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 ALIBU1, DANIEL NEUHOFF2, KALIMUTHU SENTHILKUMAR3, MATHIAS BECKER4, ULRICH KÖPKE2

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

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.

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 m². Plant Spacing: 45 cm by 45 cm (1 plant/hill). Data Collected: above ground biomass at physiological maturity and grain yield.

Table 1: Crop management options tested

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Fertilizer Rate (kg ha⁻¹ season⁻¹)</th>
<th>N Rate (kg ha⁻¹ season⁻¹)</th>
<th>Weeding freq. (stage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer’s practice (FP)</td>
<td>-</td>
<td>0</td>
<td>1 (6 leaf)</td>
</tr>
<tr>
<td>Unfertilized control (UC)</td>
<td>-</td>
<td>0</td>
<td>2 (6, 12 leaf)</td>
</tr>
<tr>
<td>Inorganic fertilizers (IF)</td>
<td>130 urea</td>
<td>60</td>
<td>2 (6, 12 leaf)</td>
</tr>
<tr>
<td>Maximum inorganic fertilizers (MI)</td>
<td>261 urea + 130 TSP + 100 MOP</td>
<td>120</td>
<td>2 (6, 12 leaf)</td>
</tr>
<tr>
<td>Organic fertilizer (OF)</td>
<td>5929 Lablab purpureus</td>
<td>60</td>
<td>2 (6, 12 leaf)</td>
</tr>
<tr>
<td>Maximum organic fertilizers (MO)</td>
<td>5929 Lablab purpureus + 6758 poultry litter</td>
<td>120</td>
<td>2 (6, 12 leaf)</td>
</tr>
</tbody>
</table>

Lablab purpureus was grown in situ 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 4.44.023.63 and 1.93.050.140 respectively. 60% mineral N was applied at the time of sowing and 40% at 6 leaf stage.

Results and Discussion

- 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.

References