# Yield response of climbing bean genotypes to different crop management options in two agroecological zones in central Malawi

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**Abstract**

Farmers in Linthipe (Dedza district) and Kandeu (Ntcheu district) evaluated several crop management options for intensifying maize-climbing bean production under smallholder farming systems in 2013/14 and 2014/15 crop seasons. Two climbing bean varieties, DC86-263 and MBC33, were evaluated for yield under sole and maize-bean cropping systems, as well as combinations of inorganic and organic soil fertility management options as follows: i) no soil fertility amendment, ii) chicken manure application (7 ton $ha^{-1}$), iii) fertilizer application (23 kg N $ha^{-1}$ and 21 kg $P_2O_5$ $ha^{-1}$ in sole bean; and 115 kg N $ha^{-1}$ and 21 kg $P_2O_5$ $ha^{-1}$ in intercrop with maize , and iv) application of a combination of manure and fertilizer. Results showed significant differences in bean yield due to effects of cropping seasons ($p< 0.05$). Both genotypes performed better in 2013/14 than in 2014/15 season (1.2 ton $ha^{-1}$ - 0.7 ton $ha^{-1}$ for MBC33 and 1.4 ton $ha^{-1}$ - 0.3 ton $ha^{-1}$ for DC86-263 respectively). Cropping systems significantly affected yield of MBC33 ($P < 0.05$), where values were lower in intercrops (0.34 ton/$ha^{-1}$) than under sole crop (0.9 ton $ha^{-1}$). Treatments with manure had significantly ($p<0.005$) high values (0.7 ton $ha^{-1}$) than without manure (0.4 ton $ha^{-1}$). On the other hand, application of both fertilizer and manure significantly increased yields of DC86-263 from 0.4 to 0.7 ton $ha^{-1}$. The interaction between seasons and a combination of inorganic fertilizers, significantly influenced the yield of DC86-263, where the yield tended to be consistently high under crop management options with inorganic fertilizer application. The combined maize and bean yield under maize intercrop with DC86-263, where a fertilizer and manure were applied, performed better, with a land equivalent ratio of 2.57, implying that the genotype is suited for maize-bean cropping system. On the contrary, the yield of MBC33 was drastically suppressed by the interaction between maize and manure application, as the same bean genotype performed 222% better when it was grown as a sole crop with stakes under manure application. The results from these studies indicate that the climbing bean genotypes respond differently under sole and intercrop systems, but also with organic or inorganic fertilizer application or a combination of the two. As such farmers will have to select specific bean varieties for different cropping systems and soil fertility amendment options that will provide the best economic returns under specific conditions.

**Key words**: Maize-bean cropping system, management options, climbing bean genotypes, soil fertility