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Reducing Spatial Variability of Soybean Response to Rhizobia Inoculants in Siaya County of Western Kenya

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Abstract

Soybean grain yields in sub-Saharan Africa have remained approximately 50 % below those attained in South America despite numerous efforts.Variability in yields related to soil fertility remain a major challenges towards development of integrated soil fertility management packages for use with rhizobia inoculants. A study was conducted in Siaya County (western Kenya) involving 107 farmers with soils of different fertility status. The main objective was to test two inoculants (Legumefix and Biofix) and nutrient source (Minjingu and Sympal) combinations to raise soybean grain yields in the soils of variable fertility. Inoculation was done using Legumefix (*Bradyrhizobium japonicum* strain 532c) or Biofix (*Bradyrhizobium diazoefficiens* strain USDA110) with and without Minjingu or Sympal in a factorial design with each farmer acting as a replicate. Widespread potassium, nitrogen, phosphorus deficiency and soil acidity was observed in most soils. Inoculation and phosphorus+ sources resulted in increased nodulation, nodule occupancy and grain yields in most sites. The yield response varied from farmer to farmer with increases in grain yield and no response in other farms reported. Higher grain yields (3000–4000 kg ha^{-1}) were obtained with Legumefix+ Sympal (12 % of the farmers testing it). The formulation of the nutrient source (Sympal or Minjingu) was important to meet other nutrient deficiency in most of the soils. Determination of value cost ratio (VCR) showed that inoculants alone are the most profitable with VCR of 47.5 (Legumefix) and 11.4 (Biofix). However for sustainable yields Legumefix + Sympal, Legumefix +Minjingu and Biofix + Sympal were recommended with VCR of 6.3, 5.1 and 3.9 respectively.

Keywords: Biological nitrogen fixation, nodule occupancy, soil fertility gradient, soybean inoculants

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