Original Research Article

Cluster Based Pre Scaling Up of Improved Malt Barley Technologies: Evidence from West Shewa Zone, Oromia Region, Ethiopia

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Abstract: Malt barley is a high-opportunity cash crop, with great room for profitable expansion, particularly when connected to growing breweries. With the intention of popularizing advanced malt barley varieties (IBON174/03 and HB-1963) on a large-scale demonstration farming approach, this activity was carried out in West Shewa Zone potential areas to increase production and productivity of malt barley technologies during 2020-2022 production seasons. West Shewa Zone was purposively selected based on agro-ecological zone as the target population for this cluster farming. From the Zone potential areas, three districts were randomly selected including Ambo, Toke kutaye and Elfeta Districts. From each district, 9 kebeles and 144 host farmers participated in this cluster based on their interest and availability of adjacent farm plots. Thus, 9 clusters were formed, and 60 ha of land was covered on improved malt barley technologies. Training was given for stakeholders for 144 farmers, 44 DAs, and 16 agricultural experts who worked in selected districts on barley production and management packages. The study found that the average yield from the IBON174/03 variety was 30qt ha^{-1}, 29qt ha^{-1}, and 28qtha^{-1} at Toke kutaye, Elfeta and Ambo districts, with an overall mean grain yield of 29qtha^{-1}. The HB-1963 variety yielded 26 qt ha^{-1}, 24 qt ha^{-1} at Toke kutaye, Elfeta and Ambo districts respectively for an overall grain yield of 25 qt ha^{-1}. Therefore, from the researchers and farmers evaluation both demonstrated malt barley varieties were recommended for the study areas and similar agro-ecologies for further demonstration and dissemination.
Keywords: Average yield, Cash crop, Demonstration, Farmers evaluation, Packages.

1. INTRODUCTION

Barley is one of the most important cereal crops that are largely grown in highland areas of Ethiopia with annual production of about 1.9 million tons cultivated on an area of about one million hectares of land (CSA, 2014). With an average national yield of 2.5 tons per hectare, the crop is grown by more than 3.7 million smallholder farmers on about one million hectares of land, yielding 2.3 million tons of grain annually (CSA, 2021). Malt barley is a high-opportunity cash crop, with great room for profitable expansion, particularly when connected to growing breweries. However, there is a shortage of malt barley to meet the demand of the local breweries that forced the malt factory to import large quantity of malt barley and on other hand farmers' complaint on selling price of the malt barley (Dawit Alemu *et al.*, 2014).

Both in the field of research and development, efforts have been made to boost the productivity and production of malt barley. Regarding with the crop the National Agricultural Research System has been working to increase the quality, productivity, and adaptability of malt barley technologies (Asres T, 2018). As a result, several varieties have been introduced, but their popularity level is still low, resulting in a great loss of opportunity in terms of higher output, domestic supply for local agriculture-related industries, and the preservation of foreign reserves (Dawit A. et al., 2014). The limited adoptions are mainly related (*i*) limited awareness about the varieties, (*ii*) limited accessibility of the varieties to users due to supply limitation, and (*iii*) limited linkage with markets especially with agro-industries and overall weak linkage of the value chain actors.

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In response to the aforementioned information, the Ambo Agricultural Research Center conducted adaptation trials and used participatory variety selection to identify the best-performing, high-yielding malt barley varieties. A number of high grain yield and quality malt barley varieties with end user preferred traits and associated production technologies had been developed, but their adoptions were very limited due to lack of awareness and access to improved technologies among farmers, development agents and extension services. Therefore, the pre scaling up demonstration of existing or new improved varieties and associated crop management technologies were conducted during 2020-2022 particularly with recommended packages and their combinations. Good agricultural practices including land preparation, planting time, seed rates, post-harvest handling and storage were among important practices promoted (Workineh 2021). In order to improve production and productivity of the crop, this activity was begun to demonstrate and disseminate improved malt barley technologies at large, clustered farms through placing farmers in groups with full packages at potential districts of the Zone.

1.2 Objectives
- To demonstrate and popularize advanced malt barley technologies through pre scaling up farming approach.
- To evaluate the yield performance of the selected crop varieties
- To develop the knowledge, skills and attitude of stakeholders about the technology.

2. RESEARCH METHODOLOGY
2.1 Description of the study areas
The pre scaling up activity was conducted during 2020-2022 cropping season at West Shewa Zone: Ambo, Toke kutaye and Elfeta districts. Zone and districts were purposively selected based on agro-ecological zone as the target population for this cluster farming and potentiality for the crop (Zones Offices of agricultural, 2022).

2.2 Site and Farmers selection
From West Shewa Zone, three districts were selected purposively based on their potential for demonstration of the crop production and accessibility for supervision. The selection of Districts, kebeles and host farmers were done together with districts Agriculture Office and the extension team. Potential Kebeles were selected in order to conduct the large-scale demonstration activity. three potential Kebeles from the districts and participant farmers were selected based on their interest and availability of adjacent farm plots with a minimum 0.25 ha per head. Thus, 9 clusters were formed, 144 farmers (Male 110 and female 34) directly participated in these demonstrations, and 60 ha of land was covered by improved malt barley technologies.

2.3 Demonstration design
In the selected Districts two popularized improved malt barley varieties were *IBON174/03* and *HB-1963*, those preferred and selected by farmers during PED were used with their full recommended practices. Planting was done at a seed rate of 100 kg ha^{-1}. Fertilizer was applied at a rate of 100/150 kg ha^{-1} NPS and UREA, respectively. Plowing, weeding, and other management practices were applied based on the research recommendation

2.4 Data Collection Method
Data such as total amounts of inputs distributed for participant farmers, total number of farmers participated in the training and field day by gender, other stakeholders in technology dissemination, yield data and farmers perception were collected using checklists through interview and discussions.

2.5 Method of Data Analysis
The collected data were entered in to SPSS and analyzed using simple descriptive statistics and narrating the qualitative explanation of the farmers.

3. RESULT AND DISCUSSION
3.1 Capacity building on malt barley technologies
Before implementing the pre-scaling up activity in all selected areas, capacity building was carried out for stakeholders. From the participants 144 farmers, 44 DAs, and 16 agricultural experts who worked in selected districts received training. To raise awareness about enhanced improved malt barley technologies among farmers and equip them and others with knowledge and skills about the technology management packages, the major strategies in this respect were training on knowledge, skill, and attitude. In order to do this, Ambo Agricultural Research Center has formed a multidisciplinary team to provide training and to support malt barley technology extension initiatives. The members of the team included agronomists, pathologists, breeders, socio-economists, and others (Table 1).

Table 1: Number of participants on malt barley technology production and Management training

No.	Districts	Participants					
		Farmers		Experts		DAs	
		M	F	M	F	M	F
1	Ambo	29	13	3	1	5	1
2	Toke kutaye	31	12	3	3	5	2
3	Elfeta	50	8	4	2	5	1
	Total	**110**	**34**	**10**	**6**	**40**	**4**

Source: Own data, 2022

3.2 Input Provision

The entire group obtained advanced malt barley (*IBON174/03* and *HB-1963*) varieties seed and fertilizers (NPS and urea). In organic fertilizer NPS and UREA were used with their recommendation rate of 100kg/ha and 100Kg/ha respectively. The distribution of agricultural inputs was done according to the area of farmland that included in the Cluster in each district.

Table 2: Input distribution for malt barley cluster

No.	Districts	Area coverage (ha)	Host farmers		Amount of Input distributed		
			M	F	Seed (Qt)	NPS (Qt)	UREA (Qt)
1	All selected districts	60	110	34	60	60	60
	Total	**60**	**110**	**34**	**60**	**60**	**60**

Source: Own data, 2022

3.3 Yield and yield performance of clustered commodities

Demonstrated crop varieties shown significant variation on growth and tillering performances as compared to the conventional farming system. There also observed that there are differences between farmers to farmers, fields to fields, and clusters to clusters on the growth performance of the crops.

Table 3: Yield performance of Malt barley varieties at selected Districts

Districts	Crop	Variety	Average yield(Q/ha)
Ambo	Malt barley	HB-1963, IBON174/03	24, 28
Toke kutaye	Malt barley	HB-1963, IBON174/03	26, 30
Elfeta	Malt barley	HB-1963, IBON174/03	26, 29

Source: Own data computation, 2022

The malt barley varieties were subjected to all of the recommended barley production and management practices. The study found that the average yield from the *IBON174/03* variety was 30qt ha-1, 29qt ha-1, and 28qtha-1 at Toke kutaye, Elfeta and Ambo districts, with an overall mean grain yield of 29qtha-1 (Table 3). The *HB-1963* variety yielded 26 qt ha-1, 24 qt ha-1 at Toke kutaye, Elfeta and Ambo districts respectively for an overall grain yield of 25 qt ha-1.

3.4 Field days

Field days offer an opportunity to disseminate findings and increase the general public's understanding of new developments in techniques and technologies. In order to achieve this, a field day was utilized as a means of raising awareness about the malt barley varieties sowed, the production process, and the clustering technique in this extensive demonstration activity. As a result, 641 stakeholders (Male 451 and female 190) including farmers, researchers, DAs, agricultural experts and districts higher officials participated in field day in all clustered districts.

Table 4: Number of field day participants (Mini field day in all districts)

Participants	Male	Female
Farmers	413	173
Development agents	14	6
Agricultural Experts	12	3
Districts higher officials	12	8
Total	**451**	**190**

Source: Own data, 2022

4. CONCLUSION AND RECOMMENDATION

The pre scaling up activity was conducted at West Shewa Zone potential areas to increase production and productivity of malt barley technologies through promotion and popularization during production seasons of 2020-2022. From the Zone potential areas, three districts were purposively selected including Ambo, Toke kutaye and Elfeta Districts. From each district, 9 kebeles and 144 host farmers directly participated in this cluster based on their interest and availability of adjacent farm plots. Thus, 9 clusters were formed, and 60 ha of land was covered on improved malt barley technology. Before the implementation of the activity, 204 stakeholders from the districts that were chosen took part in theoretical and hands-on training on malt barley production and management packages. The study found that the average yield from the *IBON174/03* variety was 30qt ha-1, 29qt ha-1, and 28qtha-1 at Toke kutaye, Elfeta and Ambo districts, with an overall mean grain yield of 29qtha-1 (Table 3). The *HB-1963* variety yielded 26 qt ha-1, 24 qt ha-1 at Toke kutaye, Elfeta and Ambo districts respectively for an overall grain yield of 25 qt ha-1. Therefore, the researchers recommended that this large-scale demonstration should be promoted in other similar agro ecology areas to increase production and productivity of malt barley technologies, to increase farmers income, to achieve food security and to popularize improved agricultural technologies using the cluster farming approach.

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