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Science for Better Livelihoods in Dry Areas

YIELD GAPS, VARIETAL ADOPTION, AND SEED COMMERCIAL BEHAVIOR

Faba Bean Seed System in the Highlands of Ethiopia[1]

INTRODUCTION

Grain legumes play a crucial role in Ethiopian agriculture, with a 12.4 % share of the total land cultivated and 9.88% of the total grain production. Faba bean is the most important pulse crop, ranking first among all pulse crops (CSA, 2014) in terms of area allocation (31%), production (35%) and number of farmers involved (52%). Agro-ecologically, faba bean is grown in the highland areas of the country and produced under rain-fed condition. In recent years, faba beans have become one of the main agricultural export commodities and about 40 thousand tons with a value of close to 20 million USD were exported in 2014 (ECRA, 2014). However, faba bean production is highly constrained by adverse conditions for crop growth and production imposed by biological (biotic stresses) and environmental (abiotic stresses) factors. In addressing these challenges, the national agricultural research system has generated 31 improved varieties along with associated agronomic practices (MoA, 2014).

Despite the availability of improved varieties and associated crop management practices, availability and access to these technologies are limited, resulting in low productivity. The yield gaps between research-managed and national yield levels are still very high across all crops and agro-ecologies, including faba bean (Spielman et al., 2010). Likewise, the performance of the formal seed sector also varies considerably with crop type and agro-ecology, where legume seed supply in general and faba bean in particular is very low. This paper presents the performance of the faba bean seed system in the highlands of Ethiopia. It specifically presents the current yield gaps, the adoption of improved varieties, the commercial behaviour in seed, and the demand and supply relations for certified seed. The study was based on a nationally representative sample of 370 faba bean growers selected from 19 districts in 13 zones of the four major regions of the country (Amhara; Oromia; South Nations, Nationalities and Peoples and Tigray) during the 2014 cropping season.

KEY FINDINGS

Yield gaps

Yield gaps based on a comparison of the productivity levels achieved at national level, at farmers' field under farmers' practice and under recommended practices, and on-station at research stations may serve as indicators of the availability and access to technologies, knowledge and information, thereby reflecting on the performance of seed systems, extension services, and other input delivery systems (van Ittersuma et al., 2013; Spielman et al., 2010).

The results indicated that there is a clear yield gap in faba bean production due to variety and application of recommended crop management practices. The national average yield was 1.8 tonnes ha^{-1} in 2014 and is 44% and 50% lower than the yield achieved on farmers' fields with improved variety and recommended practices and at research stations, respectively. These trends indicate the potential of narrowing the yield gap through improved access to varieties and quality seed along with associated extension services on recommended agronomic practices (Table 1).

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Table 1: Yield gaps in faba bean production in the highlands of Ethiopia

Category	Yield range (tons/ha)	Use of technologies and practices
Research fields on-station	2.3 – 5.0 (~3.6)	• Improved variety • Recommended practices, and • Researcher managed
Farmers' fields with recommended practice	2.0 – 4.4 (~3.2)	• Improved variety • Recommended practices, and • Farmer managed
National yield level	1.1-1.9 (~1.5)	• National production system

Source: *MoA, 2014; CSA (2004-14)*

Note: *The ranges show recorded yield level*

Varietal adoption

The proportion of farmers growing improved faba bean varieties is low. About 19% of the faba bean growers were found to be full adopters where all plots were covered with improved varieties, 1.9% partial adopters, where only one or more of the plots were covered with improved varieties, and the remaining 79.1% were non-adopters, where all the plots allocated were covered with local varieties (Table 2). The adoption rate of faba bean based on the number of plots allocated with improved varieties is estimated at 18.93%, whereas the degree of adoption based on the proportion of land allocated with improved variety is estimated at 22.38%. The data shows a statistically significant difference between the average plot size allocated with improved varieties (0.37 ha) and allocated with local varieties (0.3 ha). This indicates that plots allocated with improved varieties are on average larger than those allocated with local varieties.

Of the total 31 released varieties, only six varieties, namely, CS-20–DK (with 2.54% of the adopters, released in 1977), Degaga (2.23%, 2002), Gabelcho (1.66%, 2006), Moti (0.63%, 2006), Kassa (0.59%, 1980), and Shallo (0.39%, 1999) were identified by 8% of adopters. The remaining 14.34% of adopters were not able to name the improved varieties they are growing. Some of the identified varieties, such as CS-20-DK, are more than 40 years old, showing the low varietal replacement rates in farmers' fields.

Table 2: Estimated adoption of improved varieties of faba bean in Ethiopia

Measurement	Adoption status	Estimated adoption (%)
Households	Full adopters	19.6
	Partial adopters	1.9
	Non-adopters	78.5
Plots	Adopters	18.93
	Non-adopters	81.07
Area	Adopters	22.38
	Non-adopters	77.62

Source: *Survey, 2014*

Commercial behaviours in seed use

Farmers may use seed from different sources for various reasons (Bishaw, 2004). Understanding the commercial behavior of smallholder farmers in terms of purchasing practices or use of saved seed helps in gauging the seed market and in targeting promotions to create demand and to ensure supply (Alemu and Bishaw, 2015; Bishaw et al., 2011).

The commercial behavior of faba bean producers indicates that only about 25% of the farmers use purchased seed from formal or informal sources. Of these 25% of farmers, only 6.4% purchased certified seeds, including partial adopters. The assessment further revealed that of the total 19.6% of farmers who are full adopters of improved varieties, only 5.4% purchased certified seed, whereas 4.8% purchased seed from local sources, and the remaining 9.4% used their own saved seed. About 1% of partial adopters (1.9%) also purchased certified seed whereas the remaining farmers used seed from informal sources. Among the non-adopters, 13.4% used purchased seed from local sources and 65.1% used saved seed. These results indicate that a major proportion of adopters or non-adopters of improved varieties depend on the use of saved seed or locally purchased seed for faba bean, showing the predominance of the informal sector.

Certified seed demand and supply

The public seed enterprises are the main actors in certified seed supply. Given the limited commercial interest in the crop, their engagement is low in terms of volume of seed and varietal coverage. The revealed certified seed demand of 5,752 tons is estimated to cover only 8.65% of the total faba bean area (0.44 million ha). However, only 45.9% of the revealed demand was actually supplied (2,638 tons), which can potentially cover 3.97% of the total faba bean area. Moreover, the data shows a mismatch between varietal choice and certified seed supply. The revealed demand was for eight varieties, i.e., Moti, Bulga, Wolki, CS-20-DK, Lalo, Dagem, Mesay, and Tesfa. However, the certified seed supply was only for four varieties, namely Moti, Bulga, CS-20-DK, and Mesay, implying that very few farmers were served through the formal sector despite a demand for quality seed of this crop. Moreover, seed of old commercial varieties are supplied through the formal sector.

CONCLUSIONS AND RECOMMENDATIONS

The yield gap, varietal adoption level, and the commercial behaviors of smallholders in faba bean seed use demonstrate the following key challenges and future areas of attention:

- Faba bean is grown as a food security crop in the highlands of the country where there is limited crop diversity. Moreover, the faba bean farming landscape is characterized by low average yields where local landraces and old commercial varieties dominate, showing a low rate of varietal replacement and leading to low productivity and high yield gaps. Therefore promotion of newly released improved varieties of faba bean and integrated crop management practices should be undertaken for increased crop productivity and faster varietal replacement;
- There is huge gap between the demand and supply of certified seed and mismatch of varietal choices from the formal sector. Moreover, the size of the revealed demand for certified seed is found to be very small and is not commensurate with the total land allocated for faba bean. In order to ensure realistic demand and supply of certified seed from the formal sector, better demand assessment measure should be in place taking into account shifts in farmers' demand in response to emerging production and marketing challenges. This should be coupled with creating demand for the use of certified seed and creating awareness for newly released varieties;
- The commercial behavior of farmers indicates the dominance of the farmers' use of their own saved seed or locally purchased seed even among adopters of improved varieties. Given the considerable use of saved seed of improved varieties, it will be important to promote decentralized and business-oriented seed production schemes by mobilizing the communities or farmer groups that can contribute to the use of quality seed of preferred varieties;

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