

Effect of conservation agriculture and integrated soil fertility management on urea nitrogen use efficiency in contrasting agro-ecological regions in Kenya

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Abstract

An experiment was carried out in a sub-humid and a semi-arid agro-ecologies in Kenya to evaluate the effects of conservation agriculture (CA) and/or Integrated Soil Fertility Management (ISFM) on maize (*Z. mays*) nitrogen use efficiency (NUE). Rain-fed maize crop was established under treatments including CA, ISFM, CA+ISFM and control. ¹⁵N labelled urea fertilizer and isotopic methods to determine grain NUE were used. Surprisingly, compared to CA and ISFM, NUE was lower under the combined practice (CA+ISFM), 19 and 15% in sub-humid and semi-arid, respectively. This could be attributed to microbial nitrogen immobilization aided by observed high water content under CA+ISFM.

Keywords: Nitrogen use efficiency, Conservation agriculture, Integrated soil fertility management.

1. Background

Maize (*Zea mays*) production in Kenya is on the decline attributed to low soil fertility and erratic rainfall. Conservation Agriculture (CA) and Integrated Soil Fertility Management (ISFM) are renowned soil management practices that could address the above constraints (Sommer et al, 2018). When using mineral nitrogen (N) fertilizer in the said practices, it is important to investigate maize nitrogen use efficiency (NUE) under them.

2. Objective

To investigate maize crop NUE under CA and/or ISFM conditions.

3. Methods

The experiment was carried out in two agro-ecological locations of Kenya, a sub-humid and a semi-arid. With treatments, CA, ISFM, CA+ISFM and the control, it involved maize crop establishment under rain-fed conditions with use of ¹⁵N labelled urea fertilizer. Isotopic methods were used to determine maize grain NUE.

4. Results

Comparing between CA, ISFM and CA+ISFM, results (Figure 1) show a higher maize grain NUE under CA for both locations, 26 and 23% in sub-humid and semi-arid respectively, and surprisingly a lower grain NUE under the combined practice (CA+ISFM), 19 and 15% in sub-humid

and semi-arid, respectively. ISFM resulted to 20 and 21% grain NUE in sub-humid and semi-arid, respectively. The lower NUE under CA+ISFM is likely as a result of microbial nitrogen immobilization aided by observed high water content under this treatment.

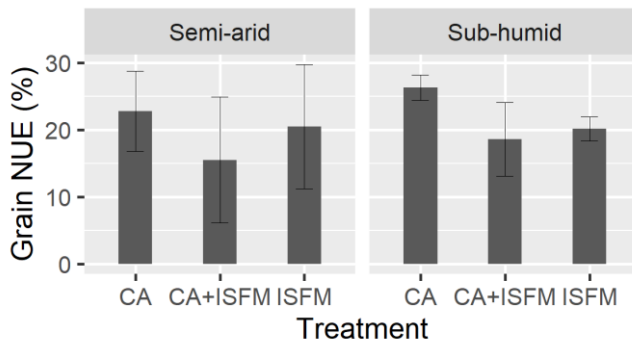


Fig. 1: Maize nitrogen use efficiency (NUE) under Conservation Agriculture (CA), Integrated Soil Fertility Management (ISFM) and the combined practice (CA+ISFM) in semi-arid and sub-humid locations in Kenya

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References

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