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"Solidarity in a competing world — fair use of resources"

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

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Abstract

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 fertiliser, a significant cost driver in maize production (13–18 %). However, much of this fertiliser is lost after nitrification through leaching and denitrification processes. Fertiliser 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 International Center for Tropical Agriculture (CIAT), in collaboration with the University of Hohenheim and Corpoica, have conducted research on the phenomenon of biological nitrification inhibition (BNI) present in permanent plots of *Brachiaria humidicola* (Bh) (≥10 years established) to quantify the residual effects of BNI on subsequent maize cultivars. This residual effects of BNI result in greater nitrogen use efficiency (NUE) and therefore in higher maize grain yields. The trial was planted at the Research Center Corpoica-La Libertad, located in the eastern Plains of Colombia, during a period of three years (2013–2015). This article aims to evaluate the profitability of maize production on plots previously used for Bh and compares the results to conventional maize production (M). The analysis focused on measuring indicators of technical and economic efficiency with respect to NUE, yields and costs associated with each plot. Subsequently, profitability indicators were defined and a sensitivity analysis was performed to identify changes in yields, prices and expected costs. The results show that maize production on plots previously used for Bh (with residual BNI effect) is more profitable, with yields exceeding the ones obtained on conventional maize plots (no residual BNI effect) by up to 62 %. This is accompanied by an increased technical and economic efficiency in NUE, lower unit costs (75 %) and a superior cost-benefit ratio. However, the results are highly sensitive to variations in expected returns, and to some extent to maize sales prices and increased production costs. In general, 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 Bh.

Keywords: Biological nitrification inhibition, *Brachiaria humidicola*, economic efficiency, improved forages, resource efficiency, rotation systems

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