# Effect of different management options on yield of climbing and drought tolerant bush beans in different soil health conditions.

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## INTRODUCTION

The bean crop is one of the most important legumes, mostly grown under traditional cropping systems, and is the cheapest source of proteins, calcium, magnesium, vitamin B, iron and Zinc for the rural poor (TLII, 2013), as well as cash if sold. However, its productivity has remained low (< 0.5 Mg ha-1 ) due to constraints which include low soil fertility, pest and diseases, unsuitable varieties, as well as adverse climatic conditions (e.g. drought) (Beeb *et al*., 2008; Muthoni *et al.,* 2007; TLII, 2013). The stagnated productivity is worrisome as it may negatively affect livelihoods as well as the food and nutrition security status of the rural poor. In the 2013/2014 season, CIAT under the Africa RISING project undertook a participatory bean evaluation study in Dedza and Ntcheu districts of central Malawi. The study was aimed at determining and demonstrating the effects of management options on the yield of climbing (DC86-263 and MBC33) and drought tolerant bush beans (SER45 and SER83) grown under different cropping and fertility management systems. The ultimate aim was to facilitate positive changes in bean production practices under smallholder farming.

## METHODS

Participatory approaches were adopted in the study to enhance learning and facilitate the adoption of improved bean production technologies by participating farmers. The baby-mother approach was used (Snap *et al*., 2002). Mothers trials were laid out in split-plot design, with the bean varieties as whole plots and management options as split plots. Management options included mono-cropping, intercropping with maize, use of manure, fertlisers and a combination of manure and fertilizer as well as different staking options for climbing beans. The data on yield components was collected on 4.5 $m^2$ net plot from five randomly selected plants. Samples of grains were dried at 65$^oC$ to constant weight. Data analysis involved graphing, descriptive analysis and the use of ANOVA to compare yield between cropping systems (management options).

## RESULTS

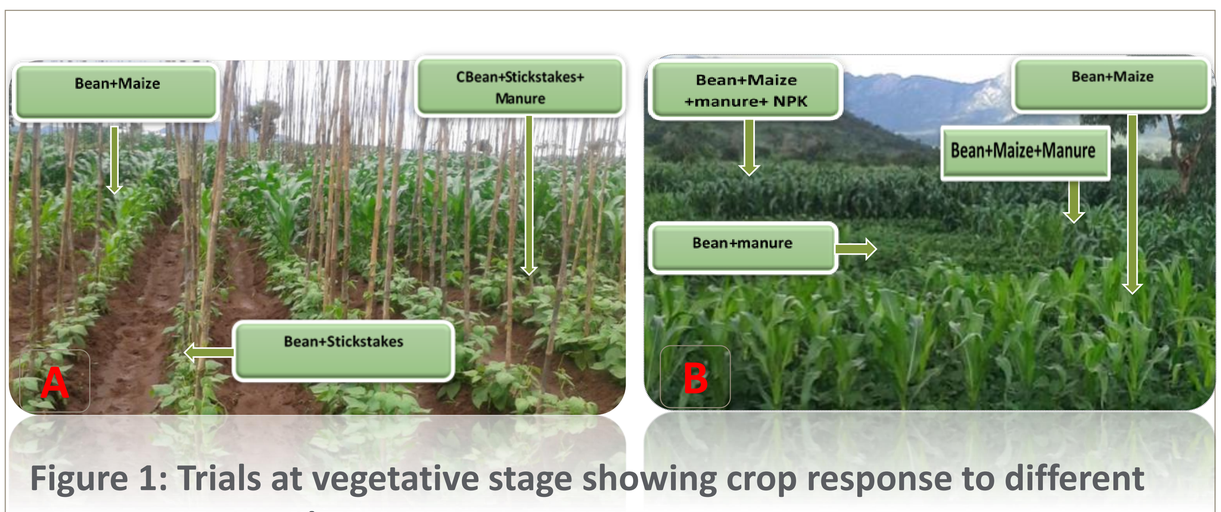


**Figure 1: Trials at vegetative stage showing crop response to different management options**

During the vegetative stages clear contrasts in crop responses between management options were observed (**Figure 1**).

Relative yield performance for climbers showed that DC86-263 had the highest yields under the management Bean+Stickstakes+Manure in purestand, and the least when intercropped with pegionpeas, while MBC33 did much better under Bean+maize(DKC8033)+NPK+manure and Bean+Maize+NPK, however, the least in Bean+Maize+manure (**Figure 2A**).

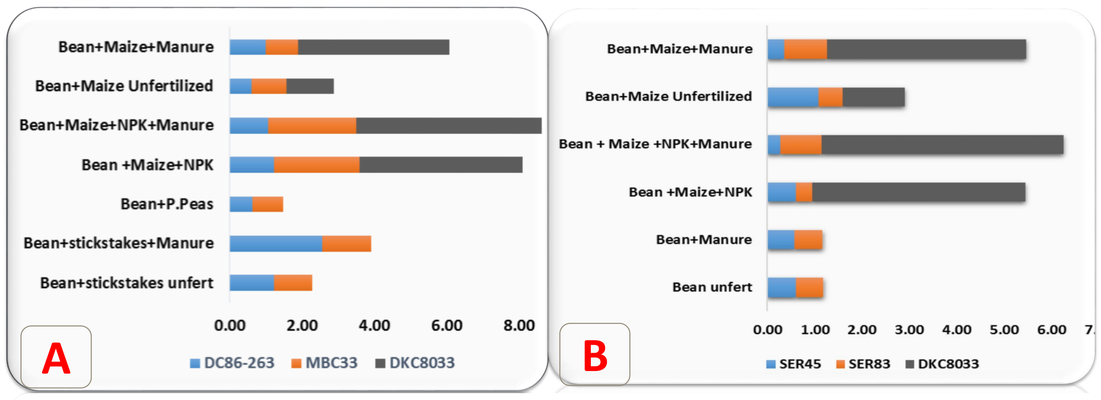


**Figure 2: Graph showing relative performance of climbing and bushbeans under different management options**

SER45 yield was the best under the bean-maize unfertilised and worst in the bean-maize intercrop with both manure and NPK. In contrast, SER83 gave the highest yield under intercrop with maize+manure, and the least under the same cropping system, but with only NPK applied (**Figure 2B**).

**Table 1: Comparing yield in climbing beans under different management options**

| Cropping system (treatments) | 100 seed weight (g) | | | Yield in Mgha$^{-1}$ | | |
|---|---|---|---|---|---|---|
| | DC86-263 | MBC33 | Mean | DC86-263 | MBC33 | Mean |
| Bean + Stick stakes + Manure | 27 | 65 | 46 | 1.363 | 2.558 | 1.961$^{a}$ |
| Bean + Sticks stakes Unfertilized | 27 | 52 | 39 | 1.058 | 1.229 | 1.144$^{bc}$ |
| Bean + Maize + NPK | 26 | 71 | 49 | 2.357 | 1.232 | 1.795$^{ab}$ |
| Bean + Maize + NPK + Manure | 27 | 79 | 53 | 2.451 | 1.059 | 1.755$^{ab}$ |
| Bean + Maize + Manure | 33 | 61 | 47 | 0.888 | 0.993 | 0.940$^{c}$ |
| Bean + Maize Unfertilized | 32 | 54 | 43 | 0.962 | 0.610 | 0.786$^{c}$ |
| Bean+ Pigeon pea | 30 | 57 | 44 | 0.856 | 0.627 | 0.741$^{c}$ |
| Genotypic mean | 29a | 63b | 46 | 1.419 | 1.187 | 1.303 |
| | | | | LSD Cropping systems (P<0.01)= | | 0.786.8 |
| | | | | LSD Genotype x Cropping System (P<0.05)= | | 1.112.6 |
| | | | | CV= | | 50.9 |

Bean yield results revealed significantly different values between management options ($p < 0.05$) . In climbers, the option of using stick stakes and manure produced the highest yield, whereas that of pigeonpeas as live stakes produced the least (**Table 1**). DC86-263 was consistently high in management options with NPK fertilizer as one of the treatment components. In bush beans, SER83 was more responsive to manure application, while SER45 to unfertilised bean+maize intercrop ( **Table 2**)

**Table 2: Comparing yield in bushbeans under different management options**

| Cropping system | Seed Yield Mgha$^{-1}$ | | | 100 seed weight (g) | | |
|---|---|---|---|---|---|---|
| | SER 45 | SER 83 | Mean | SER45 | SER83 | Mean |
| Bean+Maize Unfertilized | 1.076$^{a}$ | 0.517$^{cd}$ | 0.796 | 26 | 31 | 28 |
| Bean+Maize+Manure | 0.359$^{cd}$ | 0.897$^{ab}$ | 0.628 | 30 | 29 | 29 |
| Bean +Maize +NPK+Manure | 0.206$^{d}$ | 0.884$^{ab}$ | 0.545 | 34 | 26 | 30 |
| Bean + Maize +NPK | 0.593$^{bc}$ | 0.354$^{c}$ | 0.473 | 33 | 30 | 32 |
| Genotype mean | 0.567 | 0.636 | 0.601 | 34 | 29 | 31 |
| LSD$_{0.001}$ (Genotype x Farming systems | | | 0.418 | | | |
| CV | | | 39.1% | | | |

## CONCLUSION

The studied genotypes (DC86-263, MBC3,SER45 and SER83) were found to respond differently to different management options. Hence, consideration for proper choices by farmers in management options is essential to ensure optimum productivity.

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