

Farmers First

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

Many farmers in western Kenya grow continuous maize during both the short and long-rain seasons. This can have deleterious effects on soil health, increase pest and disease pressure, and negatively affect dietary diversity.

Long-term studies have indicated that maize-legume rotations can reverse the negative effects of continuous monoculture maize and subsequently increase maize yield. The introduction of a maize-legume rotation can improve soil health through increased soil organic matter and increased available nitrogen through nitrogen fixation. The rotation can also decrease pest and disease pressure by disrupting pest and disease cycles that rely on the continuous presence of maize as a host. Additionally, legumes can increase dietary diversity and are an essential high-protein food for many farming families. Because farmers typically place more importance on the long-rain maize growing season, the introduction of legume rotations during the short rains could be preferable in the area.



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|----------------------|--|------------------|--|
| 44-56% | Increased maize profit with rotation compared to continuous monoculture maize | 1.59 t/ha | Maize yields following soybeans in the rotation |
| 150-300 kg/ha | Nitrogen fixation potential of soybeans | 1.51 t/ha | Maize yields following bush beans in the rotation |

Objectives

- Test the effect of growing maize in the long-rain season after growing soybeans or bush beans in the preceding short-rain season.

Hypotheses

- Crop rotation with beans or soybeans in the short-rain season will lead to higher maize yields in the long-rain season.

Methodology

One Acre Fund Research Station: Ekeru Crop Research Station

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Agroecological Parameters:

| Alt | Mean Annual Rainfall | Mean Annual Temperature |
|-----------|----------------------|-------------------------|
| 1,318masl | 1,400mm | 21.1C |

Treatments:

1. **Control:** 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:**
 - a. *Short-Rain Season:* Bush bean variety KK8, seeding rate 79 kg/ha, planting fertilizer 123.5 kg/ha DAP, plant spacing 10 cm, row spacing 50 cm, weeding two times
 - b. *Long-Rain Season:* 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:**
 - a. *Short-Rain Season:* Soybean variety SC Saga, seeding rate 79 kg/ha, planting fertilizer 123.5 kg/ha DAP, plant spacing 10 cm, row spacing 50 cm, weeding two times
 - b. *Long-Rain Season:* 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

Experimental Design: Randomized complete block design, with 6 replicates

Variables Measured: Maize grain yield

Results

| Treatment | Yield t/ha (vs control %) | Profit USD/ha (vs control) |
|--|---------------------------|----------------------------|
| Treatment #1: Maize – previously bush beans | 1.51a (+23%) | \$127 (+44%) |
| Treatment #2: Maize – previously soybeans | 1.59a (+29%) | \$137 (+56%) |
| Control: Continuous maize monoculture | 1.23a | \$88 |

Evaluated at $p = 0.05$, yield followed by similar letters indicates no significant difference.

Interpretation and Discussion

Maize yields from the maize-legume rotations were not significantly higher than continuous monoculture maize. However, there could be a trend developing in terms of increasing yield. Other studies have noted that maize-legume crop rotation yield advantages typically become more pronounced after 2-3 years of the rotation. Additionally, the 2016 long-rain season had considerable periods of drought, which could have contributed to the overall low maize yields for all treatments.

Further trials are needed to confirm the possible impact of this practice. However, the introduction of this practice would be a simple operational change if we were to offer products to farmers during the short-rain season, as we already offer both maize and bean packages. There might be a barrier in terms of convincing farmers to rotate

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legumes into their short rain season plans. However, developing a crop rotation plan where farmers only planted legumes on a portion of their land and then rotated each season could be favorable to farmers.

Next Steps

This trial will continue at Phase 1 in the same plots for the 2016 short-rain and 2017 long-rain seasons to determine the effect on yields after multiple seasons practicing rotation. Soil sampling will be conducted during the 2017 long-rain season to determine the short-term soil health impact of these three practices.