“Inoculation increases farmers’ soyabean yields in East and Central Africa”

Working with farmers to evaluate the impact of inoculating soybean seeds with nitrogen fixing rhizobia was one of the first field tasks in East and Central Africa.Farmers in Kenya, Rwanda, and DR Congo observed exceptionally vigorous soybean plants with deep green leaf color and prolific nodulation on plants growing in some plots inoculated with rhizobia which translated into increases in yield.

In South Kivu province of DR Congo, trials were in farmers fields in four action sites with contrasting soil fertility namely; Bughore (infertile), Ikoma, Iboma and Mumosho (moderately fertile) to test the response of commonly grown non-promiscuous soybean variety PK6, to the application of phosphorus (P) at a rate of 30 kg/ha, and soybean inoculant (containing rhizobial strain USDA 110). Relative to the control (no P and no inoculum applied), grain yields in moderately fertile soils increased from an average of 0.8 t/ha to1.5 t/ha with the application of inoculant and further to 2 t/ha with combined application of P and inoculant (Figure 1 and Table 1). Application of P alone increased grain yield but not significantly. Under no P limitation, application of inoculants increased yield to the tune of 100 kg/ha (15%) to about 1.4 t/ha (176%) (Table 1), indicating the “power” of inoculants in driving soybean yields. Lack of clear response to P and inoculation in the degraded soils of Bughore provide challenges to our research team. Trials will be conducted on these “problem soils” during 2011 to address this so that these farm families may also have productive soybean fields. This is extremely important because degraded soils occupy about 50% of the arable land in South Kivu.

In western Kenya two trials were established in each of the three mandate areas; the Lake basin (1125-1200 m.a.s.l, receiving 400-500 mm of rain in growing season); the Midlands (1200-1250 m.a.s.l., receiving 600-800 mm of rain in the growing season) and the Upper Midlands (1250-1400 m.a.s.l., receiving 900-1100 mm of rain in the growing season) to determine the response of five improved soybean varieties to rhizobium inoculation with P fertilizer applied. The varieties used include one which can only nodulate with specific rhizobia strains (variety EAI 3600) and the rest are promiscuous (nodulate with several rhizobia strains). There were grain yield increases with inoculation of specific and promiscuous soybean varieties (Figure 1) in the range of 27 – 1000 kg/ha (2-100%) in all mandate areas. Moreover, the results show that some promiscuous soybean varieties (e.g. TGx 140-2F and TGx1895-33) respond little to inoculation, but will require adequate supply of P. In the first season we have noted wide variation in soybean performance within and between the mandate areas. There was a wide

range in grain yields (Table 2) indicating presence of special niches for soybean production in different zones. The experiments have been repeated in the short rains, the season considered best for grain legumes. The reasons for poor yields on some fields are not clear and will be investigated in 2011.

The reported data were collected on plots measuring 9 m^2 in partnership with farmers. This plot size is about 20 times less than the area currently planted with legumes by smallholders in Kenya,. In our trials, the best performing treatments gave yield increase of 1-1.5 kg per plot, and this was highly acknowledged by farmers. “From this small plot I have an extra *gologolo*’ (a local unit measure in Western Kenya of about 1-2 kg), with this technology replicated in my farm I will have 20 more *gologolo*, where can I get these quality seeds and Inoculant?” remarked Mrs Rose Otee from Teso District during trial evaluation. Such remarks are taken seriously and addressed through our dissemination campaigns.

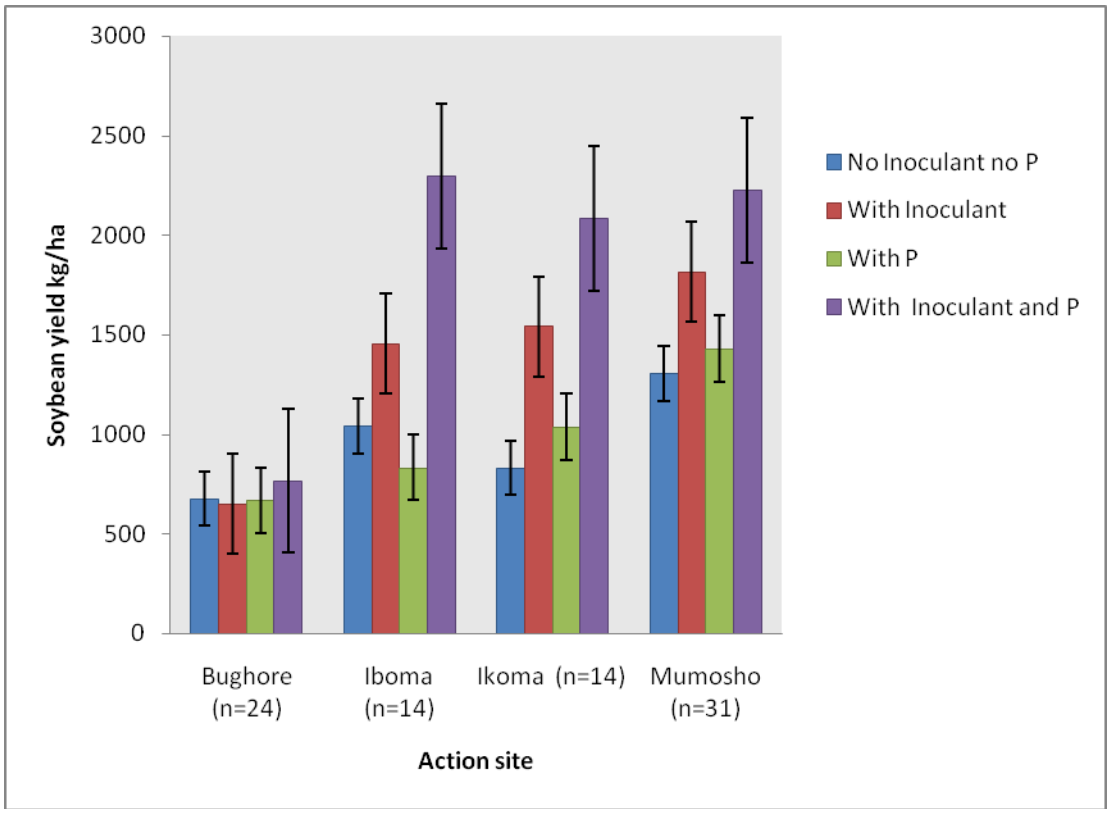

Figure 1: Grain yield response of soybean to inoculant and P fertiliser in different action sites in South Kivu, DR Congo (n = nr of sub-sites)

Table 1. Effect of Rhizobium inoculation on soybean grain yield as recoded at different action sites in South Kivu, DR- Congo.

Action site	Grain yield kg /ha		Increase when inoculant was used
	No Inoculant With P	With Inoculant and P	%
Bughore	668	767	15
Iboma	833	2296	176
Ikoma	1038	2083	101
Mumosho	1431	2226	56

Table 2. Grain yield of different soybean varieties as affected by rhizobia inoculation in the different mandate areas of Western Kenya (Data in parenthesis are ranges)

Mandate Area	Treatment	Soybean variety				
		Namsoy 4m	EAI 3600	TGx 1740-2F	TGx 1835-10E	TGx 1895-33F
Lake basin	Not inoculated	1056 (645-1912)	608 (109-2064)	1115 (178-2357)	1020 (210-2052)	771 (144-1088)
	Inoculated	1471 (459-3431)	807 (125-1545)	1132 (525-2054)	1391 (402-2603)	705 (441-1052)
	Yield increase Kg/ha	415	199	27	371	-
Midlands	Not inoculated	926 (695-2023)	817 (295-1120)	1169 (523-1590)	1212 (266-1799)	1541 (123-3146)
	Inoculated	1266 (622-2601)	1326 (713-1850)	1292 (867-2011)	1270 (760-1869)	1885 (1601-2307)
	Yield increase Kg/ha	340	509	123	68	344
Upper midlands	Not inoculated	996 (845-1138)	966 (801-1165)	1232 (1206-1255)	962 (889-1077)	1150 (886-1525)
	Inoculated	2275 (1370-3933)	1206 (1039-1359)	1295 (1245-1350)	1583 (1516-1624)	1235 (1194-1300)
	Yield increase Kg/ha	1379	310	63	621	85