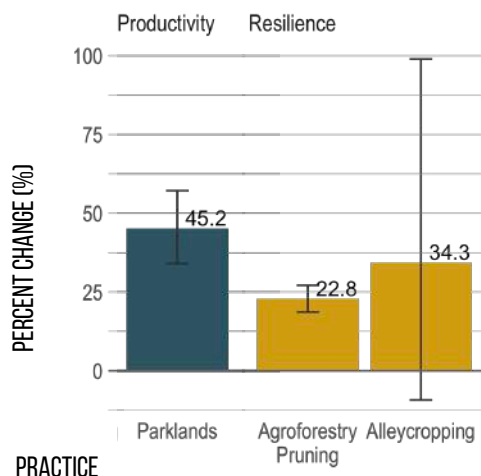


WATER MANAGEMENT

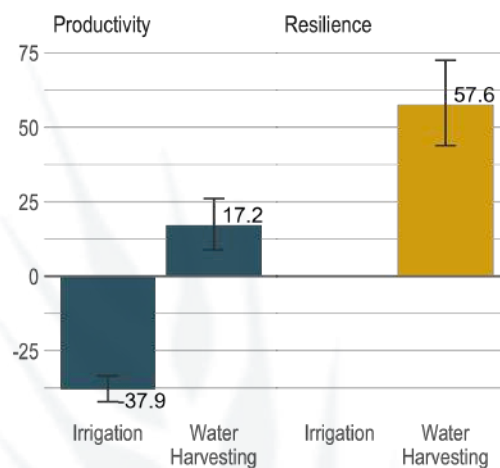


WHEAT

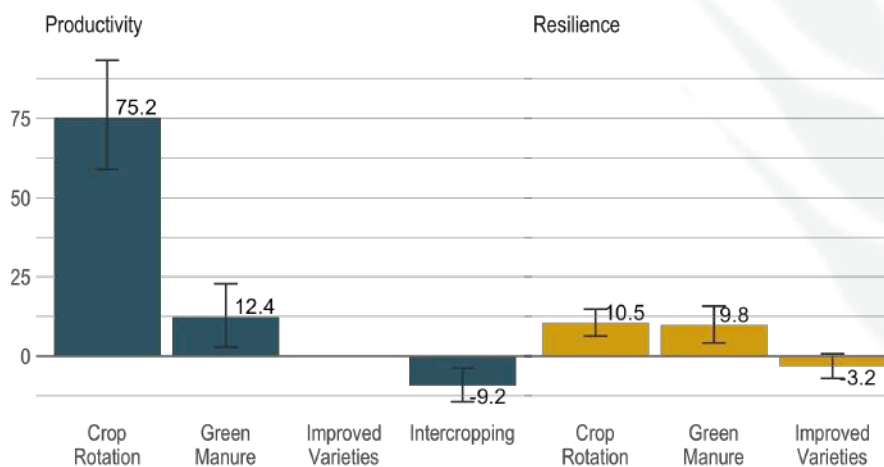
AGROFORESTRY



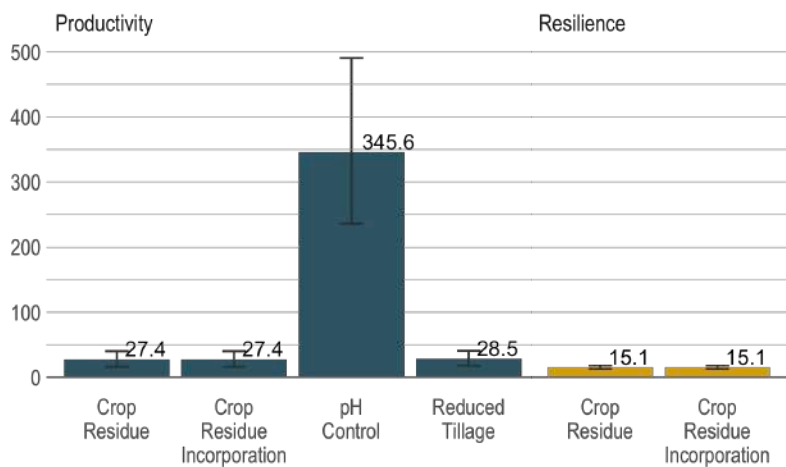
WATER MANAGEMENT



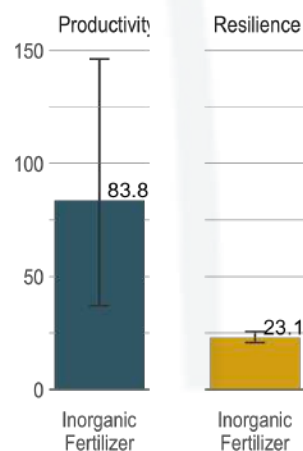
CROP MANAGEMENT



SOIL MANAGEMENT

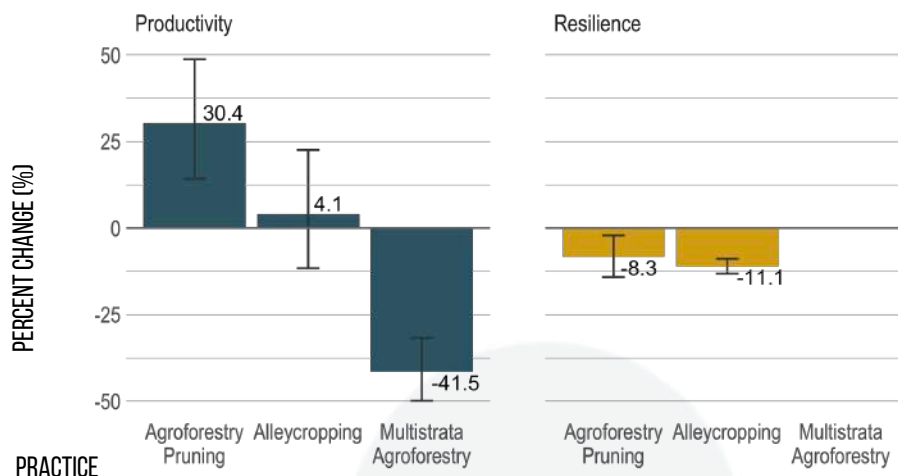


NUTRIENT MANAGEMENT

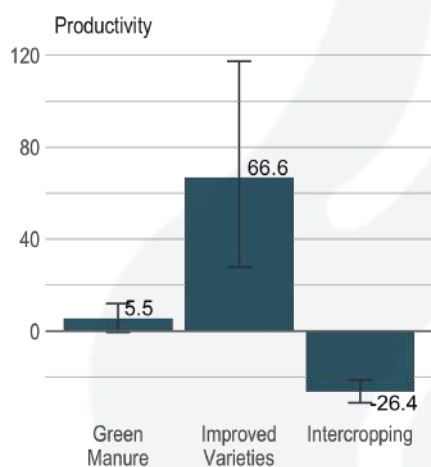


COMMON BEAN

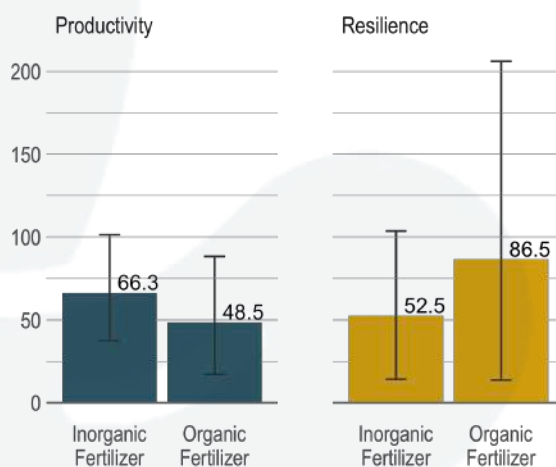
AGROFORESTRY



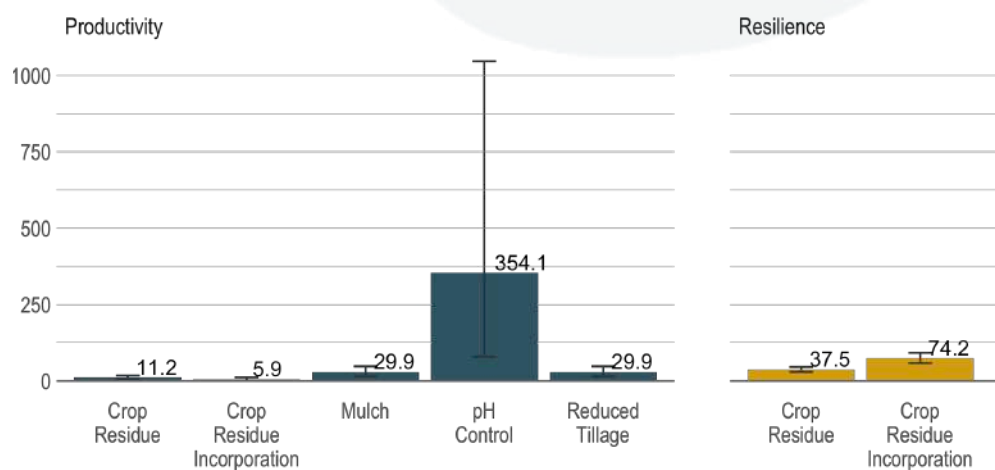
CROP MANAGEMENT



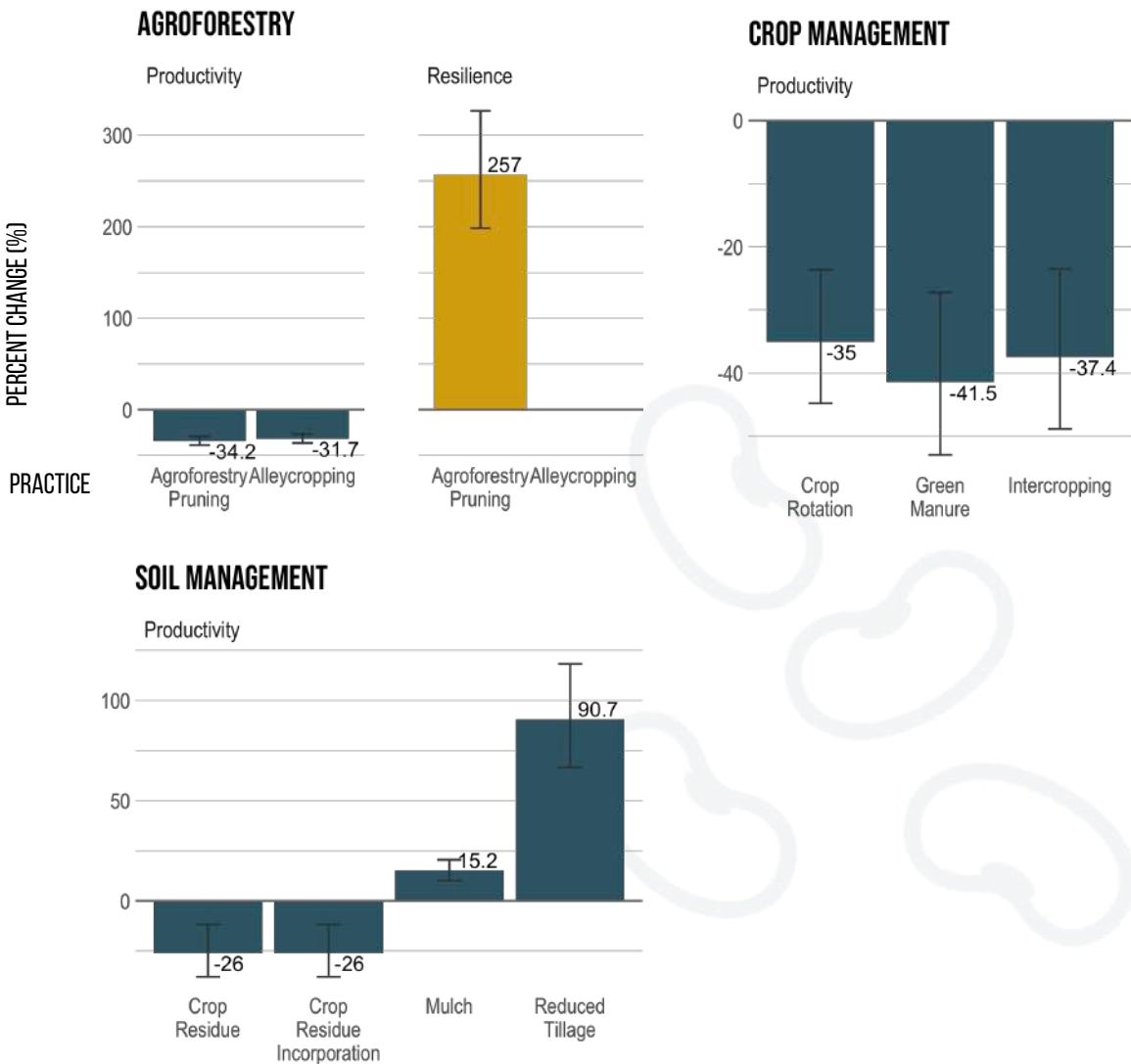
NUTRIENT MANAGEMENT



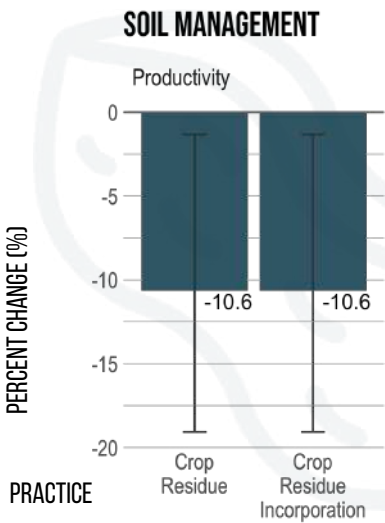
SOIL MANAGEMENT



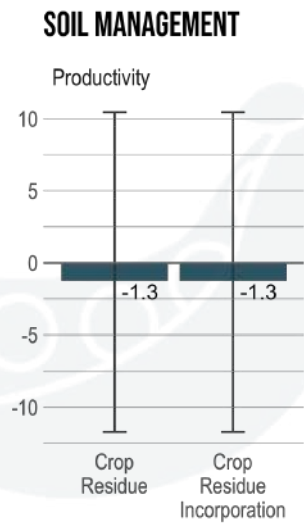
COWPEA



GROUNDNUT

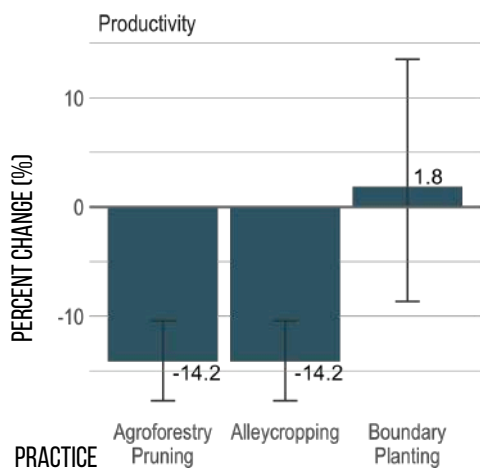


PIGEONPEA

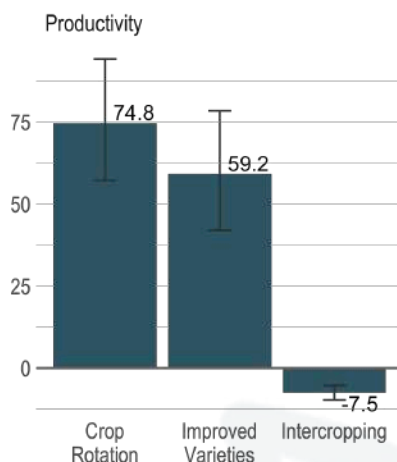


SOYBEAN

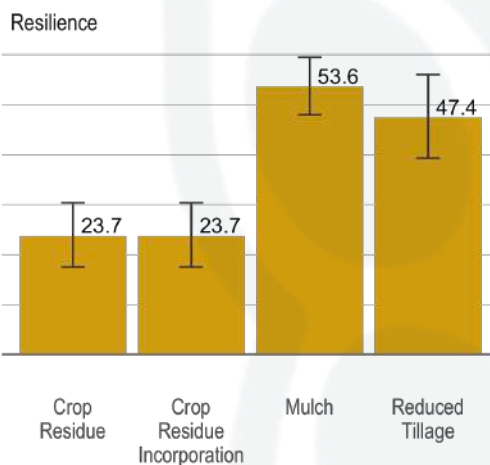
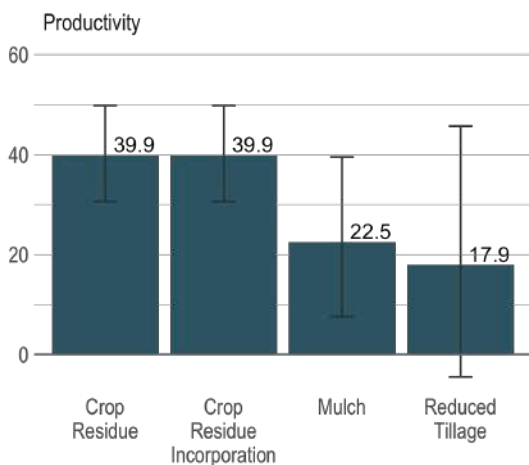
AGROFORESTRY



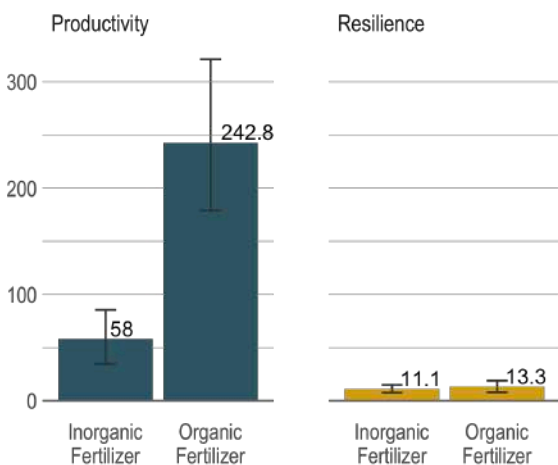
CROP MANAGEMENT



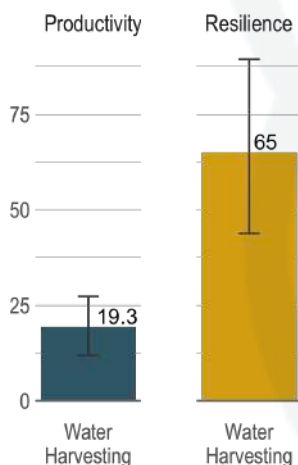
SOIL MANAGEMENT



NUTRIENT MANAGEMENT

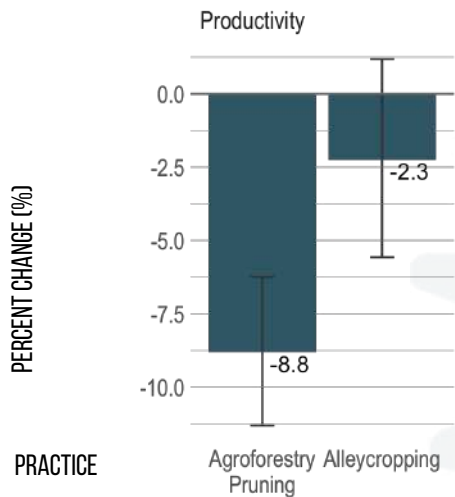


WATER MANAGEMENT



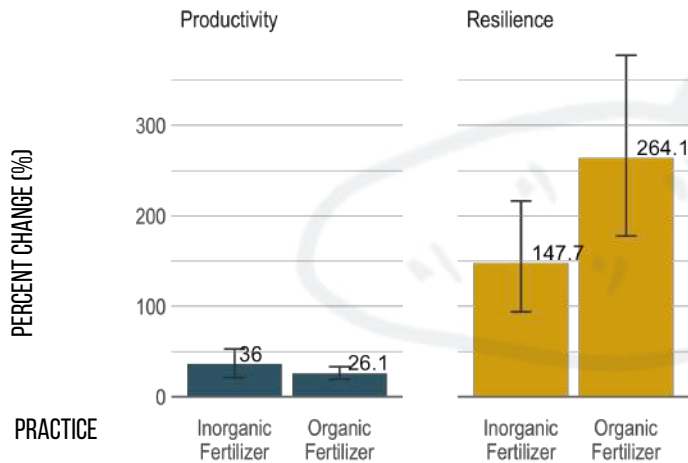
COOKING BANANA

AGROFORESTRY



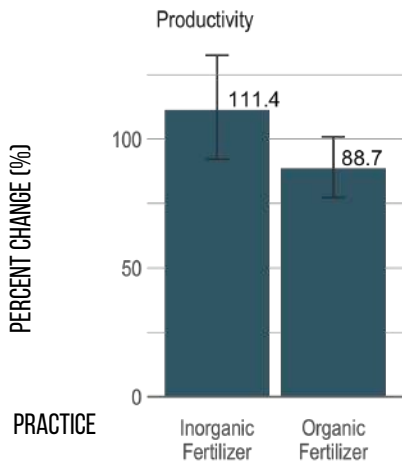
POTATO

NUTRIENT MANAGEMENT



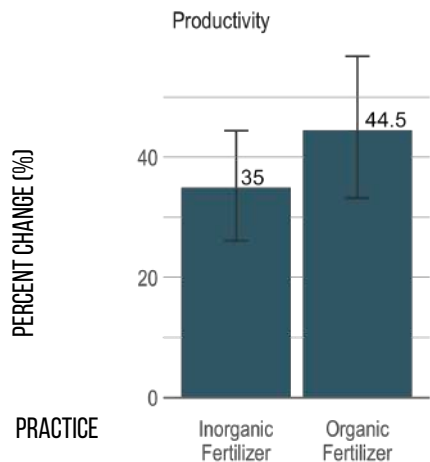
SWEET POTATO

NUTRIENT MANAGEMENT



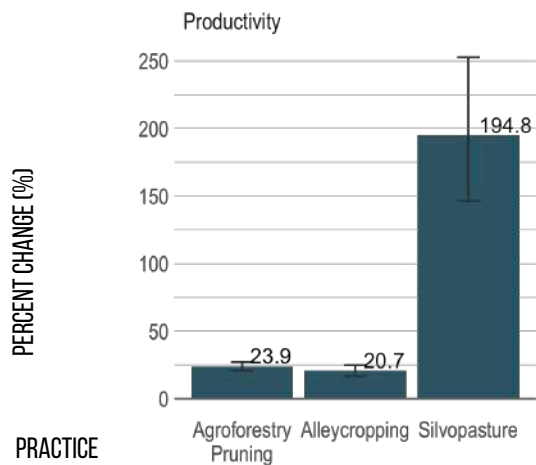
COTTON

NUTRIENT MANAGEMENT

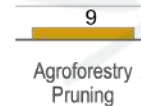


COFFEE

AGROFORESTRY

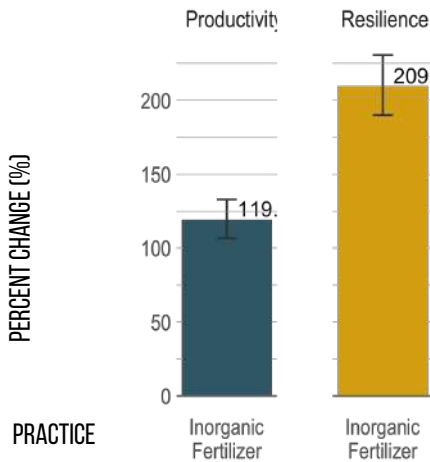


Resilience

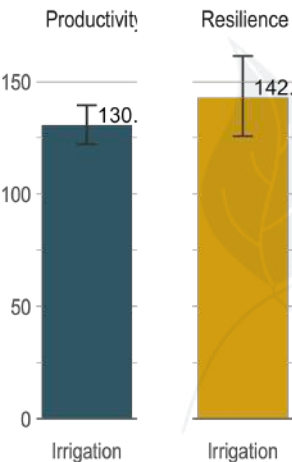


TEA

NUTRIENT MANAGEMENT

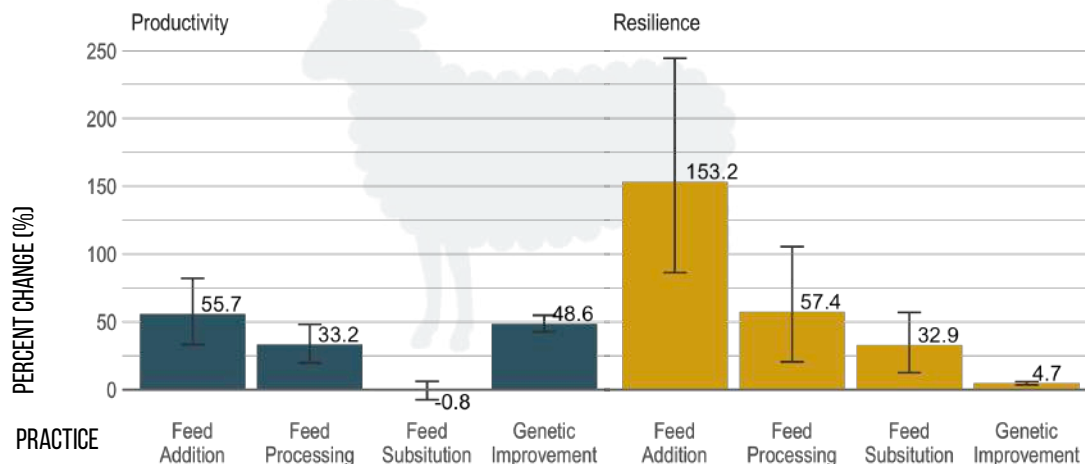


WATER MANAGEMENT



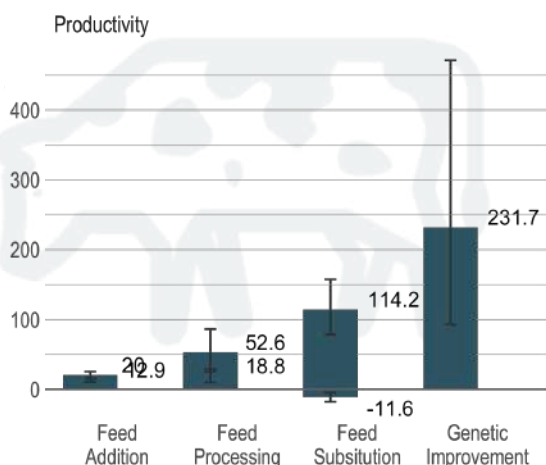
SHEEP

ANIMAL MANAGEMENT



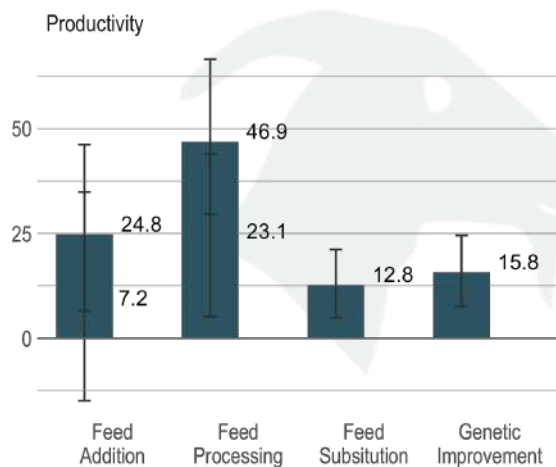
CATTLE

ANIMAL MANAGEMENT



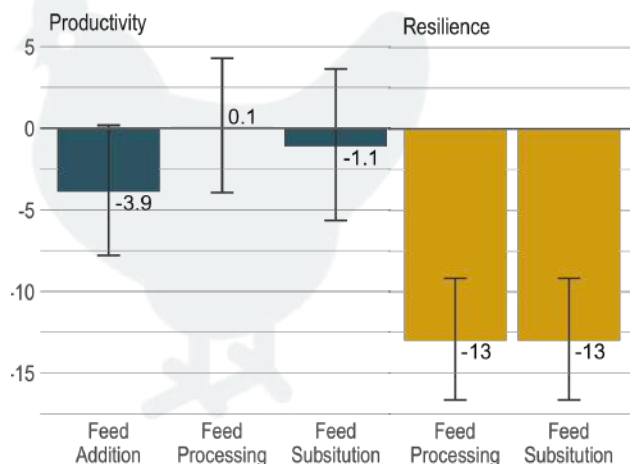
GOAT

ANIMAL MANAGEMENT



CHICKEN

ANIMAL MANAGEMENT



FISH

ANIMAL MANAGEMENT



Evidence for Resilient Agriculture is led by World Agroforestry (ICRAF) through support
from our partners.

For more information check <https://era.ccafs.cgiar.org> or contact us:

Todd Rosenstock t.rosenstock@cgiar.org

Christine Lamanna c.lamanna@cgiar.org



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



Alliance



Food and Agriculture
Organization of the
United Nations



IFAD
Investing in rural people