International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 8 Issue 2, March-April 2024 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Pre-extension Demonstration and Evaluation of Common-Bean Technology in Low Land of East Hararghe Zone, Oromia

Abdulaziz Teha, Oromia Megersa, Bedasso Urgessa

Oromia Agricultural Research Institute, Fedis Agricultural Research Centre, Harar, Ethiopia

ABSTRACT

Pre-extension demonstration of common bean technologies was conducted at Fedis and Babile districts of the East Hararghe zone. One FRG from kebele was established and 10 trial farmers. Both varieties were sown on 10m*10m plot size with full package technology. Farmers were trained by researchers. After the provision of training, farmers were sown on their farms, and regular follow-ups were undertaken by researchers. The yield performance of the improved varieties (Awash-2 and serie-125) were 18.26, 23.64 qt/ha at Ifadin and 20.46, 23.64 qt/ha at Riski kebele respectively. The result showed that there is a statistically significant difference at 5% probability level between Awash-2 and serie-125 variety and also serie-125 has 22.5% yield advantage over Aawash-2. Therefore, it is better to pre-scale up Awash-2 for the study area and similar agroecologies because of its color, market demand, and market price though its yield is lower than serie-125.

KEYWORDS: *Demonstration, Common bean, FRG, Evaluation, Technology*

How to cite this paper: Abdulaziz Teha | Oromia Megersa | Bedasso Urgessa "Pre-extension Demonstration and Evaluation of Common-Bean Technology in Low Land of East Hararghe Zone, Oromia" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-8 | Issue-2, April 2024, pp.423-426, URL: www.ijtsrd.com/papers/ijtsrd64640.pdf

IJTSRD64640

INTRODUCTION

Ethiopia is one of the top twelve producers of total pulse in the world, the third-largest producer of haricot bean in COMESA member countries, and the leading exporter in Africa (Agitu, 2014). However, despite their importance from a community perspective, caloric intake from consumption of pulses and oilseeds combined was reported at 9% for rural and 14% for urban communities (Kebebu, *et al*., 2013; Roba, *et al*., 2015). Of a total of 12.4 million hectares of farmland in Ethiopia, the majority is used for the production of cereals (9.16 million hectares); a relatively small area is seeded to pulses 1.41 million hectares (FAO, 2019). The current national average productivity of haricot bean in Ethiopia is 1.48 tons per hectare which is below average research demonstrated productivity potential (3.4 tons per hectare) in the country (Mulugeta *et al.,* 2015). This is attributed to the combined effects of edaphic, climatic, disease, and pest problems and the lack of improved varieties is one of the top problems for low yield (Gurmu, 2013).

Haricot bean is one of the pulse crops considered the main cash crop and protein source of many lowlands and mid-altitude zones of Ethiopia and the crop has a high nutritional value with important protein contents (22%), minerals (calcium, copper, iron, magnesium, manganese, zinc), and vitamins necessary to warrant the food security of people (Wondimu *et al.,* 2017 and Kabata *et al.,* 2017). The crop is widely grown in areas between 1400-2000 m.a.s.l. The main production areas include East Hararghe, West Wollega, East Shewa, West Arsi, Sidama, Wolayita, Wollo, and East Gojam (EIAR, 2014).In East Hararghe haricot-bean is the most important pulse crop that farmers cultivate as intercropping with sorghum, maize, and even in some areas in sole. However, the lack of improved varieties which can stand with variable climate conditions is the challenge farmers face. Therefore, this proposal is initiated to curtail the challenges farmers face in lacking improved Haricot bean varieties with the recommended packages.

Objectives

- To evaluate the productivity and profitability of common bean Technology under farmers' conditions.
- To create awareness among farmers, developmental agents, and subject matter specialists on improved common bean production technology.
- To collect farmers' and stakeholders' feedback regarding the technologies

Materials and Methods

This pre-extension demonstration of common bean was conducted in the Fedis and Babile districts of East Hararghe Zone.

Description of the study area

Fedis district has a latitude between 8°22' and 9°14' North and a longitude between 42°02' and 42°19' East, in middle and low land areas: altitude range is from 1200 – 1600m.a.s.l, with a prevalence of low lands. The area receives an average annual rainfall of 400 - 804 mm. The minimum and maximum temperature of the area is 20 – 25°C and 30 – 35°C, respectively. The population's livelihood mainly consists of agriculture, husbandry, and small-scale trade. The farm units are small family holdings with an average agricultural land area of less than one hectare. Agriculture is mainly rain-fed. The cropping system is classified as intensive with cereal mono-cropping mainly sorghum and maize.

Babile is located at a distance of 31 km from Harar in the direction of the country's Eastern part. It is bordered by Gursum in the Northern, Fedis in the South, Sumale region in the eastern, Harari region and Fedis in the western, and Jarso in the Northwestern. Erer Ibada located on distance of 33 km from Harar and Erer Ibada is located at 09° 10' 41.5" North of latitude, 042° 15' 27.3" East of longitude and elevation of 1274m a.s.l. The physical property of the soil in the study area is sandy loam (the majority of the soil in the study area is sandy and an equal proportion of silt and clay is known as sandy loam). The climatic condition of this area is almost dry land. It has a bimodal nature of rainfall. The socio-economic characteristic of the population in the study area depends on subsistence agriculture. These study areas have the potential for the production of horticultural crops both during the main (rainy) season and off-season (Belg).

Site and Farmers Selection

Fedis and Babile districts were purposively selected based on their potential in pulse and oil production. Ifadin and Riski were selected purposively based on the potentiality, and appropriateness of the area by considering lodging, slop's land escape, access to road, and suit for repeatable monitoring and evaluation in the progress of sowing to harvesting. The selected farmers were grouped in the form of Farmers Research Group (FRG) with members of 15 (3 male trial farmers and 2 female trial farmers) and 10 farmers working with trial farmers.

Table 1: Selected site and farmers with area coverage of the experiment

District	Kebele	No. of trial farmers	Area covered
Fedis	Riski	5	10mx 10m
Babile	Ifadin	5	for each plot
Total		10	

Technology evaluation and demonstration methods/technique

The evaluation and demonstration of the trials were conducted on farmers' fields to create awareness about common bean production. The evaluation and demonstration of the trials followed process demonstration approach by involving FRGs, development agents, and experts at different growth stages of the crop. The activity was jointly monitored by FRGs, researchers, experts, and development agents.

Experimental design

Two improved treatments (Awash-2 & Serie-125) were replicated across five trial farmers per kebele. Two improved varieties were sown on 10 trial farmers' land. 10m*10m plot size of land used from individual trial farmers for each variety. Each variety is planted at a spacing of 40cm between rows and 10 cm between plants. Fertilizer rate of 100 kg NPS/ha and seed rate of 100kg/ha.

Data Collection

Both quantitative and qualitative data were collected through personal field observation, individual interviews, and Focus Group discussions using a checklist and datasheet. The number of farmers who participated in FRG, yield performance, economic data, and number of stakeholders who participated in the training were quantitative data collected while farmers' perceptions towards the new technology were qualitative data collected.

Data analysis

Quantitative data was summarized using simple descriptive statistics (mean, frequency, and percentage) while the qualitative data collected using group discussion, field observation, and individual interviews was analyzed using narrative explanation and argument. Data from different sources were triangulated to get reliable information.

Results and Discussion

Agronomic and yield performance

The following table describes the yield performances of the demonstrated Awash-2 and Serie-125 common bean varieties across the study sites. The yield performance of the improved Awash-2 variety and serie-125 were 18.26, 23.64, 20.46, and 23.64 qt/ha at Ifadin and Riski kebeles respectively.

Table 2: Yield performance of improved varieties across Districts

Kebele	Varieties	N	Std. Deviation	Mean (qt/ha)	Maximum	Minimum
Ifadin	Awash-2	5	1.39	18.26	20.00	16.40
	Serie-125	5	2.40	23.64	27.00	20.80
Riski	Awash-2	5	2.25	20.46	23.00	18.00
	Serie-125	5	2.40	23.64	27.00	20.80
Total 10			**2.86**	21.06	27.00	16.40

The average yield performance of Serie-125 is higher than Awash-2 at Ifadin and Riski.

Independent sample t-test

Table 3: Sample t-test

	Test for equal variances		t-test for equality of means				
	F	Sig.	t	df	Sig. (2tailed)	Mean difference	Std. Error Differences
Equal variances assumed	6.94	.030	2.76	8	.025	3.64	1.31

Statistically significant difference at 5% probability level

Yield Advantage

The yield advantage of the demonstrated varieties was calculated using the following formula.

Yield advantage % = Yield advantage of new variety – Yield advantage of st; check X 100
Yield advantage of standard check

Table 4: Yield Advantage

Varieties	Average yield qt/ha	Yield difference qt/ha	Yield advantage over the standard check (%)
Awash-2	19.45	4.2	21.5
Serie-125	23.64		

Economic Analysis

Table 5: Financial analysis for Common bean varieties across the districts

Financial analysis				
	Location: Babile		Location: Fedis	
Parameters	Varieties		Varieties	
	Awash-2	Serie-125	Awash-2	Serie-125
Yield qt/ha(Y)	18.26	23.64	20.46	23.64
Price(P) per quintal	6000	4000	6000	4000
Total Revenue (TR)=TR=Y*P	109,560	94,560	122,760	94,560
Variable costs				
Seed cost	5,500	4,000	5,500	4,000
Fertilizer cost	3,800	3,800	3,800	3,800
Labor cost	15,000	15,000	15,000	15,000
Total Variable costs(TVC)	24,300	22,800	24,300	22,800
Fixed costs				
Cost of land	6,000	6,000	6,000	6,000
Total fixed costs (TFC)	6,000	6,000	6,000	6,000
Total cost (TC) =TVC+TFC				
Gross Margin (GM) = TR - TVC	85,000	71,760	98,460	71,760
Profit=GM-TFC	79,000	65,760	92,460	65,760

Farmers' Perception

Farmers in the study area selected the best-performing common bean varieties by using their criteria. Farmers set these criteria after having know-how about the variety and using those criteria they could select the varieties at

harvest time. The opinion of those farmers on varietal preference was collected from participants during the varieties demonstration. The major criteria used by farmers were maturity, yield, disease tolerance, seed/grain color, market demand, and market price

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

Varieties	Farmers rank	Reasons
Awash-2	1st	Medium maturity, high yield, better disease tolerance, white in seed/grain color, high market demand, high market price
Serie-125	2nd	Medium maturity, high yield, better disease tolerance, Red in seed/grain color, medium market demand, medium market price

Conclusion and Recommendation

The yield of the improved varieties (Aawash-2 and serie-125) was 18.26, 23.64 20.46, and 23.64 qt/ha at Ifadin and Riski Kebeles respectively. The average yield performance of Serie-125 and Awash-2 at both locations statistically significant differences at 5% significance level. It is better to disseminate the variety that has market demand, better market price, and good color variety for scaling up to enhance dissemination. Therefore, the agricultural research center and agriculture office should work in collaboration on the Awash-2 variety in the study area and similar agroecology for further promotion.

References

[1] Agete J. 2014. Analysis of factors influencing participation of smallholder farmers in red bean marketing in Halaba special district, Ethiopia. MSc Thesis. University of Nairobi, Kenya, p: 109.

[2] FAO (2019).Special Report Fao/Wfp Crop and Food Security Assessment Mission to Ethiopia. FAO/WFP.

[3] Gurmu F (2013) Assessment of farmers' criteria for common bean variety selection: The case of Umbullo watershed in Sidama zone of the southern region of Ethiopia. Ethiopian e-journal for Research and Innovation Foresight 5: 4-13.

[4] Kabata A, Henry C, Moges D, Kebebu A, Whiting S, et al. (2017) Determinants and constraints of pulse production and consumption among farming households of Ethiopia. Journal of Food Research 6: 41-49.

[5] Kebebu, A., Whiting, S. J., Dahl, W. J., Henry, C. J., & Kebede, A. (2013). Formulation and acceptability testing of a complementary food with added broad bean (V*iciafaba*) in southern Ethiopia. *African Journal of Food Agriculture Nutrition and Development, 13*(3).

[6] Kebede B, Korji D, Amare G (2018) Participatory Evaluation and Selection of Improved Haricot bean Varieties at Liben District, Lowland Agro Ecology of Guji Zone, Oromia Regional State, Ethiopia. Adv Crop Sci Tech 6: 332. doi:10.4172/2329-8863.1000332

[7] Mulugeta A, Tesfaye K, Dagne K (2015). The importance of legumes in the Ethiopian farming system and overall economy: An overview. American Journal of Experimental Agriculture 7: 347-358.

[8] Roba, A. C., Gebremichael, K., Zello, G.A., Whiting, S.J.,& Henry, C.J. (2015). Nutritional status and dietary intakes of rural adolescent girls in southern Ethiopia. *Ecology of Food and Nutrition, 54*(3),240 54. https://doi.org/10.1080/03670244.2014.974593 Burman, R., Singh, S.K., Singh, L., & Singh, A.

[9] Wondimu W, Bogale A (2017) Genetic Variability, Heritability and Genetic Advance of Some: Haricot Bean (Phaseolus vulgaris L.)Varieties at Bench-Maji Zone, Southwest Ethiopia: Asian Journal of Crop Science 9: 133-140.