Sarcouncil Journal of Multidisciplinary

ISSN(Online): 2945-3445

Volume- 02| Issue- 04| 2022

Research Article **Received:** 04-04-2022 | **Accepted:** 20-04-2022 | **Published:** 28-04-2022

Pre-Extension Demonstration of Improved Durum Wheat Technologies in Bale and West Arsi Zones

Bayeta Gadissa, Ayalew Sida and Amare Biftu

Oromia Agricultural Research Institute (OARI), Sinana Agricultural Research Center (SARC) P.O.Box-208, Bale-Robe, Ethiopia

Abstract: Pre extension demonstration of improved durum wheat varieties was carried out at Dodola and Adaba districts of West Arsi zone and Agarfa district of Bale zone using one recently released (Bulala) improved variety against standard check (Dire).The main objective of the study was to demonstrate and evaluate improved durum wheat varieties in order to enhance farmers to select best fit variety/ies for their localities. The demonstration was under taken on single plot design of 20m x 20m area for each variety with the spacing of 20cm between rows and recommended seed rate of 150kg/ha and fertilizer rates of 100/110kg/ha NPS/UREA. Mini-field day was organized at each respective site on which different stakeholders were participated and experiences were shared. Yield data per plot was recorded and analysed using descriptive statistics, while farmers' preference to the demonstrated varieties was identified using focused group discussion and summarized using pair wise and simple ranking methods. Participant farmers were enhanced to set their own selection criteria and their criteria were almost similar in all locations. Accordingly, Bulala variety was selected due to its high yielder, seed/spike (64-80), tiller (7-8), better and stem strength, good seed colour, more adaptable to environment, more tolerant to disease, good plant height, bigger seed size and big spike. Since, all participant farmers selected Bulala, it is important to proceed to the task of scaling up/out of Bulala in all demonstration sites and similar agro-ecologies.

Keywords: Demonstration, Farmers' preference, durum wheat, Bulala, Selection criteria.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the world's leading cereal grains serving as a staple food for more than one-third of the global population. Globally, it is cultivated on approximately 218 million hectares of land (HGCA, 2014). Durum wheat (*Triticum turgidum* var. *durum Desf*) accounts for 8% of global wheat production and its cultivation is concentrated in the Mediterranean basin, the North American Great Plains, India, and the former USSR (Palanarchuk, 2005).

Durum wheat produced for food and industrial purposes and used as raw materials for pasta and macaroni industries. However, due to low volumes and poor quality of national durum wheat production, pasta industries are importing huge amount of wheat and pasta every year costing about 30 million USD or >600 million Eth. Birr (Ethiopian Revenue and Customs Authority, 2013). It is one of the major cereal crops grown within the range of 1500 to 2800masl in Bale, Arsi, West Arsi and Shewa zones, Oromia National Regional State, Ethiopia. These areas have reliable rainfall and are considered as "the wheat belt area of the country" (Bekele, 2011). In 2016/17 cropping season, the area covered with wheat production in Bale and West Arsi zones was about 166,539.45 and 124,339.43 hectares respectively with average yield of 33.33 and 34.21 quintals respectively (CSA, 2017).

Commercial durum wheat varieties under production have been losing their potential to resist epidemic disease and their protein quality decreasing from time to time. To overcome the problem, Sinana Agricultural Research Centre released the new variety of durum wheat (Bulala) which has relatively better resistance towards wheat rust diseases and good in protein quality. Bulala has yield potential of 48-78 quintal per hectare with yield advantage of 16.9% and 25% over standard (Toltu) and local checks (Ingliz), respectively.

Participatory technology evaluation on farmers management condition may have many advantages, such as increased and stable crop productivity, faster release and adoption of varieties, better understanding farmers' criteria for variety selection, enhanced biodiversity, increased cost effectiveness, facilitated farmers learning and empowerment (Sperling et al, 2001).Thus, it a paramount important to demonstrate and evaluate recently released durum wheat variety (Bulala) under farmers' management condition.

OBJECTIVES

- To evaluate the yield performance of improved durum wheat varieties under farmers' condition,
- To create awareness on the importance of durum wheat varieties among farmers, DAs, SMSs and other participant stakeholders,
- To collect farmers' feedbacks on durum wheat varieties,

***Corresponding Author:** Bayeta Gadissa

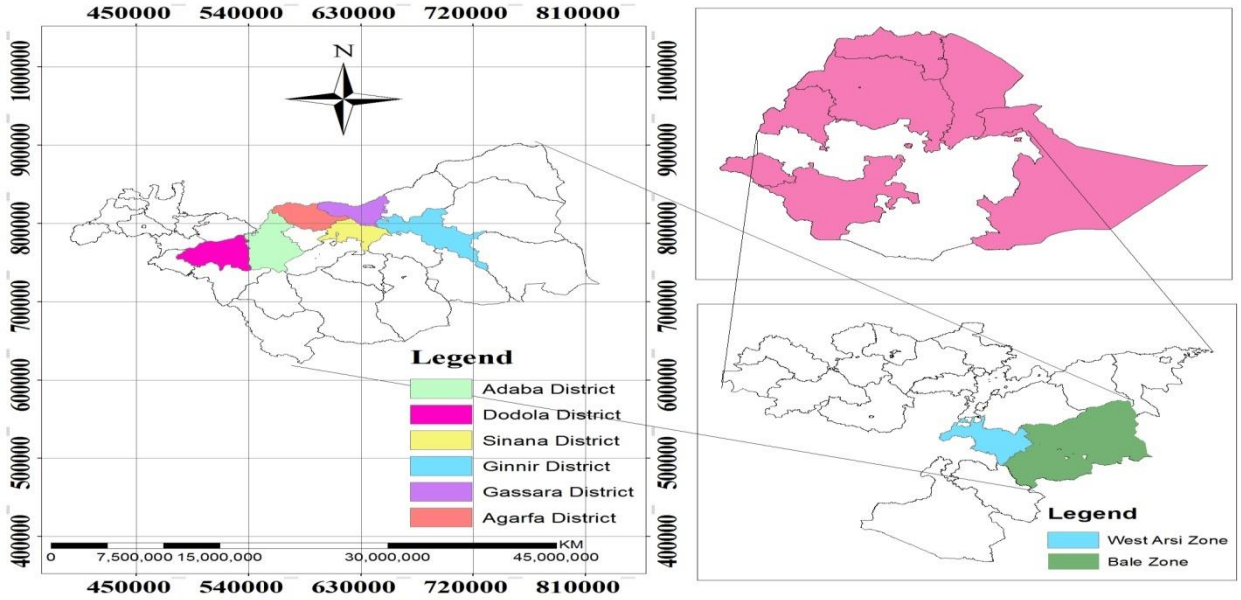
DOI- tps://doi.org/10.5281/zenodo.6841532

- To strengthen the institutional and other stakeholders' linkage on technology promotion and dissemination.

METHODOLOGY

Description of the Study Areas

The trial was conducted in selected districts of West Arsi and Bale zones of Oromia National Regional State. These districts were Dodola and Adaba from West Arsi whereas Agarfa was from Bale zone.



Site Selection

Pre extension demonstration of improved durum wheat varieties was conducted at Dodola and Adaba districts of West Arsi Zone and Agarfa district of Bale Zone. Purposive sampling methods were employed to select three representative districts from both zones based on their potential for durum wheat production. One kebele from Dodola and Adaba districts and two kebeles from Agarfa district were also selected purposefully based on their accessibility and production potential of the crop.

Trial Farmers' Selection

Having suitable and sufficient land to accommodate the trials, willingness to contribute the land, vicinity to roads so as to facilitate the chance of being visited by many farmers, initiatives to implement the activity in high-quality, good in field management and willingness to explain the technologies to others were the criteria used to select the hosting farmers. Accordingly, a total of nine farmers were selected to undertake the activity.

Materials Used and Field Design

An improved recently released durum wheat variety (Bulala) with one standard check (Dire) were planted on selected farmers' land with simple plot design (20m x 20m) for each variety in the main cropping season. Full packages were applied in which row planting with the spacing of 20cm between rows; recommended seed rate of 150 kg per hectare and fertilizer rate of 100kg/110kg of NPS/UREA per hectare was applied. In addition, twice hand weeding was done on time (i.e. the first weeding one month after planting and the second weeding was done one month later after of the first weeding).

SARC was the source of agricultural inputs (seed and fertilizers). Hosting farmers provided their land. Farm operations (land preparation-ploughing four to five times using oxen plough) were carried out by trial/hosting farmers, whereas land leveling, planting, first and second weeding, follow up and visit, harvesting, threshing were handled and managed by SARC.

Data Type and Method of Data Collection

Both qualitative and quantitative data were collected using appropriate data collection methods such as direct field observation/measurements, key informant interview and focused group discussion (FGD). Yield data per plot in all locations were recorded. Total number of farmers participated on field visits and mini field days were recorded. Farmers'

Publisher: SARC Publisher

preference to the demonstrated varieties (likes and dislikes, which is the base for plant breeding process and perceptions towards the performance of the technologies) was identified.

Data Analysis

Descriptive statistics was used to analyze the yield data. Pair wise ranking and simple matrix ranking was used for traits of demonstrated varieties.

RESULT AND DISCUSSION

Yield performance of demonstrated varieties

The yield of demonstrated varieties of durum wheat (Bulala and Dire) from Dodola, Adaba and Agarfa were harvested and analyzed using simple descriptive statistics (mean). Accordingly, the newly released durum wheat variety Bulala (46.02qt/ha) give higher yield than the standard check Dire (39.04qt/ha). Bulala has 17.27% yield advantage over the standard check Dire. At all demonstration sites Bulala variety gave higher yield. The cost benefit ratio analysis also shows, Bulala has higher net benefit ratio (3.46) than Dire (2.81).

Table 1: summary of yield of the demonstrated varieties.

District	Kebele	Yield obtained (Qt/ha)	
		Bulala	Dire
Adaba	Ejersa	44.25	38.25
Dodola	Ketchema Ch.	42.5	37.5
Agarfa	Ali	49.25	40.26
	Ilani	53.39	42.6
	Mean	51.32	41.38
Overall mean		46.02	39.04

Comparison of Yield Advantage of Improved Varieties

$$\textbf{Yield advantage \%} = \frac{\textbf{Yield of new variety (qt/ha)} - \textbf{Yield of commercial variety (qt/ha)}}{\textbf{Yield of commercial variety (}\text{qt/ha)}} \times 100$$

Yield Advantage of **Bulala** over **Dire**: $\frac{46.04-39.26}{39.26} \times 100\% =$ **17.27%**

Table 2: Cost Benefit Ratio Analysis

No	Variety	Yield obtained (qt/ha)	Sale price (ETB/qt)	Gross Returns (Price X Qt) TR	Total Variable Costs TVC (ETB/ha)	Net Return (GR-TVC)	Benefit cost ratio (NR/TVC)
	Bulala	46.04	1500	69060	15482.00	53,578.00	3.46
	Dire	39.26	1500	58890	15455.00	43435.00	2.81

Farmers' Variety Evaluation and Selection

Consulting the intended end users to assess which quality/ies of a particular variety they desire is highly important to hasten the adoption rate of the variety/ies and associated packages. Because, it will not only be resource saving in terms of preferred variety promotion/dissemination, but also time saving and fast adoption (Dan, 2012).

Accordingly, the task of variety evaluation and selection was carried out in Adaba, Dodola and Agarfa districts.

Publisher: SARC Publisher

Table 3: Participants of Variety evaluation and selection

Location	Number of participants		
	Farmers	**Experts (DAs & SMS)**	**Subtotal**
Adaba	26	6	32
Dodola	32	6	38
Agarfa	42	13	55
Total	**100**	**25**	**125**

Focused Group Discussion (Fgd)

Before leading the participant farmers and experts to focus group discussion, brief orientation was given to the evaluators on why variety/technology evaluation and selection is necessary in research process. Then evaluators were grouped in to small manageable groups (by selecting one group leader and one secretary) and encouraged to set their own criteria to select the demonstrated varieties in order of their preference, how to carefully assess each variety by considering each criteria and using rating scale, how to organize collected data, how to make group discussion and reach on consensus, and finally report through their respective group leader.

Table 4: Pair wise ranking result to rank variety traits in order of importance

Code	Variety trait	Yield	Tiller	Seed/spike	Stem strength	Seed colour	Adaptability	Disease tolerance	Plant height	Seed size	Spike size	Frequency	Rank
1	Yield											9	1st
2	Tiller	1										7	3rd
3	Seed/spike	1	2									6	4th
4	Stem strength	1	2	3								0	10th
5	Seed colour	1	2	3	5							3	7th
6	Adaptability	1	2	3	6	6						5	5th
7	Disease tolerance	1	7	7	7	7	7					8	2nd
8	Plant height	1	2	3	8	5	6	7				1	9th
9	Seed size	1	2	3	9	9	6	7	9			4	6th
10	Spike size	1	2	3	10	5	6	7	10	9		2	8th

Table 5: Rank of the varieties based on farmers' selection criteria

No	Varieties	Rank	Reasons
1	Bulala	1st	High yielder, Seed/spike(64-80), tiller(7-8), better stem strength, good seed colour, more adaptable to environment, tolerant to disease, good plant height, bigger seed size, big spike,
2	Dire	2nd	Low yielder, Seed/spike(47-54), tiller(3-4), softer stem, less adaptable to environment, not tolerant to disease, good plant height, smaller seed size, small spike

Publisher: SARC Publisher

CONCLUSIONS AND RECOMMENDATIONS

Pre extension demonstration and evaluation of durum wheat technologies was carried out on nine (9) representative trial farmers' field. Improved variety viz. *Bulala* was demonstrated, evaluated and compared against the standard check Dire. The mean yield of the varieties was analyzed using simple descriptive statistics. Accordingly, Bulala is the high yielder than Dire.

Similarly, farmers were enhanced to select the variety/ies of their interest by setting their own selection criteria. Consulting the intended end users to assess which quality/ies of a particular variety they desire is highly important. Because, it will not only be resource saving in terms of preferred variety promotion/dissemination, but also time saving and fast adoption (Dan, 2012). Stable, suitable and widely accepted durum wheat variety/ies for the study areas were identified and ranked based on farmers' preferences. According to pair wise ranking result, yield, adaptability, tillers, seeds/spike and disease resistance were the top five priority concern of the farmers for sustainable production of durum wheat in the study districts.

To summarize, Bulala was selected by participant farmers in all districts due to it is high yielder, Seed/spike(64-80), tiller(7-8), better stem strength, good seed colour, more adaptable to environment, tolerant to disease, good plant height, bigger seed size and big spike. Therefore, the succeeding pre-scaling up/out of Bulala variety of durum should be carried out in areas where it was selected.

REFERENCE

1. Diriba, B. "Analysis of Rural Women Farmers‟ Drudgery and Their Role in Agricultural Production: The Case of Sinana Districts, Bale Zone, Oromia National Regional State, Ethiopia. Diss. M. Sc. Thesis." Haramaya University, Ethiopia, 2011..
2. Central Statistical Agency (CSA). "The Federal Democratic Republic of Ethiopia. Central Statistical Agency Agricultural Sample Survey 2016/2017 (2009 E.C.): Report on Area and Production of Major Crops." (Private Peasant Holdings, Meher Season), Volume I. Addis Ababa, Ethiopia. 2017.
3. Makosa, D. "Integrating Consumer Preferences into Breeding: A Stepping Stone to Food Security. Department of Agricultural Economics: Tokyo University of Agriculture, Japan. Presented on Wheat for Food Security in Africa." (2012): 8-12.
4. Annual Report of Ethiopian Revenue and Customs Authority, Addis Ababa, Ethiopia, (2013).
5. HGCA. "Prospects: IGC 2014 wheat harvest area estimates." (2014). http://www.hgca.com/markets/market-news/2014/february/11/prospects-igc-2014-wheat-harvest-area-estimates.aspx. Accessed 2 April 2014.
6. Palamarchuk, A. "Selection strategies for traits relevant for winter and facultative durum wheat." *Durum wheat breeding: current approaches and future strategies. Food Products Press, New York* (2005): 599-644.
7. Sperling, L., Ashby, J. A., Smith, M. E., Weltzien, E., & McGuire, S. "Participatory plant breeding approaches and results." *Euphytica* 122: (2001): 439-450, 2001.

Source of support: Nil; **Conflict of interest:** Nil.

Cite this article as:

Gadissa, B., Sida, A. and Biftu, A. " Pre-Extension Demonstration of Improved Durum Wheat Technologies in Bale and West Arsi Zones. *Sarcouncil Journal of Multidisciplinary 2.4* (2022): pp 1-5

***Corresponding Author:** Bayeta Gadissa

DOI- tps://doi.org/10.5281/zenodo.6841532