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Potential of Soil Fertility Management Techniques on Agricultural Productivity in Tharaka-Nithi and Murang’a Counties, Kenya

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Abstract

Continuous cropping with low or non-use of soil external inputs is a major constraint for smallholder farmers in the highland regions of Kenya. On-station experiments were set up to determine effects of minimum (MT) and conventional (CT) tillage and organic inputs (OIs) on maize performance, water use efficiency and soil physicochemical properties. The research was carried out in Meru South (sub-humid) and Gatanga (semi-humid) sub-counties during long rains and short rains 2016. The experimental design was a split plot and treatments laid down in a randomised complete block design with four replications per treatment. Tillage was the main plot: minimum and conventional. Soil inputs were the sub-plots; control (no input; C) mineral fertiliser (MF), crop residues (CR) + MF (RMf), CR + MF + animal manure (RMfM), CR + *Tithonia diversifolia* + Phosphate rock (RTiP), CR + animal manure+ legume intercrop (RML), CR + *Tithonia diversifolia* + animal manure (RTiM). Higher amount of rainfall was received during the long rain season than in the short rain season in both sites. Data was subjected to ANOVA using Mixed Procedure Model in SAS 9.3 software. Differences between treatment means were examined using Tukey Kramer at HSD $p = 0.05$. Initial soil characteristics indicated that the soils in both sites had low amounts of total nitrogen. Tillage did not have a significant effect on maize grain yield during the two cropping seasons. Nevertheless, maize grain yields were greater under minimum tillage than under conventional tillage. Compared to control, results showed that use of soil inputs significantly increased grain yields during the cropping seasons in both sites ($p < .0001$). RMfM inputs led to the highest grain yields increase during LR16 season by 120 and 97% in Meru South and Gatanga, respectively. During SR16 season, RMfM performed best in Meru South while in Gatanga Mf inputs led to the highest yields. The output highlights the importance of soil fertility management techniques to smallholder farmers and other stakeholders for better agricultural production in the highland regions.

Keywords: Crop yields, rainfall distribution, soil fertility