Economic Analysis of Maize Production and Nitrogen Use Efficiency in Rotation with Brachiaria humidicola

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Results

Compared to the M option:

- Yields in PBh and DBh increase their levels at 32% and 62% rates, respectively
- Productive efficiency of N increases by 38% and 70% for DBh and PBh options respectively, and lower unit costs (75%) and a superior cost-benefit ratio can be observed
- Maize production in the PBh option achieved the highest economic return, associated with increases in yield as well as reductions in the per unit product cost

Figure 1: Effects of crop rotation on maize yield

The highest EE in fertilization was obtained with 60 N Kgh/ha doses in the three plots and among them the highest value was reached in the PBh plot

• The agronomic NUE and the economic efficiency indicators decrease with an increasing dose of nitrogen fertilizer

• The results are highly sensitive to variations in expected returns, and to some extent to maize sales prices and increased production costs

Table 1 Yield, costs, income and economic indicators of maize with respect to the N applied dose for each plot

<table>
<thead>
<tr>
<th>Variables</th>
<th>M (Kg N/ha)</th>
<th>DBh (Kg N/ha)</th>
<th>PBh (Kg N/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize yield (kg/ha)</td>
<td>2.93</td>
<td>2.69</td>
<td>2.37</td>
</tr>
<tr>
<td>Standard deviation of yield</td>
<td>1.41</td>
<td>2.46</td>
<td>2.4</td>
</tr>
<tr>
<td>Income (USD)</td>
<td>768</td>
<td>618</td>
<td>568</td>
</tr>
<tr>
<td>Unit cost (USD/kg)</td>
<td>0.57</td>
<td>0.52</td>
<td>0.5</td>
</tr>
<tr>
<td>Total unit cost (USD/kg)</td>
<td>0.34</td>
<td>0.33</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Average data of three years of evaluation (2013-2015), with three repetitions for each dose of nitrogen fertilizer. Prices were converted to dollars by using the average Representative Market Exchange Rate (RMER) for each year, respectively.

Conclusions

• Crop rotation of Brachiaria humidicola and maize is an alternative to improve production efficiency and profitability, resulting from the residual effects of BNI related to 8h

• Knowing about the economic benefits of such a rotation system serves as a decision making tool to livestock producers and can help in promoting the adoption of Brachiaria humidicola in livestock production systems

Aknowledgments

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Introduction

- Among the essential macro elements for maize production, nitrogen (N) is the one limiting growth and yield the most
- To maintain desired production levels, substantial amounts of N are required, mainly obtained through nitrogen fertilizer, a significant cost driver in maize production (13%-18%)
- Much of this fertilizer is lost after nitrification through leaching and denitrification processes
- Fertilizer not used by the crop produces considerable environmental damage (e.g. water pollution, emission of greenhouse gases) and generates economic loss to the producers
- The residual BNI effect in Brachiaria humidicola (Bh) (>10 years established) plots, leads to a more efficient use of N fertilizer and associated reduced costs, resulting in higher grain yields of subsequent cropped maize

Objectives

- To evaluate the profitability of maize production on plots previously used for Bh and compares the results to conventional maize production (M)

Materials & Methods

Maize yield was evaluated in three plots of different previous land use systems:

- Productive Brachiaria humidicola (PBh)
- Degraded Brachiaria humidicola (DBh)
- Conventional maize (M)

On each plot, 3 doses of nitrogen (N) were applied, 60, 120, and 240 kg N ha⁻¹

The analysis focused on measuring indicators of technical and economic efficiency with respect to Nitrogen Use Efficiency (NUE), yields, costs, associated with each plot, profitability indicators and sensitivity analysis

References
