Soybean Grain Yield Responses to Integrated Soil Fertility Management

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Introduction

Soybean (*Glycine max*) is an important cash and oil crop in Ghana used in cereal-legume rotations to fix atmospheric nitrogen to improve soil fertility and as a trap-crop against *Stirga hermonthica*, a parasitic weed that causes severe yield losses in cereal crops. Grain yields are low on farmers' fields partly due low availability of soil nutrients, especially nitrogen (N), phosphorus (P) and potassium (K) and inappropriate management practices, e.g., unimproved varieties, no fertilizer and *Rhizobium* inoculant application

The Africa Research in Sustainable Intensification (Africa RISING) project is testing and demonstrating several agricultural technologies to intensify and sustain crop yields in small-scale crop-livestock farming systems in Northern Ghana. Results of two multi-locational trials to test and demonstrate the effect of using fertilizer N, P and K and *Rhizobium* inoculants on grain yield of early-maturing and late-maturing soybean entries are presented.

Procedures

Five integrated soil fertility management (ISM) options on grain yields of early-maturing (85-90 days) and late-maturing (100-110 days) soybean entries were evaluated in Trials 1 and 2 respectively in 2012 and 2013. A split-plot design with entries as main-plots and ISFM as sub-plots was used in both trials.

In 2012, Trial 1 was conducted at Bamahu and Trial 2 at Nyankpala, Yendi and Wa. In 2013, Trial 1 was conducted at Bamahu and Wa, and Trial 2 at Nyankpala, Yendi, Bamahu and Wa.

The N, P and K rates were 25, 60 and 30 kg/ha as (urea), P_2O_5 (triple superphosphate) and K_2O (muriate of potash) respectively. The soybean entries were chosen based on their performance in earlier on-station and on-farm trials. Inter and intra-row spacing were 60 x 5 cm for the early-maturing and 75 x 5 cm for the late. Details of the soybean entries and ISM treatments are presented in Figures 1-4.

Days to 50% flowering, plant height, nodule numbers and nodule weight per plant and grain yield were recorded. Means of grain yield are presented across year and site.

Results summary

Figure 1: Grain yield of early-maturing soybean entries, average of 3 sites in 2012 and 2013

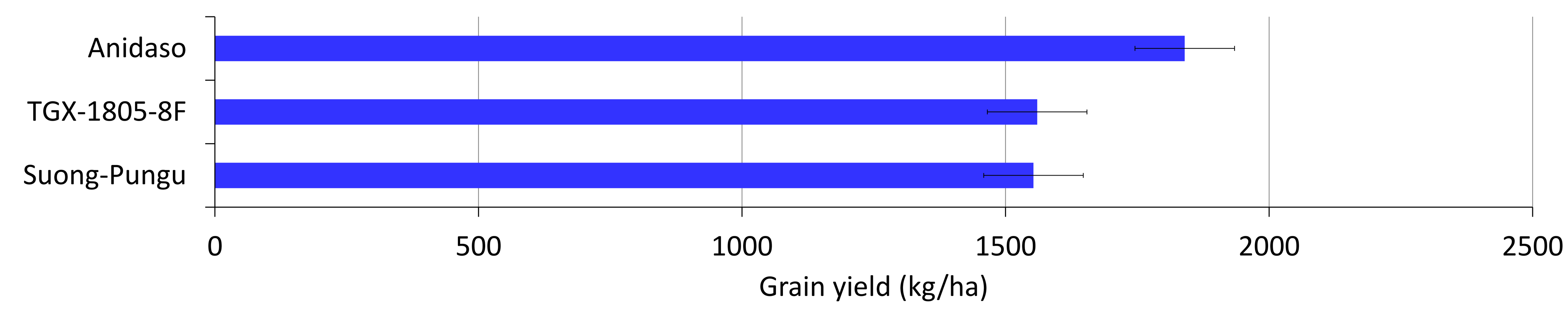


Figure 2: Grain yield of late-maturing soybean entries, average of 7 sites in 2012 and 2013

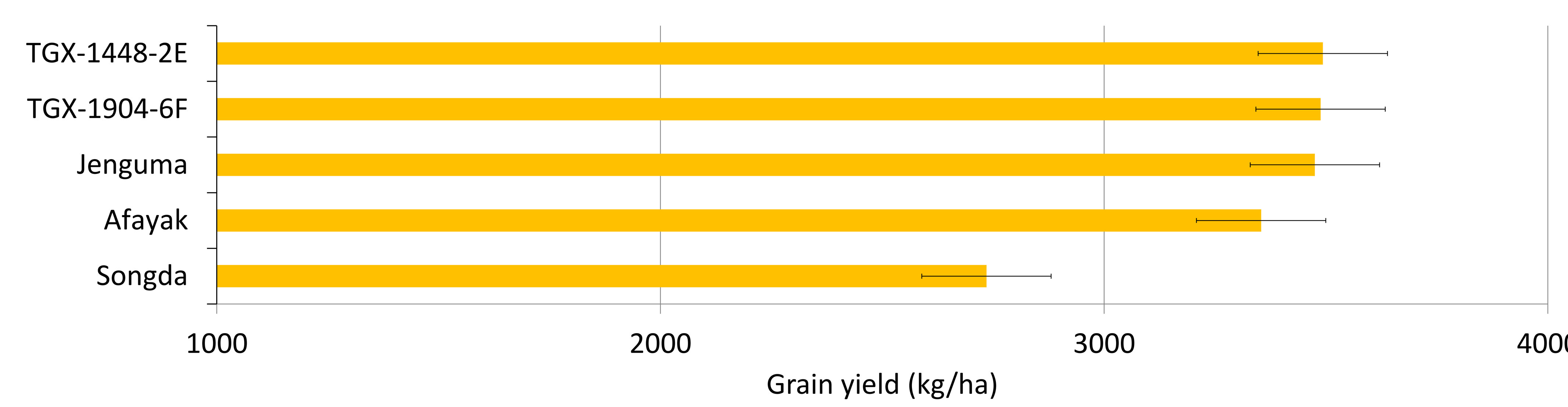


Figure 3: Grain yield of early-maturing soybean entries, average of 3 sites in 2012 and 2013

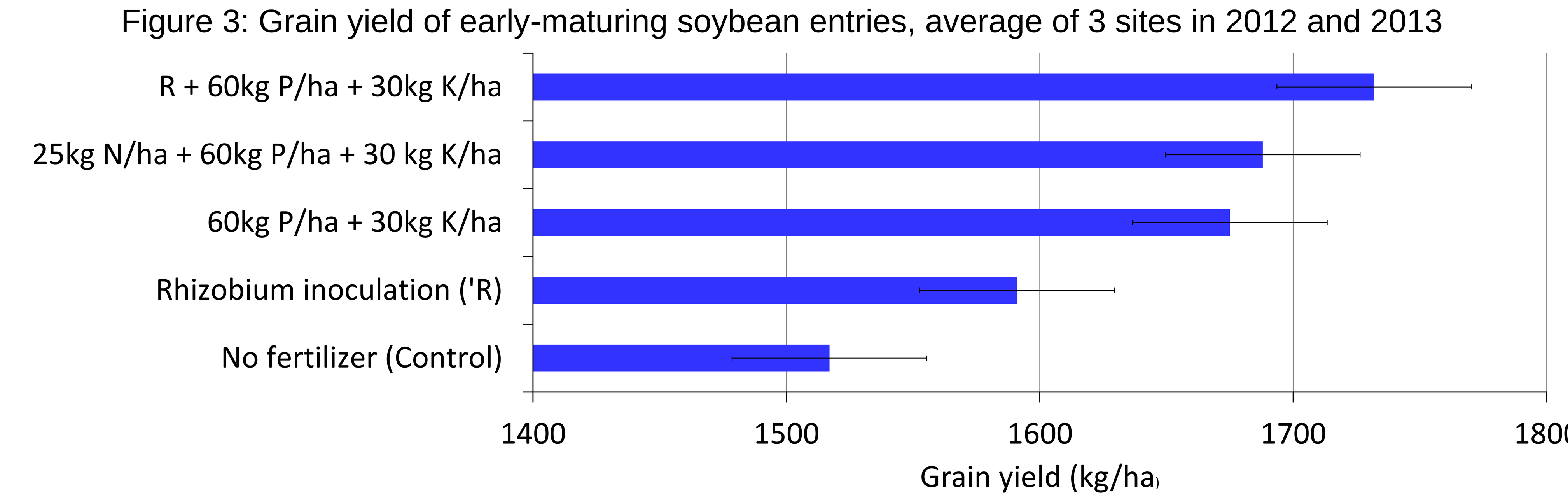
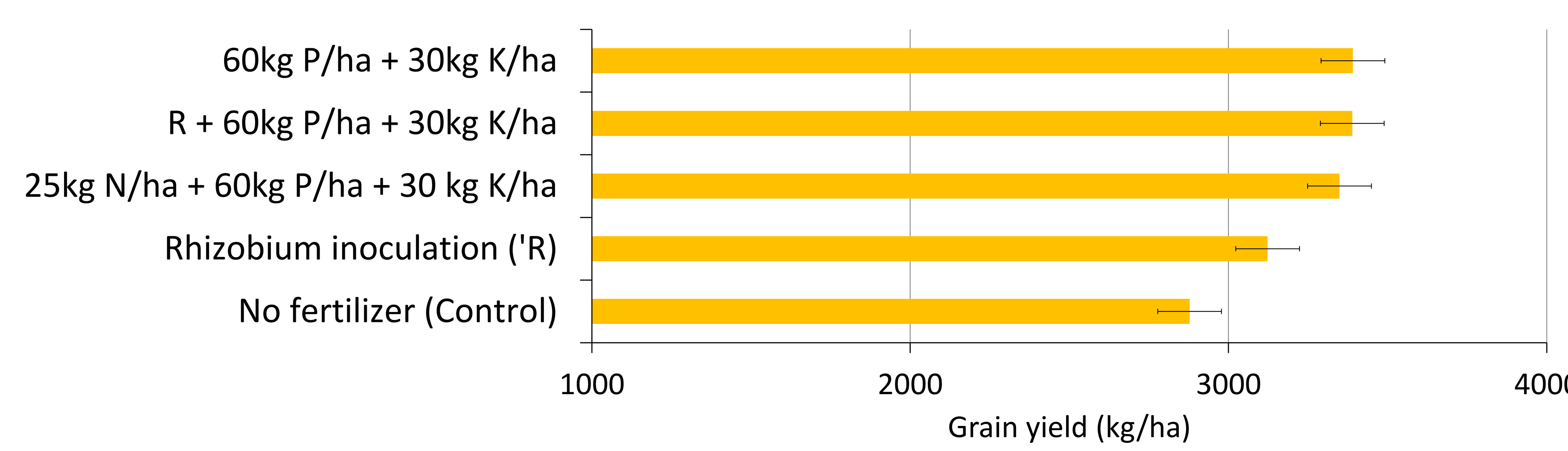


Figure 4: Grain yield of late-maturing soybean entries, average of 7 sites in 2012 and 2013



Grain yield of Anidaso was higher ($P<0.05$) than the other early maturing entries (Fig. 1), whilst that of Sonda was lower ($P<0.05$) the rest of the late maturing varieties (Fig. 2). Applying N, P and K fertilizer and *Rhizobium* inoculation produced more ($P<0.05$) grain than inoculation alone (Figs. 3 and 4).

Conclusion

Soybean production can be intensified by planting inoculated seeds of Anidaso, Jenguma, Afayak and the unreleased entries with P and K fertilizer.

Acknowledgement

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