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Pre-Extension Demonstration of Faba Bean Variety with its Full Packages in Gamo Gofa Zone, SNNPRs, Ethiopia

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Abstract

Participatory pre extension demonstration of faba bean variety was conducted in Bonke and Chencha Woreda at three Kebele and 24 farmers field on 100 m^2 area of demonstration plots. All necessary inputs were delivered to farmers from Arbaminch agricultural research center. Farmers were trained and well capacitated by relevant researchers. After the provision of training, farmers sown the seeds on their farm and regular follow-up was undertaken by researchers. For the sake of to promote the technology to large scale field days was organized and farmer selected the variety according to their preference criteria and select dosha variety over local as better. The yield performance shows that dosha gave better yield (2.55 tons per hectare) than local variety (2.12 tons per hectare). To enhance diffusion and adoption of the variety, it is better to scale up dosha variety.

Keywords: Yield; Farmers; Farmers preferences; Field day

Introduction

Faba bean (*Vicia faba* L.) is also referred to as broad bean, horse bean and field bean and it is the fourth most important pulse crop in the world. The crop as a multipurpose use and is consumed as dry seeds, green vegetable or as processed food. Its products are a rich source of high-quality protein in the human diet, while its dry seeds, green haulm and dry straw are used as animal feeds. Faba bean seeds are used for human nutrition. The grain of faba bean contains a high protein content of 24%-33% [1].

Ethiopia is the world's second largest producer of faba bean next to China; its share is only 6.96% of world production and 40.5% within Africa. Farmers who adopted the new faba bean technologies, whether the full package or individual components, obtained significantly higher yields. Simply replacing traditional varieties with improved ones led to gains of 18% in Egypt, 8% in Sudan and 42% in Ethiopia [2].

Faba bean serves as a daily food and as cash crop in many parts of the country. This crop is a multipurpose crop. It is vital for soil fertility, human nutrition, animal feeding and industry purposes. The pulses production and productivity is constrained by several biotic and abiotic stresses, of which lack of improved varieties, shortage of certified seeds, diseases such as rust, powdery mildew and root rot, insect pests such as aphids and low soil fertility are the major ones and becoming a major challenge to food security. In addition to this, its production in Ethiopia is limited and fails to face the increasing local consumption of seeds due to gradual decreases in its average yield. So, increasing crop production is the major target of the national agriculture policy and can be achieved growing high yielding and stable cultivars under favorable environmental conditions [3].

In Ethiopia, the productivity of faba bean is far below its potential due to the fore mentioned factors. Winch reported that, the productivity of faba bean in Ethiopia is quite lower (1.52 ton/ha), as compared to in UK, which is about 3 ton/ha). In Ethiopia, there are about 29 improved faba bean varieties which are adapted to different agro-ecology and have different disease reaction. Farmers in the Ethiopia commonly used to cultivate local varieties. Therefore, growing of high yielding varieties of faba bean is crucial to ensure the sustainability of the crop and food security [4].

Even though faba bean is important crop as national and internationally, the production and productivity of faba bean in Southern Ethiopia is low 1.64 t/ha due to poor participation of farmers in the selection process, lack of improved varieties, poor agronomic practice, diseases and insect pests. Some improved faba bean varieties has been released by the different regional and federal research centers in the nation but farmers are still stress on few local faba bean varieties. Farmers are not were informed about the released varieties both agronomic practice and their economic importance because the varieties were released without the involvement of farmers and the released varieties had not yet scientifically demonstrated in the study area. To solve the problem, participatory demonstration was serves as the tools for to enhance technology adoption and diffusion of faba bean variety [5].

Objectives

- To enhance rapid diffusion and adoption of released faba bean variety.
- To evaluate farmers preferences and feedback information.
- To study cost benefit analysis of the demonstration plots.

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Materials and Methods

Selection of participant farmers

For conducting participatory pre extension demonstration of faba bean varieties three kebeles were selected from Chencha Woreda (2 kebeles) and Bonke Woreda (1 kebele) purposively based on the relevant agro-ecology for the specific commodity, twenty four participant farmers (beneficiaries) from all kebele were screened based on the willingness to participate and the availability of sufficient farm land for demonstration. Farmers Research Group (FRG) were organized and capacitated through different trainings and experience sharing [6].

Implementation procedure

Ten by ten (100 m^2) plot size area were prepared for each variety (dosha and local) by inter and intra spacing of 40 cm and 10 cm respectively and 100 kg/ha seed rate were used and 100 kg NPS fertilizer applied. The varieties were tested for their adaptation to our area by Arbaminch Agricultural Research Center (AMARC). The seeds were supplied by the project and distributed by AMARC in collaboration with the Woreda experts and development agents of the respective kebeles. As part of the intervention activities, training on agronomic practices was given to farmers, DAs and experts. Farmers evaluate the demonstration plots three times during crop stages (at seed emergency, at flowering, maturity stages). Finally, in order to evaluate the performance and final outputs of the varieties and share the lessons with different stakeholders, field days were organized in the fields of beneficiary farmers and technologies were promoted to the mass stakeholders [7].

Data collection methods

Both primary and secondary data were collected from various sources using different methods. The agronomic data were collected by the researchers directly from the field. The data on grain yield of the varieties were taken from 10 × 10 (100 m^2). The data were collected from all plots of the beneficiary farmers. In addition, perception data were collected using focus group discussion during evaluation periods [8].

The respondents were responding their perception level on the relative advantage of each characteristics of the variety compared to local/previously introduced varieties. Secondary information was also collected from the kebele, Woreda experts from office of agriculture and rural development [9].

Data analysis

The collected data were analyzed by using SAS V 9.0. Software, simple descriptive statistics and matrix rankings.

Results and Discussion

Yield performance of farmer's field

Yield data were collected from 24 farmers field and the yield performance was shown in the Table 1.

Location (N=24)	Mean yield performance of the variety	
	Dosha (qt/ha)	Local (qt/ha)
Ginko kebele	22.81	19.59
Zolo kebele	33	27.56
Yela kebele	20.48	16.44
G.mean	25.5	21.2
Note: 10 Qt=1 ton		

Table 1: Yield performance of farmer's field.

According to the above table, the mean yield performance of farmers field at Ginko kebele were 22.81 qt/hec and 19.59 qt/hec of dosha and local respectively. From Zolo kebele the mean yield of 33 qt/hec and 27.56 qt/hec of dosha and local respectively obtained. Finally, 20.48 qt/hec and 16.44 qt/hec of dosha and local were obtained [10].

On average, 25.5 quintal per hectare and 21.2 quintal per hectare of dosha variety and local respectively were obtained from the demonstration plots [11].

Yield performance of FTCs

According to the Table 2, the average yield that were obtained from all FTCs from dosha variety were 31 quintal per hectare and that of local were 29 quintals per hectare. Improved variety shows better performances at all FTcs except Ginko kebele [12].

Location	Yield performance of the variety	
	Dosha (qt/ha)	Local (qt/ha)
Ginko kebele	23	28.5
Zolo kebele	37.5	34
Yela kebele	31	25
Mean	31	29

Table 2: Yield performance of FTCs.

Yield increase and advantage

As the Table 3 shows that, dosha shows 322 kg yield increase and 16.44% yield advantage over local variety in Ginko kebele. In Zolo kebele dosha variety shows 544 yield increases and 19.74% yield advantage over local variety over local and finally in yela kebele, dosha shows 404 kg yield increase and 24.6% yield advantage over local variety. Generally, dosha shows 423.4 kg or 4.234 quintal yield increase and 20.25% yield advantage over local variety [13].

Location	Yield increase(kg)		Yield increase	Yield advantage (%)
	Dosha	Local	Dosha	Dosha
Ginko kebele	2281	1959	322	16.44
Zolo kebele	3300	2756	544	19.74
Yela kebele	2048	1644	404	24.6
Mean	2550	2120	423.4	20.25

Table 3: Yield increase and advantage.

Farmers preferences

Farmers preferences criteria were conducted and they compare and rank improved variety with checks by 10 different criteria. Farmers who participated and evaluated the demonstration plots were representative to the area and having long experience in farming. Before beginning of the selection process, selected farmers from the districts were asked to set their priority selection criteria. Selection criteria of farmers in the study area was based on an extensive discussion and agreement and farmers set criteria during seed emergency, flowering and maturity stage of the crop and shown as below (Table 4) [14].

- Seed emergency
- Branch number
- Pod number
- Seed number
- Earliness
- Disease and pest resistance
- Stem strength
- Seed size
- Yield
- Marketability

Variety	Location									
	Zolo			Ginko			Yela			Over all
	Total score	Mean score	Rank	Total score	Mean score	Rank	Total score	Mean score	Rank	
Dosha	36	3.6	1	32	3.2	1	35	3.5	1	1
Local	27	2.7	2	31	3.1	2	25	2.5	2	2

Table 4: Farmers preferences.

Farmers scored each variety for individual traits considered important by them and ranking of varieties were done on a scale of 1-4, 4 being the highest score representing very good and 1 being very poor. According to the table above ranking and scoring of faba bean variety, the highest score was recorded for dosha variety (3.6 in Zolo and 3.5 in Yela) and the lowest score was recorded for local check. Farmers select dosha variety by its seed earliness, disease and pest resistance, its high branch number, pod number and its high yield [15].

Direct cost-benefit analysis

Cost benefit analysis is the tools to identify the incomes gained and the costs for obtaining the net benefits (Table 5).

Items	Quantity/Unit	Unit price/Cost	Dosha	Local
Average yield (kg/hectare)	Kg	ETB	3100	2900
Adjusted yield (-10%)	-10%	-	2790	2610
	In ETB	10 ETB	27,900	26,100
Total gain in birr (A)			27,900	26,100
Fertilizer costs in kg	NPS	100 kg	1200	1200
Seed cost	100 kg	ETB (Dosha=20, local=10)	2000	1000
Land preparation	Ha	ETB	1000	1000
Labor costs per day	Sowing	1 day*10 person*50 birr	500	500
	1st and 2nd weeding	2 day*10 person*50 birr	1000	1000
	Fertilizer application	1 day*10 person*50 birr	500	500
	Harvesting and threshing	1 day*10 person*50 birr	2000	2000
Transporting cost	-	-	1000	1000
Total costs (B)	-	-	9200	8200
Net benefit (A-B)	-	-	18,700	17,900

Table 5: Cost benefit analysis.

According to CIMMYT the yield obtained initially were adjusted at -10% because the adjusted yield for a treatment is the average yield adjusted downward by a certain percentage to reflect the difference between the experimental yield and the yield farmers could expect from the same treatment. Experimental yields, even from on-farm experiments under representative conditions, are often higher than the yields that farmers could expect using the same treatments. Because of:

Management: If they manage the experimental variables. Researchers can often be more precise and sometimes more timely than farmers in operations such as plant spacing of the plant, weed control or fertilizer application.

Plot size: Yields estimated from small plots often overestimate the yield of an entire field because of errors in the measurement of the harvested area and because the small plots tend to be more uniform than large fields.

Harvest date: Researchers often harvest a crop at physiological maturity, whereas farmers may not harvest at the optimum time. Thus, even when the yields of both researchers and farmers are adjusted to constant moisture content, the researchers yield may be higher, because of fewer losses to insects, birds, rodents, ear rots, or shattering.

Form of harvest: In some cases, farmers harvest methods may lead to heavier losses than result from researchers harvest methods. This might occur, for example, if farmers harvest their fields by machine and researchers carry out a more careful manual harvest.

As the table shows that the net benefits that were obtained from dosha after harvesting were 18,700 ETB and that of local was 17,900 ETB. Relatively dosha gave better net benefits than local variety.

Conclusion

Two varieties of faba bean (dosha and local) were demonstrated on 24 farmers fields and at three different FTCs on 100 m^2 areas by seed rate of 100 kg/hectare, 40 cm × 10 cm of inter and intra spacing. Finally, field day was organized and the demonstration plots visited by kebeles and neighbor kebeles farmer, kebeles development agents and Woredas personnel. Yield data were collected and obtained 25.5 quintal/hectare of dosha and 21.2 quintal/hectare of local variety. Generally, farmers select dosha variety as best by different criteria.

It was recommended that, it is better to disseminate disease and pest resistant and high yielding varieties through scaling up to enhance dissemination and diffusion. It is better to train farmers on agronomic practices from production to marketing to boost the production and to maximize yields.

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