Tropentag, September 18-21, 2016, Vienna, Austria
"Solidarity in a competing world — fair use of resources"

Effect of mineral and organic fertilizers on maize productivity in an inland valley in Uganda

SIMON ALIBU[1], DANIEL NEUHOFF[2], KALIMUTHU SENTHILKUMAR[3], MATHIAS BECKER[4], ULRICH KÖPKE[5]

[1]*National Agricultural Research Organisation (NARO), National Crops Resources Research Institute (NaCRRI), Uganda*
[2]*University of Bonn, Inst. of Organic Agriculture, Germany*
[3]*Africa Rice Center (AfricaRice), East and Southern Africa, Tanzania*
[4]*University of Bonn, Inst. Crop Sci. and Res. Conserv. (INRES) - Plant Nutrition, Germany*
[5]*University of Bonn, Inst. of Organic Agriculture, Germany*

Introduction

Wetlands offer a huge and yet largely untapped potential for increasing crop production due to extended periods of water availability and relatively fertile soils. However, cropping the wetlands with out destroying them is a delicate balance. Organic farming shows promise for sustaining and restoring wetland productivity. In this study, we compared the effects of organic and mineral nitrogen fertilisers on productivity of maize in an inland valley in Uganda.

Methodology

We evaluated the response of maize (Longe-10H) to varying levels of organic and inorganic N fertilisers (table 1) in 3 hydrological zones along the inland valley slope (Fig. 1) in a randomized complete block design (RCBD) with 4 replications.

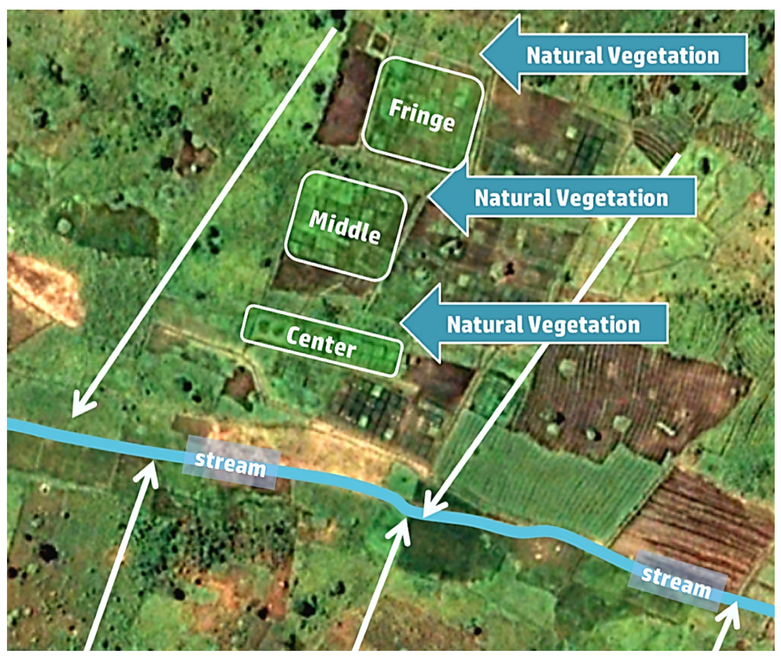

Figure 1. Fringe, middle and center zones separated by areas of natural vegetation. The arrows indicate direction of the slope.

The maize was sown in December 2014 and 2015 (after the long rainy season) in 30m^2 plots at a plant spacing of 0.45 m by 0.45 m. Grain yield, total above ground biomass at physiological maturity and harvest index (HI) were measured, and subjected to ANOVA.

Results

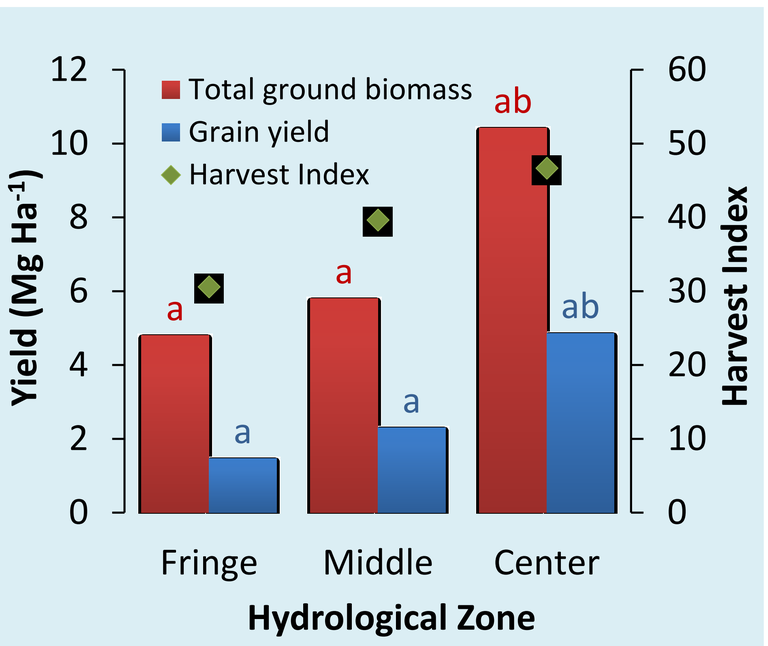

Figure 2. Harvest index (HI), grain and biomass productivity of maize in 3 hydrological zones.

Key Finding

The centre of the inland valley presents the greatest potential for dry season production of maize, although with low grain yield response to organic and mineral N fertilization.

Table 1. N treatments/levels in the experiment

	N (kg ha^{-1})	Source of N
T-1	0	-
T-2	60	Urea
T-3	120	Urea
T-4	60	Green Manure -GM (*S. rostrata*)
T-5	120	Green Manure + Poultry Litter

In T-5, green manure provided 60 kg N while poultry litter supplied 60 kg N

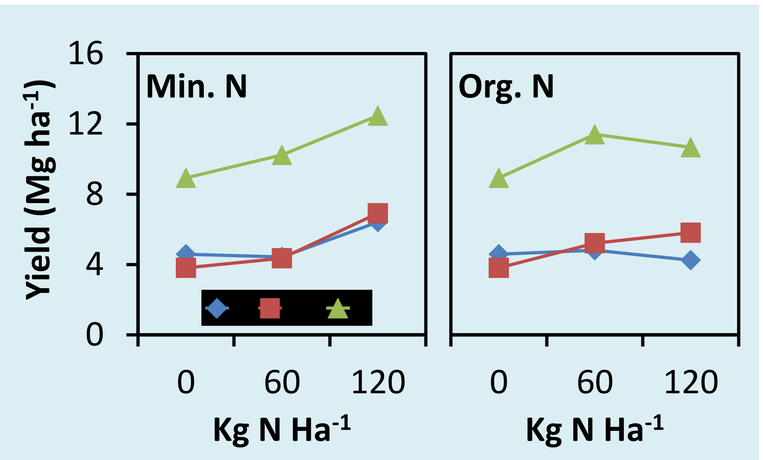

Figure 3. Biomass response of maize to mineral and organic N in 3 hydrological zones.

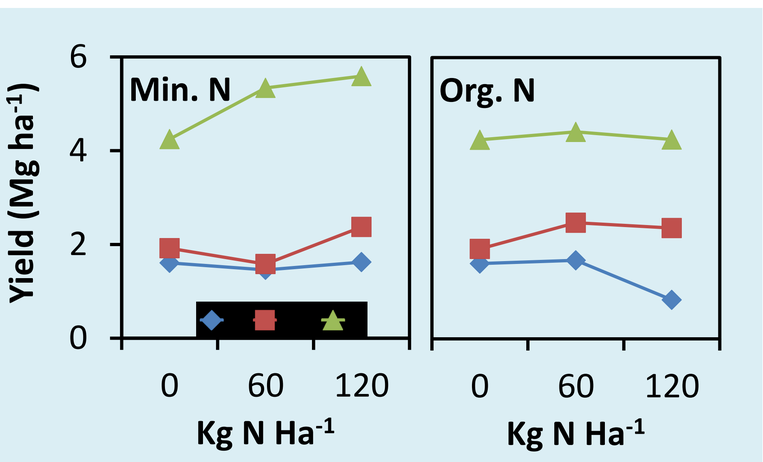

Figure 4. Grain Yield response of maize to mineral and organic N in 3 hydrological zones.

- On average, total biomass, grain yield and HI of maize were significantly higher in the center (Fig.2).
- Application of mineral N gave the largest biomass and grain yield increase. But, grain yield response to mineral N was low in the center, with a maximum 22% increase compared with the standard reference (fig. 2 & 4).
- No clear grain-yield response of maize to mineral N was found in the fringe.
- GM only tended to increase grain-yield in the middle, while additional chicken manure did affect grain yield.

Discussion and Conclusion

The center of the inland valley presented the greatest potential for dry season production of maize probably because of high nutrient and organic matter deposits from the top (fringe) and middle slope positions of the inland valley. However, response to mineral and organic N fertilizers in the center was low. The benefits of GM were clearest in the mid-slope position of the inland valley, which is consistent with findings of Zingore, (2008).

Simon Alibu
NARO - Uganda
simoalibu@hotmail.com

Reference

Zingore S. 2011. Maize productivity and response to fertilizer use as affected by soil fertility variability, manure application, and cropping system. Better Crops Vol. 95 - No. 1