Tropentag, September 20-22, 2017, Bonn, Germany
"Future Agriculture: Socio-ecological transitions and bio-cultural shifts"

Production potential of dry season maize along a hydrological gradient of an inland valley in Central Uganda

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

[1]National Agricultural Research Organisation (NARO), National Crops Resources Research Institute (NaCRRI), Uganda
[2]University of Bonn, Institute of Organic Agriculture, Germany
[3]Africa Rice Center (AfricaRice), East and Southern Africa, Tanzania
[4]University of Bonn, Institute of Crop Science and Resource Conservation (INRES) - Plant Nutrition, Germany

Introduction

Maize is the main food staple in East Africa contributing 19.3% of total calories consumed annually (Smale et al., 2011). Any shortage of maize causes food insecurity. Inland-valley wetlands with enhanced soil moisture than surrounding uplands provide opportunities for growing off-season maize. In this study, we assessed the potential of an inland-valley in central Uganda for producing dry season maize.

Methodology

From Dec. 2015 to Apr. 2016 and Jun. to Oct. 2016, we evaluated the response of Longe-10H maize to different crop management options (Table 1) at 3 hydrological zones along the slope of an inland valley (Fig.1). Trial Design: RCBD with 4 replications. Plot Size: 30 m^2. Plant Spacing: 45 cm by 45 cm (1 plant/hill). Data Collected: above ground biomass at physiological maturity and grain yield.

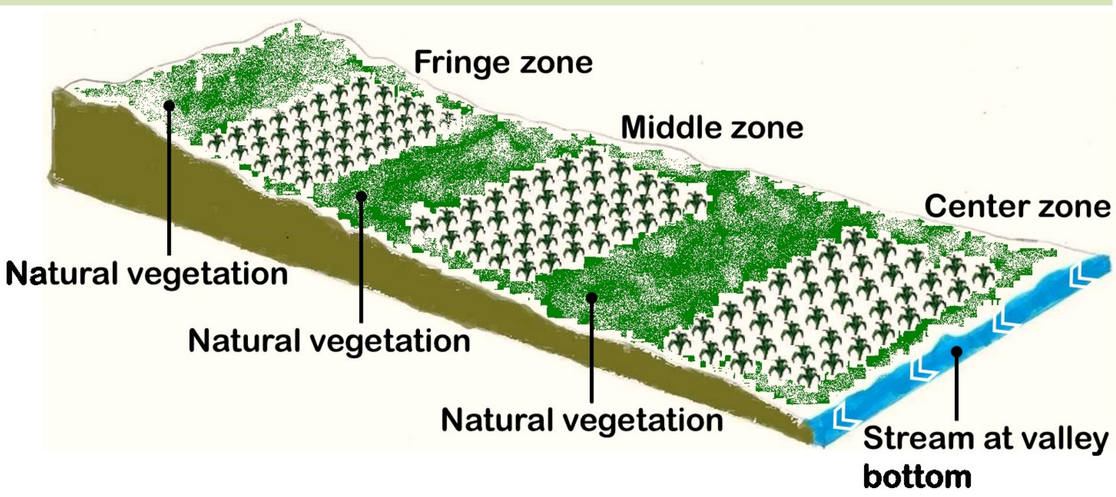

Figure 1. Overview of experimental set up

Table 1: Crop management options tested

Treatments	Fertilizer Rate (kg ha^{-1} $season^{-1}$)	N Rate (kg ha^{-1} $season^{-1}$)	Weeding freq. (stage)
Farmer's practice (FP)	-	0	1 (6 leaf)
Unfertilized control (UC)	-	0	2 (6, 12 leaf)
Inorganic fertilizers (IF)	130 urea	60	2 (6, 12 leaf)
Maximum inorganic fertilizers (MI)	261 urea + 130 TSP + 100 MOP	120	2 (6, 12 leaf)
Organic fertilizer (OF)	5929 *Lablab purpureus*	60	2 (6, 12 leaf)
Maximum organic fertilizers (MO)	5929 *Lablab purpureus* + 6758 poultry litter	120	2 (6, 12 leaf)

Lablab purpureus was grown insitu for 2 months and shoot biomass applied at a rate adjusted on fresh weight basis. % NPK in fresh *Lablab purpureus* shoots and poultry litter was 4.44:0.23:2.63 and 1.93:0.50:1.40 respectively. 60% mineral N was applied at the time of sowing and 40 % at 6 leaf stage.

Results and Discussion

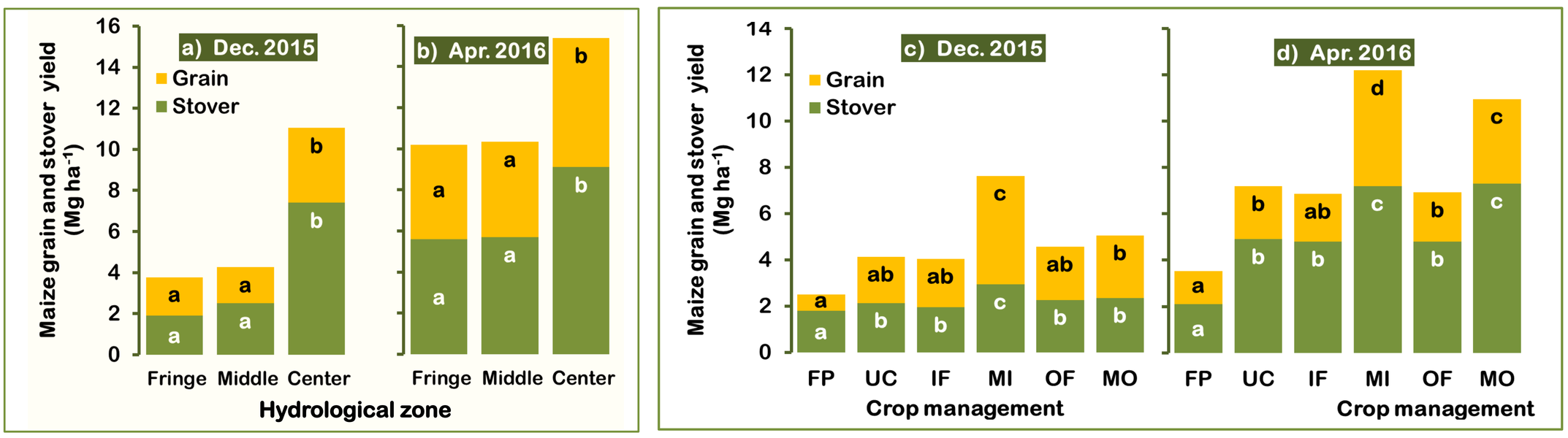

Figure 2: Maize productivity at 3 hydrological zones of an inland valley under different crop management

- Productivity of maize in the inland valley at 3.8 Mg ha^{-1} exceeded the national average of largely upland maize by 60%.
- The center of the inland valley with prolonged soil moisture retention showed the greatest potential for producing dry-season maize (Fig. 2 a, b), especially in the season that received less rainfall at the reproductive stage (<25 mm in 2015 against >63 mm in 2016). Grain yield at the center exceeded yield in other hydrological zones by 50% and 25% in 2015 and 2016 respectively (Fig. 2a, b).
- Combined N fertilization with *L. purpureus* and poultry litter (MO) produced comparable maize grain and stover yields as mineral N (MI) when applied at equivalent N rates i.e. 120 N ha^{-1} (Fig. 2 c, d). Edmeades (2003) reported similar results. Application of only 60 kg N did not produce a yield advantage over the unfertilized control (UC). According to Limin et al, (2013,) when indigenous nutrients supply is high, small amounts of applied nutrients do not produce large yield responses.
- Improving the farmers practice (FP) by only one extra weeding produced yield gains of 1.4 – 2.7 Mg ha^{-1}.
- Our results suggest that inland valley wetlands can be utilized to grow maize during the dry season thereby allowing farmers to squeeze in more harvests and contribute to food security.

Federal Ministry of Education and Research
Federal Ministry for Economic Cooperation and Development
GlobE Wetlands in East Africa
universitätbonn Rheinische Friedrich-Wilhelms-Universität Bonn
IOL Institut für Organischen Landbau
AfricaRice
NaCRRI
INRES Institut für Nutzpflanzenwissenschaften und Ressourcenschutz
http://www.wetlands-africa.de/
FKZ
031A250 A-H

Contact
simoalibu@hotmail.com

References

1. Smale et al. World Bank Policy Research Working Paper 5659. **2014**.
2. Limin et al. *Field Crops Research* 140 (**2013**) 1–8
3. Edmeades D.C. *Nutrient Cycling in Agroecosystems* 66: 165–180, **2003**.