Int.J.Curr.Res.Aca.Rev.2023; 11(9): 66-72

International Journal of Current Research and Academic Review

ISSN: 2347-3215 (Online) Volume 11 Number 9 (September-2023)

Journal homepage: http://www.ijcrar.com

doi: https://doi.org/10.20546/ijcrar.2023.1109.009

Promotion of Large-scale Demonstration and Participatory Evaluation of Improved Barley Varieties in Potential Areas of West Shewa Zone

Dawit Milkias*, Soruma Gerbi, Alem Jambo and Yenenesh Duguma

Ambo Agricultural Research Center P. O. BOX 37 Ambo, Ethiopia

**Corresponding author*

Abstract

In Ethiopia barley is widely grown by smallholders as a staple food and as a source of cash income. The cluster-based pre-scaling up of improved food barley variety was done at West Shewa Zone four districts (Elfeta, Toke kutaye, Ambo and Midakegn) with the objectives of popularizing advanced barley variety (HB1307) on large scale demonstration farming approach. A total of 127 farmers were participated on food barley production cluster in all districts with in 68 hectares of land. The technical skills of cluster groups on food barley variety (HB1307) production were improved through practical demonstrations and give trainings. The high-quality food barley variety named as "HB1307" variety with recommended agronomic practices was supplied for cluster groups by Ambo Agricultural Research Center. Based on food barley productivity potential and CSA data, the average yield obtained from the cluster was 2.9 tons/ha, which is more than the yield advantage using CSA data in the Zone, which is 2.89 tons/ha. This yield exceeds both the national average 2.6 tons/ha and the regional average 2.86 tons/ha CSA 2021). Therefore, scaling-out of the variety with full production packages should be carried by each district extension agents for similar agro-ecological areas through establishing and strengthening seed producer Cooperatives.

Article Info

Received: 30 July 2023
Accepted: 28 August 2023
Available Online: 20 September 2023

Keywords

Cluster groups, West Shewa Zone, Yield advantage, HB1307 variety.

Introduction

Barley is a major grain crop in Ethiopia, cultivated in a wide range of ecologies between 1800 and 3400 meters above sea level, with different growing seasons and techniques (Muluken, 2013). Ethiopia is the second-largest producer of barley in Africa, following Morocco, producing about 25% of the continent's total barley (FAO, 2014).

In the highlands of the West Showa zone, barley is cultivated by most smallholder farmers as their main crop, and it has a lot of potential. Nonetheless, the region's trend in food barley output has been declining for the past few years. There are lots of different contributing factors. The production of food barley may have shifted to other high-value crops as a result of several factors, including the low yield of food barley landraces and the government's current priorities.

The national and regional research systems in the country have been undertaking a number of research activities on crop improvement and have been releasing numerous varieties in an effort to address the productivity problem in the study area. In accordance with the aforementioned information, the Ambo

Agricultural Research Center and the agricultural extension team conducted a large-scale demonstration convey and used participatory variety selection to identify the best-performing and highest-yielding food barley variety in order to increase the target zone's barley productivity. However, the selected and highly performed varieties were not demonstrated widely to the farmers yet (Solomon and Muluneh, 2022).

The majority of farmers in the Zones still use local varieties, which are known for their extremely low yield and high vulnerability to disease, even though this variety is readily available. In the West Shewa Zone, low production yields are primarily caused by a lack of improved seed types, a low utilization of better production technology, and a high prevalence of rust diseases linked to both biotic and edaphic variables in the selected districts. Therefore, in order to increase food barley production and productivity in the highland areas of the West Shewa Zone, specifically the districts of Ambo, Toke Kutaye, Midakegn, and Elfata, this activity was started to demonstrate and popularize improved food barley technology at large and clustered farms, organizing farmers in groups with its full packages.

The main objectives of this study to demonstrate and popularize advanced barley variety (HB1307) on large scale demonstration farming approach. To strengthen farmers' awareness, access to and adoption of full package production technologies of selected commodity; And also to evaluate farmers' opinions and comments regarding the upgraded food barley technology.

Materials and Methods

Site selection and participant farmers

The large-scale demonstration activity was conducted in West Shewa Zone highland areas to increase production and productivity of food barley through promotion and popularization. West Shewa Zone were purposively selected based on agro-ecological zone as the target population for this cluster farming. From high land areas of the Zone, four districts were randomly selected including Ambo, Toke kutaye, Midakegn and Elfata Districts.

The districts were selected purposively based on their potential for food barley production and accessibility for supervision. The selection of Districts and kebeles were done together with districts Agriculture Office and the extension team. Potential Kebeles were selected in order to conduct the large-scale demonstration activity. Two potential Kebeles from the districts were selected based on accessibility and potentiality for food barley production.

Description of Barley Varieties

Several agencies brought different types of barley to the designated Districts. However, the Ambo Agricultural Research Center Extension research team has introduced and widely disseminated the improved food barley variety, HB1307, in the chosen area. Due to the farmers' preference for particular characteristics and the absence of effective extension services, the variety was not as widely scaled up to the larger barley production farms. Farmers were not cultivating the advanced types as a result.

The locally popular cultivars are the main farmers varieties produced in the area. For the last few years small scale demonstration of improved food barley varieties were conducted in the districts and hence farmers preferred "HB1307" variety for its desirable characteristics. Based on the farmers' trait preference, HB1307 variety was preferred by farmers because of its high yielding, consumption quality, early maturity and palatability respectively (Table 1).

Demonstration Process and Agronomic practices

Eight food barley clusters totaling 68 hectares of land were established in collaboration with experts at the district level and Kebeles Level DAs, as per Table 1. Following the preparation and delivery of instruction to the target farmers on food barley production and management, the target farmers received enhanced seed of a recently released food barley variety named HB1307, which they planted in the LSD program. The 68 hectares of land with food barley activity are covered. Fertilizer was applied at a rate of 100 kg/ha N and 120 kg/ha NPS, respectively. A row planting technique was used, with a 20 cm row spacing and 125 kg/ha of seed. Every agronomic procedure, including weeding, rouging, and plowing.

Yield Potential and Yield Gaps

Yield potential is the genetic potential, which is dependent on biological or plant factors under the ideal environmental conditions and crop management practices, having one definite yield level for the species or variety. One definite yield level is because there is

only one ideal environment and set of crop management practices.

Potential yield is the yield of a variety × environment combination under the best crop management and will be different in environments differing in temperature and solar radiation regimes for a given variety (West Shewa Zone Office of Agricultural, 2019). Demonstration yield is the amount of grain yield of demonstrated improved barley variety (HB1307) obtained per unit area with recommended production packages. At the same time farmers yield was computed as the grain yield of local barley variety with farmers agronomic practices. Technology gap is the difference between potential yield and demonstration yield of improved barley variety (HB1307) per unit area. At the same time technology index is the difference between technology gap and potential yield and then multiplied by hundred. Technology gap, extension gap and technology index were calculated as per the formula given by Samui *et al.*, (2000).

Utilization of input

HB1307, a well-known food barley variety was demonstrated along with its fully recommended packages. Farmers followed the agricultural expert's advice and followed all agronomical practices like ploughing, weeding and other agronomic managements according to the recommendations.

Method of data collection

As a consequence, the methods used to collect the data were field observation, discussion with the target farmer, and farmer group discussions done during the field visit. From the farmer's field, data regarding yield and the farmer's preferences for the variety were gathered. The main types of data acquired during the activity included the number of farmers who attended the field day and training, the number of locations addressed, the quantity of seed provided, and the number of farmers who benefited from the demonstration process.

Method of data analysis

Through monitoring and continuous follow up of the activity with the cooperation of the stakeholder, both qualitative and quantitative data were gathered and analyzed by using average grain yield and package comparison among study areas were made. Finally, the collected data were analyzed using descriptive statistics, gap analysis and preferences were analyzed using narrations and tables.

Monitoring and Evaluation

In collaboration with farmers and appropriate offices, evaluations of every cluster were carried out at every level of development. Farmers had taken part in the variety evaluation process at different points in time. In particular, farmers, experts, and researchers took use of the opportunity to observe and evaluate the varieties during germination, blooming and harvesting.

Results and Discussion

Cluster formation and training

Eight clusters (HB1307) were established in the Elfeta, Toke kutaye, Ambo and Midakegn districts of the West Shewa zone with the purpose of popularizing food barley variety on a large scale. A total of 68 ha of land were planted in all districts (Table 1).

Before planting, all of the participating farmers development agents (DAs), agricultural experts, and host and non-host/follower farmers received training. Following the selection of the farmers, DAs, and agricultural experts attended a theoretical and practical training surely. A multidisciplinary team of researchers from the Ambo Agricultural Research Center trained a total of 221 participants (Male 189 and Female 52), including farmers (Male 117 and Female 36), DAs (Male 38 and Female 39), and experts (Male 14 and Female 7). The topics covered included participatory agricultural research and promotion, appropriate ago-ecologies and weather conditions for barley production and management packages, agronomic practices, the crop's economic and nutritional importance, and post-harvest management (Table 2).

Technology Gap, Extension Gap and Technology Index

Based on food barley productivity potential and CSA data, an overview of the LSD activity yield performance is provided. Table 3 shows that the average yield obtained from the cluster was 2.9 tons/ha, which is more than the yield advantage using CSA data in the Zone, which is 2.89 tons/ha (CSA 2021). This yield exceeds both the national average (2.6 tons/ha) and the regional average (2.86 tons/ha). The difference in yield is the outcome of knowledge of management and diversity.

Variations in soil fertility and management techniques may be the source of yield performance variability within the study cluster.

Grain yield gap was analyzed based on the actual implementation of improved food barley technology and the trend of farmers practices to grow food barley in the district. Based on this the yield gap of food barley has been explicated in terms of technology and extension gaps. Technology gap (GP) analysis indicates the degree to which technologies have not been adopted.

This feedback information is essential to identify the weakness of technology transfer program, to remove bottlenecks and accelerate adoption of improved technologies (Neha *et al.*, 2018). The mean value of TG analysis and overall gaps against the recommended technology practices were computed. Hence, the overall TG was calculated using the formula (1) and it was found 1.3 tons/ha (Table 3 and 4). The yield difference may be observed due to the environmental differences and agronomical practices.

Technology gap (TG) = Potential yield (tons/ha) – Demonstration yield (tons/ha) …1

The same was also reported by Beshir *et al.*, (2019). Similarly, extension gap (EG) was calculated using the formula (2) and found 1.2 tons/ha and the result indicated that it needs emphasis to strengthen the extension approach using various methods like offering training to farmers, skill and experience sharing, awareness enhancement via information dissemination channels and other pertinent methods ((Table 3 and 4).

Extension (EG) = Demonstration yield (tons/ha) – Farmers yield (tons/ha) …2

It is also believed that advanced food barley technology production package with acceptable quality grain will subsequently change the extension gap. Hence, dissemination of newly released improved food barley technologies including production packages will have a significant contribution to replace farmers barley varieties and then hasten adoption rate.

At the same time technology index (TI) was computed using formula (3) and recorded 22.2 %. This is an indication that realize yields at farmers farm and even at the demonstration sites still have huge potential for increase (Table 3 and 4).

Technology Index (TI) = Technology gap / potential yield (tons/ha)

If this gap is closed, the food barley production and productivity will be enhanced (EIAR (2016)

Farmers' Trait Preference

Ten farmers six of them male and four of them female from each district were chosen at random from a range of age and sex categories in order to gather their preferences for food barley. Men, women, and women headed households were given different preference for traits. Forty barley producer farmers engaged in trait preference in each of the three groups (Abdala, 2023). Early maturity, high yielding capacity, marketability, and the ability to produce high-quality food were the primary characteristics mentioned by farmers.

Field days

Different levels of field days were organized at different time in all selected districts as shown in *Fig* 1, From the eight cluster established a total of six field days were organized. To raise farmer's awareness on the performance of the food barley technologies, by these field days a totally 827 (male 611 and 216 female) participants were attending the field events and believed that awareness was created among participants.

Recommendation

The current investigation involved the cluster-based pre-scaling up of the food barley (HB1307) variety in four districts within the West Shewa Zone. The study had 127 participants (Male 101 and F 26) and 10 clusters totaling 68 hectares of land. The average productivity of the clustered area was 2.9 tons/ha.

According to the study's findings, the enhanced food barley variety, HB1307, performed better in terms of grain output when compared to farmers' practices. In comparison to all farmers methods, 36.02% of the production increment for the food barley under research has been reported. This raised awareness among other farmers and encouraged them to adopt the enhanced package of food barley techniques. This demonstration trials also enhance the relationship and confidence between farmers, extension workers, and researchers.

Table.1 Number of clusters formed and participants' farmers

No.	Districts	No. of cluster	Variety used	Land size of cluster(ha)	Participant farmers	
					M	F
1	Elfeta	2	HB1307	12	21	6
2	Toke kutaye	2	HB1308	15	26	3
3	Ambo	2	HB1309	31	35	9
4	Midakegn	2	HB1310	10	19	8
	Total	**8**		**68**	**101**	**26**

Table.2 Number of participants on training

No.	Districts	Participants					
		Farmers		Experts		DAs	
		M	F	M	F	M	F
1	Elfeta	34	12	4	2	12	3
2	Toke kutaye	28	7	6	3	8	2
3	Ambo	31	11	4	1	11	3
4	Midakegn	24	6	4	1	7	1
	Total	**117**	**36**	**14**	**7**	**38**	**9**
Overall total		**221**					

Own data, 2021

Table.3 Grain yield analysis for Food Barley (HB1307)

No. of District	Variety	Technology gap (tons/ha)	Extension gap (tons/ha)	Technology index (%)
Elfeta	HB1307	1.38	1.17	23.4
Toke kutaye	HB1307	1.4	1.25	23.9
Ambo	HB1307	1.3	1.21	23.0
Midakegn	HB1307	1.12	1.12	18.4
Mean		**1.3**	**1.2**	**22.2**

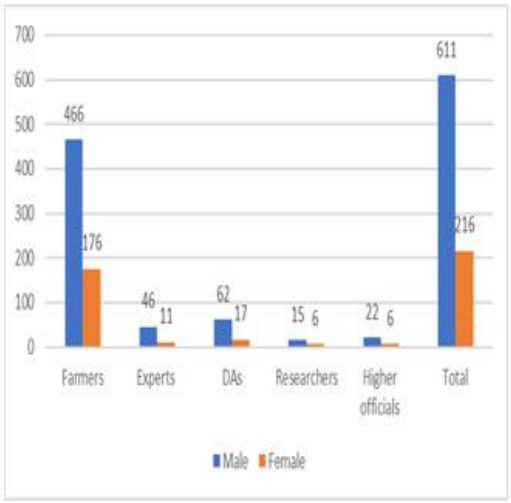
Own data 2021

Table.4 Grain yield performance of Food barley (HB1307) variety tested at West Shewa Zone in 2019-2021 crop season.

District	Variety	Area (ha)	Potential yield (tons/ha)	Demonstration yield (tons/ha)	Farmers Yield (tons/ha)	% Yield increases over farmers practices
Elfeta	HB1307	12	5.9	4.52	3.35	34.9
Toke kutaye	HB1307	15	5.85	4.45	3.20	39.1
Ambo	HB1307	31	5.65	4.35	3.15	38.1
Midakegn	HB1307	10	6.10	4.62	3.5	32.0
			Mean	**4.48**	**3.3**	**36.02**
Total		**68**				

- ***% age yield increases*** = $\frac{\text{Demonstration yield(tons/ha) – farmers practices(yield) (tons/ha) x 100}}{\text{Farmers practices(yield) (tons/ha)}}$

Fig.1 Field Day participants



Own data, 2021

The large-scale demonstration's host farmers were crucial in helping other surrounding farmers spread the enhanced food barley variety HB1307 by providing them with high-quality seeds and information. It is determined that the large-scale demonstration is an effective instrument for improving food barley productivity and production by expanding farmers' knowledge, mindset, and abilities.

Therefore, it is recommended that the offices of agriculture and rural development in each district continue to spread the HB1307 variety to a wide number of farmers who practice similar agro-ecologies. To ensure a sustainable seed supply, seed producer cooperatives or organized farmer groups should be established in order to multiply and provide this variety's seed on a regular basis.

Acknowledgement

The authors are grateful to thank the farmers and development agents from the selected four Districts for their valuable collaboration and in proving information used in this study.

References

Abdala, A. (2023). Cluster based large scale demonstration of improved food barley technology in Gurage and Silte zone, Southern

CSA (2021), Agricultural Sample Survey report on Area and Production of Major Crops (Private Peasant Holdings 'Meher' Season): Statistical Bulletin 585. Addis Ababa, Ethiopia.

FAO (Food and Agriculture Organization). (2014). Food balance sheets. FAOSTAT, Rome.

West Shewa Zone Office Agricultural (2019). Annual Report (Unpublished).

Neha, P., Neeraj, K., Singh, A. K. and Abhijeet, S. (2018) Technological Gap in Recommended Cultivation Practices of Cauliflower in Bokaro District of Jharkhand, India

Samui, S. K., Maitra, S., Roy, D. K., Mondal, A. K. and Saha, D. (2000) Evaluation on Front Line Demonstration on Groundnut (*Arachis hypogaea* L.). Journal of Indian Society of Coastal Agricultural Research, 18, 180-183.

Neha, P., Neeraj, K., Singh, A. K. and Abhijeet, S. (2018) Technological Gap in Recommended Cultivation Practices of Cauliflower in Bokaro District of Jharkhand, India.

How to cite this article:

Dawit Milkias, Soruma Gerbi, Alem Jambo and Yenenesh Duguma. 2023. Promotion of Large-scale Demonstration and Participatory Evaluation of Improved Barley Varieties in Potential Areas of West Shewa Zone. *Int.J.Curr.Res.Aca.Rev.* 11(09), 66-72. doi: https://doi.org/10.20546/ijcrar.2023.1109.009