ABSTRACT

Multiple-Bean Varieties as a Strategy for Minimizing Production Risk and Enhancing Yield Stability in Smallholder Systems

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Common bean (*Phaseolus vulgaris* L.) is perhaps the most important grain legume in sub-Saharan Africa (SSA) smallholder systems for food security and household income. Although a wide choice of varieties is available, smallholder farmers in western Kenya realize yields that are low and variable since they operate in risky production environments. Significant seasonal variations exist in rainfall and severity of pests and diseases. This situation is worsened by the low and declining soil fertility, coupled with low capacity of farmers to purchase production inputs such as fertilizers, fungicides and insecticides, and land scarcity. The objective of this study was to investigate whether growing multiple-bean varieties instead of a single variety can enable farmers enhance yield stability over seasons and ensure food security. Five common bean varieties were evaluated in multiple farms for 11 seasons at Kapkerer in Nandi County, western Kenya. Data were collected on grain yield, days to 50% flowering and major diseases. In addition, daily rainfall was recorded throughout the growing seasons. The five varieties were combined in all possible ways to create 31 single- and multiple-bean production strategies. The strategies were evaluated for grain yield performance and yield stability over seasons to determine the risk of not attaining a particular yield target. Results indicated that cropping multiple-bean varieties can be an effective way for reducing production risks in heterogeneous smallholder systems. Yield stability can be greatly enhanced across diverse environments, leading to improved food security, especially for the resource-poor smallholder farmers operating in risk-prone environments. Although the results show that some of the single-bean variety strategies were high yielding, their yield stability was generally lower than those of multiple strategies. Resource-poor risk averse farmers can greatly increase the probability of exceeding their yield targets by cropping multiple-bean varieties with relatively low yields but high grain yield stability. Trading-off high grain yield for yield stability might be an important strategy for minimizing bean production risks.

Key words: Common bean, Multiple varieties, Yield stability, Risk management, Smallholder systems.