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Innovating pro-poor Strategies to safeguard Food Security using Technology and Knowledge Transfer

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Combined tied ridge, fertilizer microdosing and biochar effects on maize production under contrasting water supply in Tanzania

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Introduction/Objectives

Staple food production in remote places of developing countries is often limited due to soils with low agricultural potential and low and erratic rainfall patterns. Locally adapted agricultural methods to face these challenges are biochar soil amendments, fertilizer microdosing and tied ridge tillage. However, the effect of these methods on crop yield varies with water availability and results on their combinations is limited.

The **objective** of this study was to evaluate the influence of combined biochar and fertilizer microdosing on maize grain yield in dependence on tillage and irrigation frequency.

Material and Methods

- Two field experiments in sub-humid Morogoro, Tanzania in 2016/17 (low and high irrigation frequency) with maize
- sandy clay soil, low natural fertility
- split plot design:
  - Whole plot factor: tied ridges/ flat tillage
  - Subplot factors: 0, 5 or 10 t/ha maize cob biochar and 0%, 25% or 100% fertilizer*
- Data collected: soil moisture content, grain yield
- SPSS was used to calculate ANOVA and Duncan's post-hoc test

*recommended rate for Morogoro region

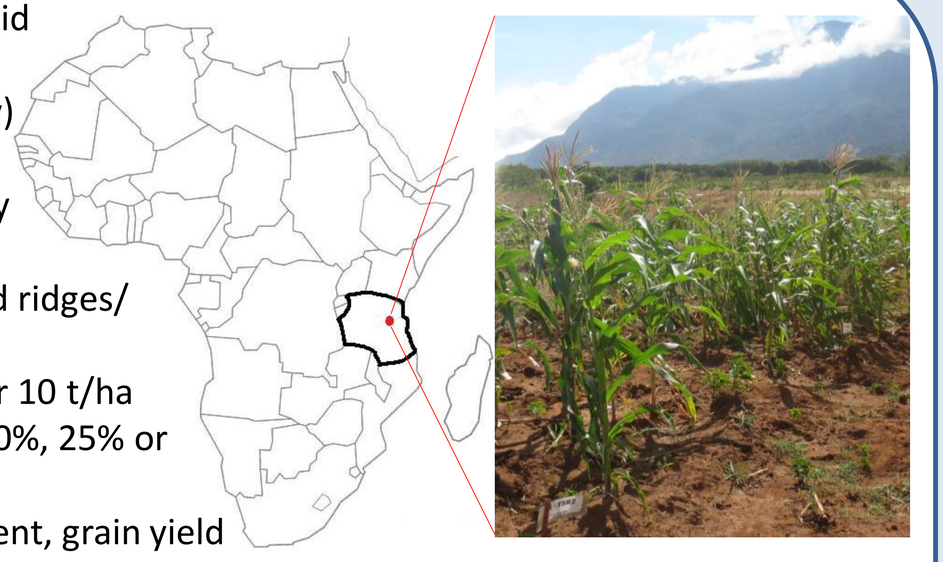

Figure 1: trial location in Morogoro, Tanzania (picture by H. A. Graef)

Results

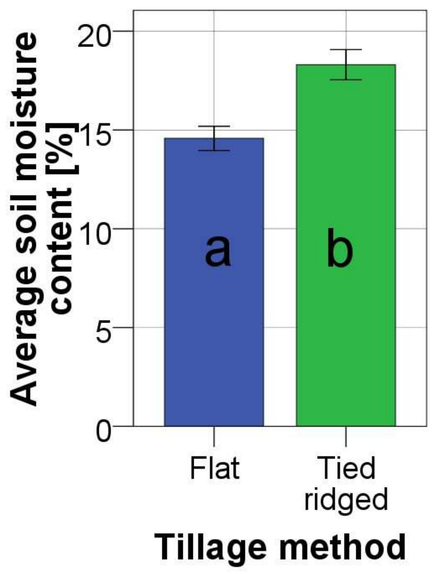

Figure 2: Effect of tillage method on soil moisture content under low irrigation frequency

- Biochar (5 or 10 t/ha) and 25% fertilizer combined increased yield under both tillage methods under high irrigation frequency compared to the control, possibly because of higher nutrient availability and pH from biochar application (Nurhidayati and Mariati 2014).
- Under low irrigation frequency, biochar at either rate and 25% fertilizer led to higher yields only under flat tillage compared to the control, equal to yield after 100% fertilizer application with or without biochar.
- Biochar application alone only increased yields at a high application rate (10 t/ha) and under flat tillage and low-frequency irrigation. Biochar-induced yield increases may be due to higher soil water retention after biochar application (Ulyett et al. 2014).
- Though insignificant, tied ridges tended to increase grain yields under low irrigation frequency and decrease grain yields under high irrigation frequency. Tied ridges led to water-logging under high water availability, as also reported by Jensen et al. (2003).

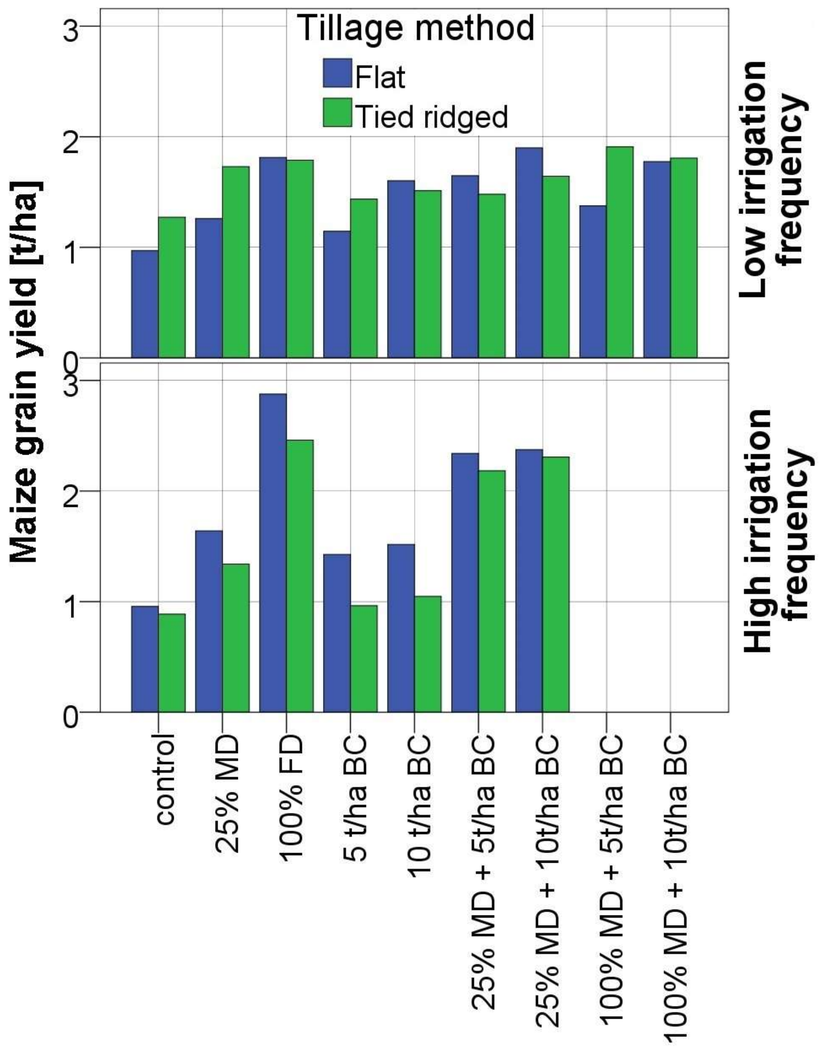

Figure 3: Effect of tillage, biochar and fertilizer treatment on average maize grain yield in dependence on the irrigation frequency

Conclusions

- Tied ridge tillage can be applied for higher soil moisture content
- High biochar application rates (10 t/ha) are advisable to increase yields under flat tillage and infrequent water supply
- Low biochar rates (5 t/ha) in combination with 25% fertilizer microdosing increase yields resource-efficiently under any water supply if not combined with tied ridges

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