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

Soil Management Options for Improving Nitrogen Use Efficiency of Rice in the Kilombero Flood Plains

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Abstract

Rice is an important staple food crop in East Africa and its production needs to be increased to meet the increasing demand. East African wetlands provide opportunities to meet the demand if managed efficiently. On-farm experiments to evaluate different soil management options that can improve the nutrient use efficiency of lowland rice under rain-fed conditions are ongoing in the Kilombero flood plain of Tanzania. Three on-farm experiments have been completed since 2014 under three hydrological zones called 'Fringe', 'Middle', and 'Center'. Treatments included inorganic fertiliser (urea), organic fertilisers (cow manure (Cm)) and green manure (*Lablab purpureus*). Urea was applied at three levels 0, 60 and 120 kg N ha^{-1}. Cm was applied at rates equivalent to 60 kg N ha^{-1} while a 6-week old Lablab was grown and incorporated *in-situ* before transplanting. Lowland rice variety SARO 5 was used in the experiment. The management practices ranged from farmers practice to best management practice. Plant samples were taken at different growth stages for biomass and nutrient use efficiency analysis. Nitrogen uptake (NP), physiological efficiency (PE), agronomic efficiency (AE) and Nitrogen use efficiency (NUE) have been evaluated at 30 and 50 DAT and yield assessed at harvest. Preliminary results show that the middle zone has a higher PE and AE compared to the fringe zone. Organic amendments produced better PE compared to the inorganic amendments (Lablab > Cm > 60 kg > 120 kg N ha^{-1}) at 50 DAT. AE was high in the order of Lablab > 60 kg N > 120 kg N > Cm. NP was significantly higher in the treatments receiving mineral N compared with all other treatments. There were no significant differences on the NUE at 30 and 50 DAT. However, differences are expected after full bloom and harvest lab data analysis is completed. 120 kg N ha^{-1} obtained the highest grain yield (9.9 t ha^{-1}) as an average for Fringe and Middle which is 6.7 t ha^{-1} higher than what is obtained on farmers' practice (3.2 t ha^{-1}). So far the different responses to NUE in the hydrological zones of the flood plain are in line with the needed optimisation of crop yield and recommendation for the most appropriate management strategies.

Keywords: Agronomic efficiency, fertilisers, lowland, N uptake, nutrient use efficiency, on-farm, rain-fed, SARO5

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