Kenya | 2016 Long Rains | GMCC Rotation

ONE ACRE FUND

Farmers First

PHASE:	(1) Research Station	(2) 50 – 500 Farmers	(3) 500 – 20,000 Farmers	(4) Full Scale

Introduction

Continuous maize monocultures can have negative effects on both soil health and maize yield over the long term. Green manure cover crops (GMCC) are leguminous plant species that when grown in a rotation with maize, can improve soil health, break pest and disease cycles, and contribute to increased yields of maize grown in the following season.

There are many variations for rotating GMCCs with maize. However, growing GMCC during the short-rain season followed by maize in the long-rain season would be the most suitable rotation for OAF farmers. This rotation could potentially add available nitrogen and increase soil organic matter from the GMCCs during the short-rain season, while increasing maize yields during the long-rain season. Because many OAF farmers perceive the long-rain season as the most important for maize production, this rotation would not affect the main maize growing season.

49-129%	**Increase in maize yield following a GMCC rotation**	**$43-$143**	**Increased profit per hectare from maize following a GMCC rotation**
2.4 t/ha	**Yield highest performing treatment: maize following jack bean**	**240 kg/ha**	**Nitrogen fixation potential of jack bean over nine months**

Objectives

- Test the long-rain season maize yield after growing lablab, mucuna, or jack beans in the short-rain season.

Hypotheses

- Short-rain season crop rotation with lablab, mucuna, or jack beans will lead to higher maize yields during the following long-rain season, compared with a continuous maize control.

Methodology

One Acre Fund Research Station: Ekero and Kakamega Town Crop Research Stations

Agroecological Parameters:

Station	Altitude	Mean Annual Rainfall	Mean Annual Temperature
Ekero	1,318 masl	1400 mm	21.1C
Kakamega	1,535 masl	1500 mm	20.4C

Ekero Station and Kakamega Station Treatments:

1. **Control:**
   a. *Short and Long Rains:* Maize variety SC Duma, planting fertilizer 123.5 kg/ha DAP, top dress fertilizer 123.5 kg/ha CAN, plant spacing 25 cm, row spacing 75 cm, weeding two times

2. **Treatment 1:** Maize-lablab rotation
   a. *Short Rains*: Local lablab variety, seed rate 79 kg/ha, planting fertilizer 123.5 kg/ha DAP, plant spacing 10 cm, row spacing 50 cm, weeding two times
   b. *Long Rains:* Maize variety SC Duma, planting fertilizer 123.5 kg/ha DAP, top dress fertilizer 123.5 kg/ha CAN, plant spacing 25 cm, row spacing 75 cm, weeding two times

3. **Treatment 2:** Maize-jack bean rotation
   a. *Short Rains*: Local jack bean variety, seed rate 79 kg/ha, planting fertilizer 123.5 kg/ha DAP, plant spacing 10 cm, row spacing 50 cm, weeding two times
   b. *Long Rains*: Maize variety SC Duma, planting fertilizer 123.5 kg/ha DAP, top dress fertilizer 123.5 kg/ha CAN, plant spacing 25 cm, row spacing 75 cm, weeding two times

4. **Treatment 3:** Maize-mucuna rotation
   a. *Short Rains*: Local mucuna variety, seed rate 79 kg/ha, planting fertilizer 123.5 kg/ha DAP, plant spacing 10 cm, row spacing 50 cm, weeding two times
   b. *Long Rains*: Maize variety SC Duma, planting fertilizer 123.5 kg/ha DAP, top dress fertilizer 123.5 kg/ha CAN, plant spacing 25 cm, row spacing 75 cm, weeding 2 times

Experimental Design: Randomized complete block design, with 6 replicates

Variables Measured: Maize grain yield

Results

Ekero Station Trials

Treatment	Yield t/ha (vs control %)	Profit USD/ha (vs control)
Treatment #1: Maize-lablab rotation	1.58 b[1] (+129%)	$137
Treatment #2: Maize-jack bean rotation	1.38b (+100%)	$109
Treatment #3: Maize-mucuna rotation	1.01b (+46%)	$59
Control: Continuous maize monoculture	0.69a	$16

[1] Evaluated at p = 0.05 (95% confidence level). Yield followed by a similar letter indicates no statistically significant difference between other yield numbers followed by the same letter.

Kakamega Station Trials

Treatment	Yield t/ha (vs control %)	Profit USD/ha (vs control)
Treatment #1: Maize-lablab rotation	2.12b[2] (+57%)	$211
Treatment #2: Maize-jack bean rotation	2.4b (+78%)	$249
Treatment #3: Maize-mucuna rotation	1.95a (+44%)	$177
Control: Continuous maize monoculture	1.35a	$106

Interpretation and Discussion

There is a clear effect of GMCCs grown during the short-rain season on maize yields during the long-rain season. This effect was very apparent at both research stations, except for maize-mucuna at the Kakamega station. The low maize yields of all treatments might be attributable to the considerable periods of drought experienced at all the research stations.

The introduction of this practice would present a moderate level of operational change. One Acre Fund currently does not offer seeds for any of the crops grown as GMCCs and does not offer products during the short-rain season.

There could be barriers to adopting this practice as farmers typically prefer to plant monoculture maize or intercrop with legumes to maximize the land they can plant with maize. However, developing a shifting crop rotation plan where farmers only plant the GMCC on a portion of their land and then rotate this each season could be favorable to farmers.

Next Steps

This study will continue for another two seasons – short rain 2016 and long rain 2017 — to further evaluate the effect of GMCC rotation. It is recommended that OAF trainings related to crop rotations be assessed for their effect on adoption of this technology. Further profit analysis will also be conducted to determine the overall cost/benefit of switching from monoculture maize to a GMCC rotation.

The effect of this practice on soil health will also be assessed at the end of the long rain 2017 growing season.

[2] Evaluated at p = 0.05. Yield followed by a similar letter indicates no statistically significant difference between other yield numbers followed by the same letter.