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Pre-extension Demonstration and Evaluation of improved Fababean technology in Jarso and Kersa Districts of Eastern Hararghe Zone

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ABSTRACT

The study was conducted in the Jarso and Kersa districts of the East Hararghe Zone. Introducing improved technologies such as fababean (Hachalu and Dosha) varieties has great advantages for the producers to minimize risks associated with it and maximize their benefits. The activity was undertaken for two consecutive years of main cropping season (2017-2018). In the process, mutual learning among farmers, researchers and development agents has been enhanced. Fababean varieties have been demonstrated among Farmers Research Group members. The number of participants on training and mini field day were 36 and 93, respectively. The yield result indicated that Dosha and Hachalu recorded 28.6 and 27.2 qt/ha at Afgug and 21.6 qt/ha and 21.1 qt/ha at Tola, respectively. Awareness of the advantages of fababean technology for farmers was increased through the promotion of this technology. Both varieties were recommended for more promotion in the area and other similar agro-ecology. Therefore, all concerned bodies should share their responsibility for future intervention and wider promotion of the technology.

Keywords: *Fababean, Demonstration, FRGs, Dosha and Hachalu.*

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 (Sainte, 2011). It is one of the oldest domesticated food legumes that have been cultivated for at least 5,000 years. According to the United Nations Food and Agriculture Organization (FAO, 2014), China is currently the world's leading producer, accounting for approximately 60% of the total. Fababean is an annual herbaceous plant with coarse hollow stems that can reach heights of two meters. Faba bean (Vicia faba L.) is one of the major pulse crops grown in the highlands of Ethiopia (Fedaku et al., 2019). It is the most important pulse crop in terms of both area coverage and the volume of annual production in the country (CSA, 2021). Nationally, about 511,908.4 ha of land was covered annually by fava bean, and 3,682,512 smallholder farmers were engaged in growing the crop.

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The average national yield of faba bean is about 2.1 t ha-1 (CSA, 2018), which is very low compared to the average yield of 3.7 t ha-1 in major producer countries (FAOSTAT, 2017).

Faba bean contains a large amount of proteins, carbohydrates, B-group vitamins and minerals. The protein content (29.57-31.83%), carbohydrate (52.96-54.60%), ash (3.37-3.47%), fat (0.81-1.24%) and fiber (10.88-11.96%) of faba beans depends on the variety (Sarah et al., 2009). Due to its high nutritional value (protein content of 24–30%) and high energy, this crop is grown for human consumption and animal feed in many parts of the world (Maalouf et al., 2019). Faba bean is consumed as a green vegetable (pods) and sometimes as split seeds. Faba bean is grown in rotation with cereal crops and improves soil fertility through nitrogen fixation (IFPRI, 2010). Nitrogen fixation in the root system of the faba bean makes more soil N available to the next crop, reducing the need for fertilizer-N and, in some cases, adding to soil organic N.

Faba bean production is insufficient because crop yields are low because farmers grow varieties that are susceptible to diseases, insect pests, drought and high summer temperatures (Fouad et al., 2013). East Hararghe is predominated by cereal crops (particularly sorghum and rarely maize) production and chat. This monoculture makes the soil fertility depletion. Faba bean is rarely grown on small-scale lands. In order to solve this problem, the Fedis Agricultural Research Center has conducted an adaptation of different faba bean varieties in some districts of East Hararghe Zone. Two improved varieties of faba bean reached farmers through demonstration.

Therefore, this activity was conducted to evaluate the productivity and profitability of these technologies under farmers' conditions.

Objectives

- To evaluate the productivity and profitability of the technology under farmers conditions.
- To create awareness among farmers, developmental agents, subject matter specialists and other participant stakeholders on improved fababean varieties production technologies.
- To strengthen linkage among stakeholders

MATERIALS AND METHODS

Description of the study area

Kersa is one of the districts in the East Hararghe Zone of the Oromia Region. It is named after a river that flows through it, the Kersa. The district is bordered in the South by Bedeno, in the West by Meta, in the North by Dire Dawa, in the Northeast by Haro Maya, and in the Southeast by Kurfa Chale. The administrative centre of the district is Kersa. The altitude of this woreda ranges from 1400 to 3200 meters above sea level. Khat, fruits and vegetables are important cash crops grown in the area. Coffee is also an important cash crop covering more than 50 square kilometres. Jarso is bordered in the South by the Harari Region, in the West by Kombolcha, in the North by the city of Dire Dawa, in the East by the Somali Region, and in the Southeast by Gursum. The administrative centre of this district is Ejersa Goro. The altitude of this district ranges from 1050 to 3030 meters above sea level; Mount Gara Sirirta, Aybera, Kilisa and Bekekalu are amongst the highest peaks. Khat, fruits and vegetables are important cash crops grown in the area.

Site and farmers selection

The activity was conducted in selected districts of East Hararghe Zone for two consecutive years of the main cropping season. Jarso and Karsa districts were selected based on the potentiality of pulse crop production. Two representative potential kebeles were selected purposively from selected districts in collaboration with Experts and Development Agents based on accessibility and potentiality for pulse crop production. From each kebele, 1FRG (Farmer Research Group) member considering gender issues. 1FRG, having 15 farmers, was established.

FRG farmers were selected based on their interest in technology, willingness to share costs like land provision and labour work, and willingness to share innovative

experience for the members and non-members of target farmers. In Each FRG member, ten representative trial farmers from each kebele were selected. Moreover, as a demonstration site, 1 FTC (Farmer Training Center) in each kebele was involved in technology promotion.

Technology evaluation and demonstration methods

The demonstration was undertaken in farmers' fields to create awareness about the Fababean technologies. The training was organized on the agronomic practice of the technology for farmers, development agents and experts.' An exchange visit was conducted to enhance farmers' awareness towards the technology. The activity was jointly monitored by FRGs, researchers, experts and development agents.

Research Design

Two improved varieties of fababean (Dosha and Hachalu) and one local check were replicated across ten trial farmers per kebele. Sown on 20 farmers land. A simple plot design (10m*10m) of land from an individual trial farmer for each variety was used. Spacing 40cm*20cm (Between row and plant) respectively. Ten trial farmers per Keble's were used as replications of the varieties. Seed rate of 134 kg/ha and fertilizer rate of 100kg/ha DAP and no need of Urea.

Methods of Data Collection

Quantitative and qualitative data were collected through personal field observation, individual interviews, and Focus group discussions using a checklist.

Data to be collected

Quantitative data, such as the number of farmers who participated, yield performance, and the number of stakeholders who participated in training and field day, while qualitative data, such as farmers' feedback and perception toward the new technology, were collected.

Data analysis

Quantitative data was summarized using simple descriptive statistics such as mean, frequency and percentage, while the qualitative data collected was analyzed using narrative explanation and argument. The cost-benefit ratio was used to evaluate the profitability of the technology. Finally, data from different sources was triangulated to get reliable information.

RESULT AND DISCUSSION

Capacity building training provided for stakeholders

Training is the most important component of the extension approach. During this stage, stakeholders are developing knowledge and skills to adapt new practices. Multidisciplinary Fedis agricultural research centre researchers participated in training delivery. The training was given on improved Fababean production, market information and knowledge, skill and experience sharing and technology transfer approaches.

Table 1: Number of participants in the training at Jarso

		Jarso		
No.	Participants	Male	Female	Total
1	Farmers	22	8	30
2	DAs	3	0	3
3	District experts	2	1	3
	Total	27	9	36

Source: Own computation 2017/18

Among the training participant stakeholders, 83.3% were farmers. Of those farmers, 26.7% and 73.3% are female and male farmers' respectively.

Table 2: Type of profession and number of participants on the mini-field day organized at Jarso

		Jarso		
No.	Participants	Male	Female	Total
1	Farmers	47	27	64
2	Das	8	0	8
3	District experts	9	2	11
	Total	64	29	93

Source: Own computation 2017/18

Mini-Field day organized

Different extension materials were utilized and distributed to the participants. For those individuals, 60 leaflets and 35 small manuals on the technology that are organized in Afaan Oromoo and English languages were distributed. During the mini-field day and farm visit, different questions, opinions and suggestions were raised and reacted by the concerned bodies. Most farmers showed high interest towards improved fababean technology production because of better grain yield and earned income by selling seeds for different stakeholders as compared to the local seeds. Generally, all farmers were very interested to have the technology for their future production.

Yield performance of the varieties

Yield of improved fababean (Dosha, Hachalu) and local ranges from 28.6, 27.2 and 16.98 at Afgug kebele, respectively. Hachalu variety gave higher grain yield (21.6 qt/ha) followed by Dosha (21.1 qt/ha) and local check (13.20 qt/ha) at Tola kebele. Both improved varieties used for the experiment showed better mean yields in both districts.

Table 3: Yield performance of early maturing Fababean varieties across districts

PA	Varieties	Mean	Maximum	Minimum
Afgug	Dosha	28.6	30	24.2
	Hacalu	27.2	30	22.4
	Local	16.98	18.3	15.5
Tola	Dosha	21.1	23.7	13.5
	Hacalu	21.6	22.4	20
	Local	13.2	14.1	12
Total	Dosha	24.9	30	13.5
	Hacalu	24.4	30	20
	Local	15.1	15.1	12.6

Summary of yield advantage of the varieties

Table 4: Summary of yield performance in study areas

Varieties	Average yield qt/ha	Yield difference	Yield advantage over local check (%)
Dosha	24.9	9.8	64.9
Hacalu	24.4	9.3	61.58
Local	15.10	-	-

Source: Own computation 2017/18

The yield advantage of Dosha and Hachalu over local check was 64.9% and 61.58% respectively.

Cost-benefit analysis

Table5. Profitability of the technology per hectare

No	variables	varieties	
		Dosha	Hachalu
1	Yield (in qtl/ha)	24.9	24.4
2	Price (ETB/qtl)	2500	2500
3	Gross returns (1*2)	62,250	61,000
4	Seed purchase (1.34 qtl/ha) ETB/ha	3,484	3,484
5	Fertilizer purchase (100kg DAP/ha)	1800	1800
6	Labour cost	4,000	4000
7	Land preparation (ETB/ha	3,000	3,000
8	Total variable cost (Σ4-7) for ETB/ha	12,284	12,284
9	Fixed costs (Costs of land) in ETB/ha	5000	5000
10	Total cost (Σ8+9) ETB/ha	17,284	17,284
11	Net return (3-10)	44,966	43,716
12	Cost-benefit ratio(11/8)	3.66	3.55

Both varieties were profitable as compared to the local variety. Their benefit-cost ratio is more than 1.

Farmers' Perception

Farmers selected the varieties based on criteria such as maturity, grain yield, disease tolerance, pod number, Seed per pod, and seed size. Based on the above criteria, farmers evaluated the varieties and ranked Dosha first, followed by the Hachalu variety. Farmers identified/are aware that the local seed variety has poor performance as compared to the improved one.

Table 6: Ranks of the varieties based on farmers' selection criteria

Crop varieties	Farmers rank	Reasons
Dosha	1st	Maturity, High grain yield, Good disease tolerance, Pod per plant, Seed per pod Performance at growing stage and Large seed size
Hacalu	2nd	Maturity, High grain yield, Disease tolerance, Pod per plant, Seed per pod, Performance at growing stage and Large seed size
Local check	3rd	Maturity, Low grain yield, Disease tolerance, Pod per plant, Seed per pod, Performance at growing stage and Small seed size

Table 7: Direct Matrix Ranking

S. no.	Traits	Dosha	Hachalu	local	Total	Rank
1.	Early maturity	4	4	3	11	4th
2.	Overall yield	5	5	4	14	1st
3.	Disease tolerance	5	5	3	13	2nd
4.	Pod per plant	5	4	3	12	3rd
5.	Seed per pod	4	4	2	10	5th
6.	Performance at the growing stage	4	3	2	9	6th
7	Seed size	3	3	2	7	7th
8	Total	30	28	19		

CONCLUSION AND RECOMMENDATION

The focus group discussion identified the most preferred variety through participatory demonstration. From the result of the study, Dosha and Hachalu varieties have maximum yield advantages of 64.9 % and 61.58% over local varieties, respectively. Therefore, the Dosha variety was recommended for further scaling up and popularization in the study area and similar agroecology.

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