Effect of BNF, lime and inorganic fertilizer on soil nitrogen and grain yields of soybean-maize intercrop on acidic soils of Kakamega County

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ABSTRACT

Objective: Low crop responses to fertilizer application among small holder farms are common phenomena in degraded acidic soils of western Kenya. Soil acidity and continuous cropping have led to low legume and cereal yields and the majority of farmers are not aware of the soil acidity problem and the use of lime to solve this problem is minimal. Prohibitive and variable costs of mineral N and P fertilizers have discouraged their adequate use by the resource poor smallholder farmers. Moreover, continuous applications of DAP fertilizers with low addition of organic inputs and lime also aggravates the soil acidity problem. It is hypothesized that a combination of liming will improve soil productivity by reducing soil acidity, improving soil P availability and crop yields in a soybean-maize mixed crop. The objectives of this study are to determine the

effect of agricultural lime on soil properties, yields of soybean and maize, evaluate the effect of inoculation on BNF and yield of soybean, to quantify the dynamic changes in soil mineral N in the root zone (0-40cm) during plant growth period and relate it to maize yield and to calculate the gross returns of maize and soybean yields under different treatments.

Methodology: The first season trial is being carried out at KARI Kakamega Research Station, to test BNF as a main plot factor, 2 lime levels as a sub-plot factor (0, 4t/ha) and 3 inorganic N levels as a sub sub-plot factor (0, 25, 50Kg N/ha). Blanket application of P at 26kg P/ha and starter P at 30Kg P/ha on maize and beans respectively will be done. This will constitute 12 treatments combinations laid out as a split-split plot experiment and arranged as a randomized complete block design (RCBD) with 3 replicates.

The second season will be conducted on-farm within three farms in Mumias District. Partial Budget Analysis of different fertility treatments will be used to calculate the gross returns on maize and soybean crops. The treatments will include 2 lime levels (0, 2.5t/ha), 2 levels of p fertilizer (0,26kg P/ha) on maize crop and BNF laid out as a factorial experiment in RCBD. The data will be statistically analyzed using SAS (JMP 8.1 version) software. Turkey's honestly significant test will be used to separate the means. Regression and coefficient of correlation (r) between changes in soil mineral N and maize yield.

Application of expected results: The results obtained from this study will be used by extension staff and farmers to promote and implement interventions to increase production of soybean and maize to reduce food insecurity in Kenya.