



## On-farm demonstration of improved emmer wheat varieties in bale zone, Oromiya national regional state, Ethiopia

Bayeta Gadissa<sup>ID\*</sup>, Amare Biftu and Ayalew Sida

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### ABSTRACT

On-farm demonstration of improved emmer wheat varieties was conducted in Sinana and Goba districts of Bale Zone. The main objective of the study was to demonstrate and evaluate recently released Haydaro variety along with standard check. The demonstration was under taken on single plot of 10 m x 10 m area for each variety with the spacing of 20 cm between rows and recommended seed rate of 150 kg ha<sup>-1</sup> and fertilizer rate of 100 qt ha<sup>-1</sup> NPS. Mini-field day involving different stakeholders was organized at each respective site. 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. The demonstration result revealed that Haydaro variety performed better than the standard check of Sinana 01 variety with an average yield of 33.5 qt ha<sup>-1</sup>, while that of the standard check was 27.2 qt ha<sup>-1</sup>. Haydaro variety had 23.16% yield advantage over the standard check. The farmers in all districts selected this variety. Thus, Haydaro variety was recommended for further scaling up in the selected area.

**Keywords:** Demonstration, Emmer wheat, Haydaro, Farmers' preference

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

\*Corresponding author's email: bayetag29@gmail.com (Bayeta Gadissa)

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## Introduction

Emmer wheat, *Triticum dicoccum* (Schubler) was first domesticated in the Near East (Charmet, 2011). Emmer is an ancient wheat crop which 20 years ago was considered an underutilized or neglected crop and which it seemed was probably going to be completely abandoned because of its low productivity and threshing and other agro technical problems (Mulatu *et al.*, 2017). It is a member of the wheat family of annual grasses. It is grown on a limited scale, comprises about 7% of Ethiopia's entire wheat production, produced mostly in the highlands of Bale, Arsi, Shewa, Hararghe, Wello, Gojjam and Gonder (BOSTID, 1996). In Ethiopia, emmer wheat is locally known as 'Hayisa or Matajabo' in Afan Oromo and 'Ajja' in Amharic.

It is used in various ways in the farming community. Some are ground into flour and baked into special bread (Kita); crushed and cooked with milk or water to make porridge, and some are mixed with boiling water and butter to

produce gruel (BOSTID, 1996). Traditionally, it become more demanding for its high quality of food products (the human diet) and is believed that broken bones heal faster when emmer is consumed in the form of porridge. Due to emmer's high protein content and smooth and easily digestible starch, infants and nursing mothers especially favor the gruel. Thus, it is recommended for mothers as special diet in maintaining their health and strength after childbirth (Tesemma and Belay, 1991). It has also attractive market price.

In the country, emmer wheat production is very low as compared to other crop and has been replaced by tetraploid and hexaploid free threshing wheat (BOSTID, 1996). This is due to lack of improved variety; threshability problem, low cultural practices, and other biotic and abiotic factors. Developing disease tolerant, high yielding, quality and stable variety/varieties are very important. Consequently, Haydaro variety



has recently released by SARC and it has 18-46 qt ha<sup>-1</sup> of yield potential. Thus, this activity was initiated to demonstrate, evaluate and validate improved emmer wheat varieties with the participation of farmers and other stakeholders for sustainable production and productivity.

### Objectives of the study

- To evaluate the yield performance of emmer wheat varieties under farmers' condition in Bale zone;
- To create awareness on the importance of emmer wheat varieties among farmers, DAs, SMSs and other participant stakeholders;
- To collect farmers' feedbacks on emmer wheat varieties for further development of emmer wheat technologies;

## Methodology

### Description of the study area

The activity was conducted in Goba and Sinana districts of Bale zone, Oromiya National Regional State (ONRS), Ethiopia. Bale zone is among the 20 administrative zones located in southeastern parts of Oromiya, Ethiopia.

### Site and farmers selection

On-farm demonstration of improved emmer wheat varieties was conducted in Goba and Sinana districts of Bale zone. Purposive sampling methods were employed to select the districts based on the potential of the crop. Two PAs from each district were selected based on accessibility or vicinity to the road. Similarly, one trial farmer from each PA of Goba district and two trial farmers from each PA of Sinana district were used to carry out the demonstration process considering each farmer's field as replication of the trial.

### Materials used and field design

Improved emmer wheat variety (Haydaro) was demonstrated and compared with standard check Sinana 01. The demonstration was under taken

on simple plot design of 10 m x 10 m area for each variety with full packages. In addition, twice hand weeding was done on time. SARC was the source of all agricultural inputs. Hosting farmers provided their land. Farm preparations 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 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. Farmers' preference to the demonstrated varieties was identified.

### Data analysis

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

## Results and Discussion

### Training

Training was given to farmers, DAs, and agricultural experts on emmer wheat crop production techniques and management packages, agro-chemical applications and safety precautions. Stakeholders such as zone and district level agriculture development office, Zone and district level cooperative promotion offices, zone and district level agricultural inputs regulations and quarantine experts were invited and participated during consultation meeting and training.

### Yield performance of demonstrated varieties

The yields of demonstrated varieties of emmer wheat obtained from Goba and Sinana were summarized in the table below.

Table 1. Yield Performance of demonstrated varieties.

| No | Variety   | Yield obtained (qt ha <sup>-1</sup> ) |        |       | Yield advantage over standard check |
|----|-----------|---------------------------------------|--------|-------|-------------------------------------|
|    |           | Goba                                  | Sinana | Mean  |                                     |
| 1  | Haydaro   | 25.50                                 | 41.50  | 35.50 | 23.16%                              |
| 2  | Sinana 01 | 23.00                                 | 31.40  | 27.20 | -                                   |

As shown in the above table, the new variety of emmer wheat (Haydaro) has better performance than the standard check Sinana 01. It gave higher yield than the standard check. The average yield of Haydaro and Sinana 01 is 33.50 qt ha<sup>-1</sup> and 27.20 qt ha<sup>-1</sup>, respectively. It is above average

when released which was 30.24 qt ha<sup>-1</sup> (Mulatu *et al.*, 2017). This shows it performed better. Haydaro has 23.16% yield advantage over Sinana 01. The cost benefit analysis also reveals that, Haydaro has higher benefit cost ratio (1.69) than Sinana 01 (1.28).

Table 2. Cost-Benefit Analysis of the demonstrated varieties.

| No | Variables  | Varieties |           |
|----|--|-----------|-----------|
|    |  | Haydaro   | Sinana 01 |
| 1  | Yield obtained (qt ha <sup>-1</sup> )            | 33.50     | 27.20     |
| 2  | Sale price (ETB qt <sup>-1</sup> )               | 1100      | 1100      |
| 3  | Gross returns (Price X Qt) TR                    | 36850     | 29920     |
| 4  | Total variable costs TVC (ETB ha <sup>-1</sup> ) | 9860      | 9680      |
| 5  | Fixed cost (FC)                                  | 8000      | 8000      |
| 6  | Total cost (TC)                                  | 17860     | 17680     |
| 7  | Net return (GR-TC)                               | 18990     | 12240     |
| 8  | Benefit cost ratio (NR/TVC)                      | 1.06      | 0.69      |

Farmers' preference of variety traits were identified and presented by pair wise ranking. Accordingly, yield, tillering capacity, crop stand,

frost tolerance and disease tolerance were the top five-priority concern trait of emmer wheat varieties given by farmers.

Table 3. Pair wise ranking result to rank variety traits in order of importance.

| No | Variety traits | A | B | C | D | E | F | G | H | I | J | Frequency | Rank             |
|----|----------------|---|---|---|---|---|---|---|---|---|---|-----------|------------------|
| 1  | A              |   |   |   |   |   |   |   |   |   |   | 9         | 1 <sup>st</sup>  |
| 2  | B              | A |   |   |   |   |   |   |   |   |   | 7         | 2 <sup>nd</sup>  |
| 3  | C              | A | B |   |   |   |   |   |   |   |   | 2         | 8 <sup>th</sup>  |
| 4  | D              | A | B | D |   |   |   |   |   |   |   | 7         | 2 <sup>nd</sup>  |
| 5  | E              | A | B | E | D |   |   |   |   |   |   | 4         | 6 <sup>th</sup>  |
| 6  | F              | A | B | F | D | E |   |   |   |   |   | 4         | 6 <sup>th</sup>  |
| 7  | G              | A | B | C | D | E | F |   |   |   |   | 0         | 10 <sup>th</sup> |
| 8  | H              | A | B | H | D | H | H | H |   |   |   | 5         | 5 <sup>th</sup>  |
| 9  | I              | A | B | C | D | E | F | I | H |   |   | 1         | 9 <sup>th</sup>  |
| 10 | J              | A | J | J | D | J | F | J | J | J |   | 6         | 4 <sup>th</sup>  |

A= Yield, B= Tiller, C= Crop stand, D= Lodging resistance, E= Seed/spike, F= Early maturity, G= Seed size, H= Disease tolerance, I= Seed color, J= Frost tolerance.

Table 4. Rank of the varieties based on farmers' selection criteria.

| No | Varieties | Rank            | Reasons  |
|----|-----------|-----------------|--|
| 1  | Haydaro   | 1 <sup>st</sup> | High yielder, higher number of tiller, more tolerant to disease, good crop stand, more resistant to lodge, seed/spike, early mature, bigger seed size, good seed color, more tolerant to frost |
| 2  | Sinana 01 | 2 <sup>nd</sup> | Low yielder, poor crop stand, less number of seed/spike, late mature, smaller seed size, less tolerant to disease, poor seed color, less resistant to lodge, less tolerant to frost            |

## Conclusions and Recommendations

On-farm demonstration and evaluation of emmer wheat varieties was carried out on representative trial farmers' fields. Improved variety viz. *Haydaro* was demonstrated along with *Sinana 01* variety, which is the standard check. Accordingly, *Haydaro* gave higher yield than *Sinana 01* variety. Moreover, *Haydaro* was selected by participant farmers in all districts due to high yielder, higher number of tiller, more tolerant to disease, good crop stand, more resistant to lodge, seed/spike and early mature, bigger seed size and good seed color, more tolerant to frost. Based on these facts, *Haydaro* variety was recommended for further scaling up in the area it was selected and similar agro ecology.

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