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Targeting Technical Options to Address Maize Production Constraints in Kakamega, Kenya

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Abstract

Nutrient deficiencies and weed infestation are the principal constraints to maize production in Western Kenya. Technologies to replenish soil nutrients and mitigate weed infestation in croplands have been introduced and tested, but their widespread adoption has not been achieved. We hypothesised that technical options that consider the site-and system-specificity of the smallholder farming systems could improve the productivity of maize. Hence, the objectives of this study were **(i)** to quantify site-specific responses of maize to applied technical options, **(ii)** to assess the capacity of technical options to correct site-specific production constraints of maize and **(iii)** to target technical options to specific farm types. Field experiments were conducted in Kakamega District during the 2008 and 2009 cropping seasons in five sites with contrasting soil types (Alfisols, Ultisols and Nitisols) and fertility levels. Treatments included farmer's practice (control), clean weeding (CW), farmyard manure (FYM), mineral nitrogen plus phosphorus (NP), seed priming with phosphorus (SP), zero-tillage plus mineral nitrogen and phosphorus (ZNP), zero-tillage plus mineral nitrogen and phosphorus plus Arachis pintoi (ZANP) and green manure (GM, incorporation of *Mucuna pruriens*). The agronomic performance and nutrient uptake of maize were evaluated. Nitrogen fixation (^{15}N natural abundance technique) by *Mucuna pruriens* and *Arachis pintoi* was quantified. The capacity of the technical options to suppress weeds was also assessed. Soil quality parameters and their dynamics were evaluated sequentially in each cropping season. Preliminary results showed that significant differences ($P \leq 0.05$) exist between treatments for agronomic parameters of maize and weed abundance. Maize biomass accumulation for NP, ZNP and ZANP was tripled when compared to the control. Additionally, 75 % of the weed biomass was accounted for by *Bidens pilosa*, *Ageratum conyzoides*, *Commelina benghalensis*, *Oxalis semiloba* and *Gallinsoga parviflora* and weed infestation was higher at the Ultisol sites than on the Alfisols and Nitisols. Generally, the control recorded higher weed biomass and species abundance in all the five sites. ZANP suppressed more than 50 % of the weed biomass at three months after planting, and, hence, could be a promising technical option to control weeds in the smallholder farming systems of Western Kenya.

Keywords: Arachis pintoi, *Mucuna pruriens*, nutrient deficiency, weed abundance, *Zea mays* L

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