

RESEARCH WITH IMPACT!

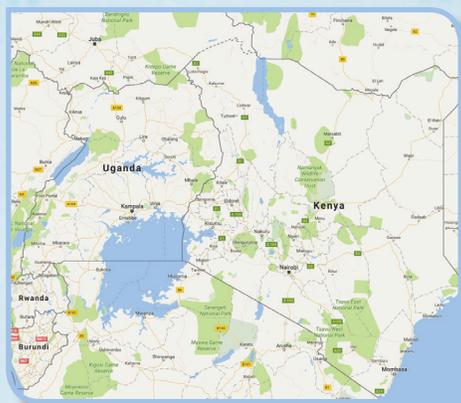
THE CHALLENGE:

Grain legumes are an important source of dietary protein and income for farmers in many parts of sub-Saharan Africa. Soybean production provides smallholder farmers in Kenya and Uganda with an alternative cash income, improves nutritional security and contributes to the soil N supply through biological N₂ fixation. Smallholder farmers currently apply little or no fertilizer on soybean and prefer to use it on other crops instead, which has contributed to poor soybean yields (<0.5 t/ha). High population density in Kenya puts pressure on the limited agricultural land, with farm sizes averaging less than 1 ha and little land available for expansion.

THE SOLUTION:



A participatory diagnosis exercise was conducted with researchers, extension agents and farmer groups to estimate current yields in farmers' fields and identify the soil constraints to soybean production. Multi-location field trials were established between 2012 and 2015 to assess the effects of rhizobia inoculation, balanced nutrient management, manure, and lime application on soybean productivity and N₂ fixation potential in actual farmer fields.



Boosting Soybean Yields and Raising Farmer Income in Kenya with Nutrient Management

THE RESULTS:

Soybean yields were increased from approximately 1 t/ha to 2.4 t/ha by application of N, P, K, and micronutrients, indicating a great potential to increase soybean production (500% over the average yield in farmers' fields) if balanced fertilizer application was adopted.

Yields were further increased to 3.0 t/ha when manure and lime were also applied, particularly on coarse-textured soils with low organic matter. Yields were largest when fertilizer was applied in combination with manure and lime.

These Kenyan farmers learned the importance of integrated nutrient management for effectively addressing multiple soil fertility constraints to soybean production. An additional benefit of biological N₂ fixation by soybean was the equivalent of supplying an additional 60 kg/ha for plant growth. However, inoculating soybean with rhizobia without proper plant nutrition has limited effects on nodulation and yield, particularly on infertile and degraded soils.

These smallholder farmers learned that investment in fertilizer in soybean production was highly profitable, with gross margins increasing by US\$400 to \$1200/ha in the fertilized plots over unfertilized plots. This profitability is more favorable than gross margins from maize production, which is often

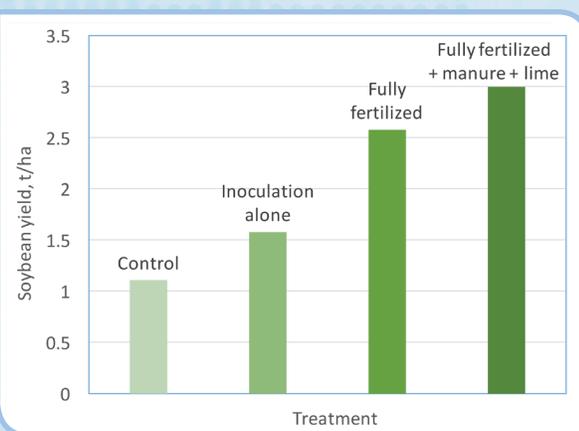


Figure 1. Yield response of soybean to treatments of seed inoculation, full fertilization (N, P, K, S, Ca, Mg, Zn, Mo) and full fertilization plus manure and lime, Kenya.

prioritized in decisions for use of fertilizer by farmers. The current annual production of soybean in Kenya and Uganda is less than 20,000 t, which is far less than the total demand of 130,000 t. The results from the project indicate that there are opportunities to reduce the deficit in regional soybean production and boost farmer income by intensifying nutrient, manure, and lime use. This successful project has developed educational training materials and provided training to 2,500 farmers and 56 extension agents on nutrient management practices for optimizing fertilizer use in soybean production.