Adaptive research to understand bean production niches in Western Kenya

Western Kenya is densely-populated (on average 750 person/ km^2) and the area of farm land available is less than 0.1 ha per capita. The area suffers from poor crop productivity due to poor soil fertility arising from continual cultivation without inputs. Bush-type common bean (*Phaseolus vulgaris* L.) is the most important pulse crop in the system but grain yields under farmer conditions remain as small as 400 kg /ha. Because the pressure on land is so acute, increasing yield is an imperative. An important option is to introduce climbing beans. Because climbing beans growing vertically they can produce a lot of biomass and yield in the limited space for planting, and provide more yield than bush bean varieties.

Data from two seasons indicate yields of climbing bean ranged from 0.2 to 3.6 t/ha: the best yields were observed on mid-altitude areas on relatively fertile soils (soil carbon above 2%). We observed no clear impact of inoculation on climbing beans. P-based fertilizers gave clear increases on growth and yield of climbing beans on 60% of the sites, with beans to with the yield responses varying between 2 and 30% overall. The strongest responses were obtained when P was applied in the form of DAP and/ or TSP in combination with K indicating the need potassium, and a small response starter N but this remains to be confirmed.

Good performing site in Migori, roots had many nodules

Poor performing site in Kakamega South, plants with multiple problems

Poor vigor due to damage by root rot disease

Knots on bean roots

The observed lack of response of climbing bean inputs might, to a large extent, be attributed to a mixture of biotic stresses. On poorly-performing sites especially where beans have been frequently cultivated (e.g. Kakamega South) we observed severe damage by bean stem fly maggot and root rot (*Fusarium solani*). At a later stage bean roots had many 'knots' characteristic of massive infection with the root knot nematode (*Meloidogyne*) with few or no nodules at all. These problems could be alleviated by more frequent crop rotation. The very low P status of many soils in the area suggest that P availability will be an emerging constraint when the most pressing biotic constraints have been relieved. The focus now is to look into agronomic practices and rigorous variety selection to address these emerging biotic challenges. Nevertheless, on good soils where biotic stresses are controlled, climbing beans can provide a three-to-one yield advantage compared with bush beans.

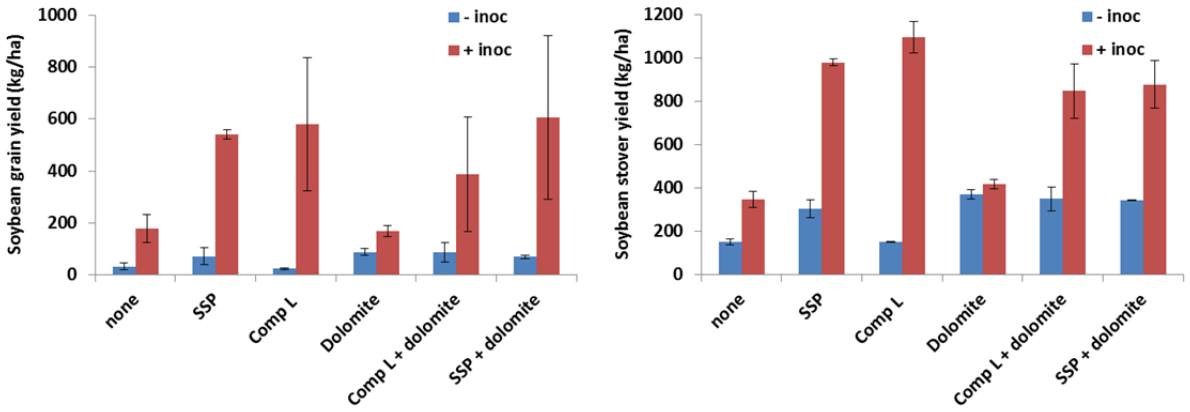

Figure 2. Response of climbing bean (variety Kenya Tamu) to different sources of P fertilizer with (+R) and without (-R) rhizobium inoculation as observed at two sites, Migori and Kamamega, in Western Kenya. Performance at Kakamega site was confounded by biotic stresses

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