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On-farm Yield variability and Responses of Common bean (*Phaseolus vulgaris L.*) Varieties to Rhizobium Inoculation with Inorganic Fertilizer Rates

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1 ABSTRACT

The experiment was conducted on fourteen farmers' fields to evaluate the responses of common bean varieties to rhizobium (R) inoculation (HB-429) and phosphorus (P) application in Bako Tibe district, Ethiopia. The treatments consisted of two varieties only with phosphorus (+P) and rhizobium (+R) inoculation and without phosphorus (-P) and rhizobium (-R) inputs. On the other hand, one separate input trial comprised of four treatments (+P+R, +P-R,-P+R & -P-R) with three replications was conducted for comparison purposes. Initial soil analysis showed the soils at all plots were strongly acidic, and very low to medium range in soil organic carbon, total nitrogen, available phosphorus and exchangeable potassium, thus expected to considerably affect crop growth and yield across plots. Significant increase in grain yield was attained from Nasir (144%) and Angar (33%) varieties due to uses of the inputs (+P+R). However, the higher dry weight of husk was recorded from Angar. Moreover, the result of input trial revealed application of P with inoculants significantly increased the yield than the use of either of the two treatments. Despite the significant positive effects of inputs(+P+R) in bean yield performances and overall differences between the varieties, the responses across farmers' plots were not consistent and yield variability ranged from less than 0.3 t ha-1 to 3.86 t ha-1. In addition to differences in farmers' agronomic practices, which might significantly affect crop performances, variations in initial soil pH, OC, N, P and K across farmers' plots significantly caused confounding effects on responses of the crop to applied inputs. Thus, grain yield were positively and significantly correlated to the soil OC, N and K contents indicating these were the main drivers for the observed yield variability across farmers. In addition, the availability of K and P was influenced by the level of soil pH and OC content. While the use of rhizobium and P are recommended for bean production, more attention should be given to optimizing pH near to neutral level. In addition, determination of optimum K rate and revision of P fertilizer application rate are mandatory for sustainable production of common bean.