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Nassary, Eliakira

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Eliakira Kisetu Nassary, Frederick Baijukya, Patrick Alois Ndakidemi

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Abstract

Intercropping with maize (*Zea mays* L.) and common bean (*Phaseolus vulgaris* L.) is one of the widely used practices of producing food crops on smallholder farms in Sub-Saharan Africa (SSA). However, the knowledge on the options toward intensification of available practices in order to optimize systems productivity using intercrops is generally lacking. Therefore, this study evaluated the effects of intercropping, cropping seasons, and different varieties of common bean on productivity of the maize-common bean based intercrop through 5 cropping seasons from 2015 to 2017. Experimental site is located at 03°18'03.74" S and 37°12'13.94' E and an altitude of 956 m above sea level in the northern highlands of Tanzania. Hybrid maize Dekalb brand (DK 8031) and two varieties of common bean (improved Lyamungu 90 and local Mkanamna) were used. The treatments within a replicate were: (1) sole crops: (i) maize, (ii) local bean, (iii) improved bean, and (2) intercrops: (i) maize + local bean, (ii) maize + improved bean. Interaction and individual effects of cropping seasons (S) (periods of years – short and long rains), varieties of common bean (V), and cropping systems (C) (sole and intercrop) were studied. Results indicated that $S \times V$ interaction was significant on bean grain yield and 100-seed weight. Improved bean outweighed the local bean with grain yields ranging from 2.2–3.5 t ha⁻¹ and 0.2–2.5 t ha⁻¹, respectively. The effect of S was significant on all measured variables in beans and the effect of M was only significant on total biomass. Further, S significantly affected all measured variables in maize and grain yields ranged from 2.3–2.6 t ha⁻¹. In maize, correlations were strong ($r = 0.48^*$; $P = 0.0325$) between maize grain yield and ground coverage of leaf canopy measured 42–56 days after sowing. The land equivalent ratios (LERs) for maize intercropped with improved and local beans were 1.48 and 1.55, respectively but LER values did not differ significantly between bean varieties. In this study, both common bean varieties were sown simultaneously with the maize, which might have resulted in their differential performance. It is recommended that studies are conducted to evaluate time of introducing this legume crop to a maize system such as early sowing, sowing mid in the season after a maize crop is well established, and sowing late in the season when the leaves in maize plant have started to senesce.

Keywords

Agricultural systems, Food crops, Smallholders, Tanzania