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Research Article

Analysis of extension gap among improved bread wheat producer's farmers found at Arsi Robe District of Arsi Zone, Oromia Regional State, Ethiopia

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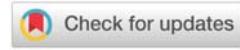
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Abstract

This study reports the analysis of agricultural extension gap among four improved bread wheat varieties at Arsi Robe district, Arsi Zone, along with their management practices under farmers' condition to enhance farmers' knowledge and skill on bread wheat production.

Four improved bread wheat varieties were used to demonstrate namely Honkolo, DEKA, Hidase (check) and Lemu. Honkolo variety had a 43.8% yield advantage over the standard check (Hidase), DEKA had a 16.4% yield advantage over the standard check (Hidase), and the variety Lemu had a negative -25.8% yield loss or below the standard check (Hidase) and it conclude that both Honkolo and DEKA varieties are the first and second option for the farmers whereas the variety Lemu is not recommended due to low productivity in the study area and others areas having similar agro ecologies. The result of agricultural extension gap analysis showed that Honkolo variety had a -2.7q/ha yield increment or in other words Honkolo variety had achieved 104.3% of the potential at research field and had a 4.3% yield advantage than the research field. According to the result DEKA variety had a 2.8q/ha yield gap or in other words DEKA variety had achieved 95% of the potential and the remaining 5% lack due to extension gap. Again the result Hidase variety had a 24.3q/ha yield reduction or in other words Hidase variety had achieved 65.3% of the potential and had a 34.7% yield penalty than the research field. Again the result Lemu variety had a 31.1q/ha yield reduction or in other words Lemu variety had achieved 52.2% of the potential and had a 47.8% yield penalty than the research field. Therefore, the lower the percentage of agricultural extension gap the higher will be the option for the production. The agricultural extension gap analysis indicate that there is no extension gap in terms of Honkolo variety where as there is a bit extension gap (5%) among DEKA variety producer farmers and a wide extension gap among Hidase and lemu varieties producer farmers. And in their average yield gap and yield performance between demonstration conducted at farmers field and the potential of the varieties at research field, having -2.7 q/ha, 2.8q/ha, 24.3q/ha and 31.1q/ha for Honkolo, DEKA, Hidase and Lemu respectively. This indicates that the varieties Honkolo and DEKA are the first and second option of varieties for farmers respectively and both are feasible if produced in the study areas and other areas having similar agro ecologies. Based on the rules of decision making and extension gap on the bread wheat varieties producers the two varieties (Honkolo and DEKA) met the requirements for recommendation. Therefore, the authors recommend Honkolo and DAKA varieties for Arsi Robe district and other areas with similar agro-ecological conditions in the South eastern districts.

Introduction

Wheat is one of the staple foods for Ethiopians, which contribute daily caloric intake. It is the fourth largest cereal crops in the country. Ethiopia is the second largest producers of wheat next to South Africa in sub-Saharan Africa. Despite, Ethiopia is among the top producers in Africa, productivity is low due to this the country is forced to import wheat

from abroad, to fill the demand. Wheat import has grown significantly from time to time this can lead the country to pay additional foreign currency[1].

Wheat yield has increased over the past decade. Recent estimates show that wheat farmers in Ethiopia produce on average 27q/ha [2]. Though the yield increased, it is not at its potential level when comparing with other countries .A range



of factors can be reasons for low productivity when comparing with other countries. There are a lot of factors can be mentioned among these technology could play a more dominant role in productivity.

To fill agricultural technology gap, now days, the Ethiopian Institute of Agricultural Research (EIAR) remains the primary agricultural research agency took the responsibility for generation of agricultural technology[3].In this regards, Kulumsa Agricultural Research Center is among the centers under EIAR which mandated for generation, demonstration and pre scaling up of improved bread wheat.

More than 100 of high yielding, disease resistant of bread and durum wheat varieties have been made realized and available with its recommended packages which is suitable for different agro ecologies of the country [4]. Despite the release of vibrant seed still challenged by disease particularly rust .Therefore; this activity was aimed to disseminate new improved varieties released recently by implementing different extension approaches (Demonstration and popularization) to the potential wheat producers. The major potential areas of wheat zones are Arsi, Bale, East Gojjam, East Shewa, South Wello and West Arsi which produce more than half of Ethiopian wheat [5].

In general, this activity were to evaluate yield performance of improved verities and to identify and analyze the extension gap among the improved bread wheat producers farmers found at the study area and to give best improved varieties of bread wheat that are released recently and area specific recommendation for concerned body based on the result of the study.

Materials and methods

Description of the study area

The clustered based farming pre-scaling up was demonstrated at Arsi Robe District during the main cropping season of 2019/20 under rain-fed condition, which is one of the major agriculture season and contribute a lot in Ethiopian agriculture. Arsi Robe District is situated at a distance of about 225 km from Addis Ababa and 98 km from the Eastern Arsi Zone capital city, Asela. The district is situated in Eastern Arsi Zone, Oromia regional state of geographical locations. The district has a bimodal rainfall pattern consisting of along rainy season "kiremit" from July to September and short rainy season "belig" extending March to May. It has a latitude (DMS) of $09^{\circ} 36' N$ and longitude (DMS) $39^{\circ} 08' E$. The minimum and the maximum rainfall are about 700 mm and 1300mm, respectively. Temperature of the district ranges from a minimum of $10.5^{\circ}C$ to a maximum of $25^{\circ}C$ [6]. It has an elevation ranging from 1200 to 4000 m.a.s.l [7].

Barley, bread wheat from cereals and oil seeds, specifically flax, and rape seed, are important cash crops grown in Arsi Robe district [7,8]. This activity was demonstrated at Arsi Robe district of five rural "kebeles" namely called "Habedangeza", "Mesaranje abu", "Jena barbuka", "Waltae" and "Ataba-robe" Figure 1.

Site and farmers selection

In collaboration with agricultural office expert the site as well as the farmers were selected, then after the orientation regarding cluster formation were given for experts,

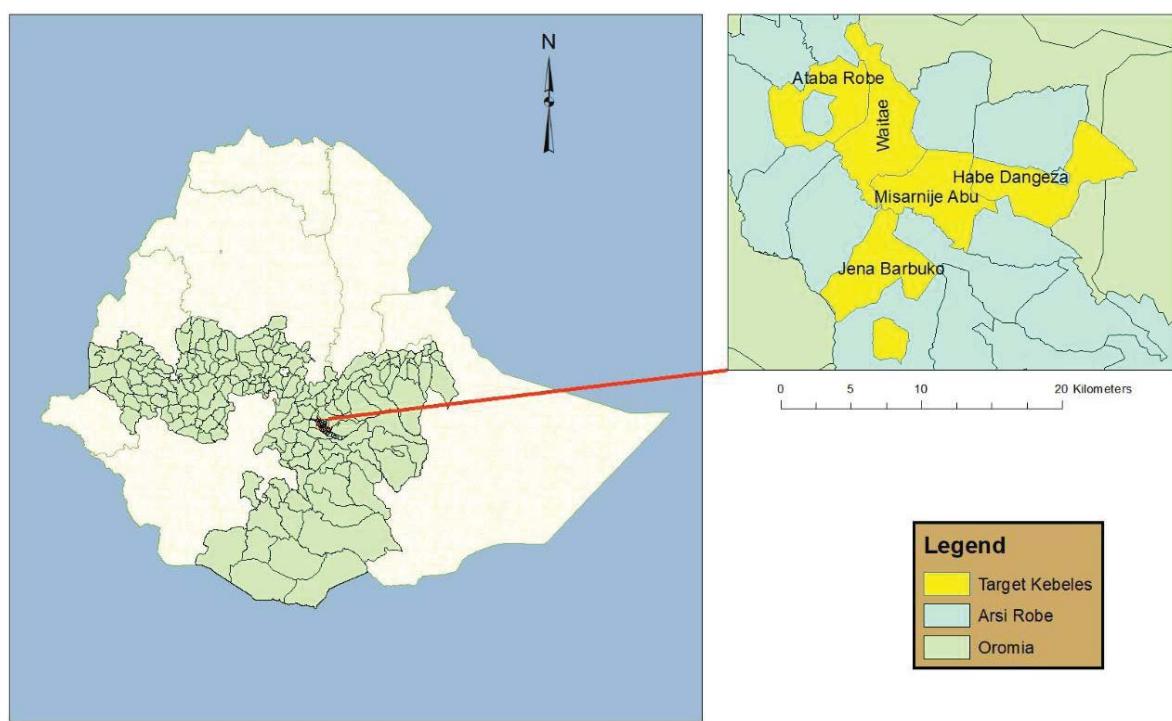


Figure 1: Map of the study district.



Development agents (Das) and farmers .After training the necessary inputs were delivered to the target beneficiarie.

The pre -scaling up of improved bread wheat varieties was conducted at Arsi Robe district at five "Kebeles" named "Habe dangeza", "Meseranje-abu", "Jena-barbuka" "Walta" and "Ataba-robe". The district was selected based on potentiality for bread wheat production. The selection of pre-scaling up site was purposive based on convenience of the area to the technologies and availability of large sized land from 2.3 ha minimum land size (for the case of "Cherera" cluster to 4.5 ha maximum land size ("zeremtela" cluster) in one place or per cluster. A total of 56 farmers (53 male and 3 women) were selected from the kebeles (Table 2 below).

Dissemination of improved Bread Wheat and input utilization

Kulumsa Agricultural Research Center (KARC) in collaboration with Arsi Robe district Agricultural and Natural Resource Management office (ARANMO) expert discussed on the cluster farming approach and to implement in the selected Kebeles of the district. In 2019/20 cropping season KARC delivered 27.4 quintals of improved bread wheat for a total of 56 direct implementers (host) farmers (53 male and 3 women farmers) to produce on 22.8 ha of land on time . Beside this Kulumsa Agricultural Research Center give advice on input utilization and its merit for the farmers (Figure 2).

Method of data collection

Data on yield and yield component were collected and comparison with average yield was made among the varieties planted in the study area (clusters).

Data analysis method

The collected quantitative data were analyzed by using

average grain yield and package comparison again average yield among study area, regional level and national average yield were made [9].

Result and discussion

Pre -scaling up of four improved bread wheat varieties called "DEKA" "Honkolo", "Hidase" and "Lemu" were demonstrated at Arsi Robe district of Arsi zone Oromia Regional State. From the district a total of five "kebeles" were selected based on potentiality of the "kebeles" and availability of clustered land. After site and farmers selection 27.4 quintals of improved bread wheat varieties namely "DEKA" "Honkolo", "Hidase" and "Lemu" were distributed for selected farmers and sowing on 22.8 ha of land. So that out of these 9.7 ha of land were covered by the variety "DEKA" 2.3 ha of land covered with the variety called "Honkolo", 4.5 ha of land covered with the variety called "Hidase" and the remaining 6.3 ha of land were covered with the variety called "Lemu" .

Planting material

Four adaptable bread wheat varieties (DEKA, Hidase,Lemu and Honkolo) were used. Planting material (Seed) were prepared in advance from Kulumsa Agricultural Research center (June 2019) and distributed to the farmers Table 2.

Data Collected

To compare the productivity of varieties actual grain yield was collected. In addition to this yield gained from the farmers field was collected and analyzed to understand the gap of agricultural extension among bread wheat producers farmers found at the study area.

Data analysis

The collected actual grain yield and potential yield of the

Table 1: Characteristics of bread wheat varieties used for the activity.

Characteristics	DEKA(ETBW 7638)	Lemu(ETBW6861)	HONQOLO(ETBW5879)	Hidase(ETBW5795)
Adaptation area	Mid to lowland	High land	High land	Mid to lowland
Days to maturity	75	140	115	121
Altitude (m.a.s.l)	1600 - 2200	>2200	2200 - 2850	2200-2600
Rainfall (mm)	500 - 800	800 - 1100	750 - 1200	500-800
Year of release	2018	2016	2014	2012
Yield potential (q/ha): at RF*	56	55 -65	35 – 63	45-70

RF*=Research Field

Source: [10] and KARC unpublished documents

Table 2: Number of,"kebeles" addressed in cluster farming ,varieties demonstrated and number of farmers involved directly.

District	Kebele	Cluster name	Cluster Size (ha)	Number of farmers		Technology used	Variety	Seed/q
				M	F			
Arsi Robe	Habe dangeza	Cherera	2.7	4	0	Bread wheat	DEKA	4
Arsi Robe	Meseranje abu	Zeremtela	4.5	10	1	Bread wheat	DEKA	6
Arsi Robe	Jena barbuka	Geredu-daro	2.5	7	0	Bread wheat	DEKA	3.75
Arsi Robe	Habe dangeza	Cherera	2.3	5	0	Bread wheat	Honkolo	3.5
Arsi Robe	Meseranje -abo	zeremtela	4.5	16	2	Bread wheat	hidase	5.6
Arsi Robe	Sude-waltai	-	3	4	0	Bread wheat	Lemu	4.5
Arsi Robe	Ataba-robe	-	3.3	7	0	Bread wheat	Lemu	5
Total	5	7	22.8	53	3		4	27.4

varieties data were analyzed using SPSS ver 20 and present in Table 3. The extension gap was calculated using the formulas as given by [11], was used .

Extension Gap =Demonstration yield-Farmers yield

Result and discussion

Yield performance of the varieties demonstrated at farmer's field.

As indicated in Table 3 below shows the analysis result on actual yield performance of the varieties demonstrated at Arsirobe district.

As it can calculated from the below Table 3, the extension gap is 2.8 q/ha for DEKA variety, -2.7q/ha for Honkolo variety, 24.3 q/ha for Hidase variety, 31.1q for Lemu variety. The result of agricultural extension gap analysis showed that Honkolo variety had a -2.7q/ha yield increment or in other words Honkolo variety has achieved 104.3 % of the potential at research field and has a 4.3 % yield advantage than the research field. According to the result DEKA variety has a 2.8q/ha yield gap or in other words DEKA variety has achieved 95% of the potential and the remaining 5% lack due to extension gap. Again the result Hidase variety has a 24.3q/ha yield reduction or in other words Hidase variety has achieved 65.3 % of the potential and has a 34.7 % yield penalty than the research field. Again the result Lemu variety has a 31.1q/ha yield reduction or in other words Lemu variety has achieved 52.2 % of the potential and has a 47.8 % yield penalty than the research field. Therefore, the lower the percentage of agricultural extension gap the higher will be the option for the production.

The agricultural extension gap analysis indicate that there is a wide different average among all varieties in their average yield gap and yield performance between this demonstration at farmers field and the potential of the varieties at research field,



Figure 2: When Expert & researcher at wheat field monitoring and evaluation time (left) & visited bread wheat field at (right).

Table 3: Extension Gap of DEKA,Hidase,Lemu and Honkolo bread wheat varieties at Arsirobe district demonstrated at farmer's field.

Parameters	Bread wheat varieties			
	Honkolo	DEKA	Hidase	Lemu
Yield potential (q/ha): at Research field (A)	35 – 63	56	45-70	55-65
Yield harvested (q/ha) at farmers field (B)	65.7	53.2	45.7	33.9
Extension gap=A-B	*-2.7	2.8	24.3	31.1

*The – (negative) magnitude showed that the yield is well performed at farmers field or the there is no or below 0 Extension gap

having -2.7 q/ha, 2.8q/ha ,24.3q/ha and 31.1q/ha for Honkolo ,DEKA, Hidase and Lemu respectively. This indicates that the varieties Honkolo and DEKA are the first and second option of varieties for farmers respectively and both are feasible if produced in the study areas and other areas having similar agro ecologies.

Yield advantage of the varieties under farmers field at the study area in 2019 cropping season

$$\text{Yield advantage \%} = \frac{(\text{Yield of new variety (q / ha)} - \text{Yield of standard check (q / ha)})}{\text{Yield of standard check (q / ha)}} \times 100\%$$

$$\text{Yield advantage \% for DEKA} = \frac{(53.2 \text{ q / ha} - 45.7\text{q / ha})}{45.7\text{q / ha}} \times 100\% = 16.4\%$$

$$\text{Yield advantage \% for Honkolo} = \frac{(65.7 \text{ q / ha} - 45.7\text{q / ha})}{45.7\text{q / ha}} \times 100\% = 43.8\%$$

$$\text{Yield advantage \% for Lemu} = \frac{(33.9 \text{ q / ha} - 45.7\text{q / ha})}{45.7\text{q / ha}} \times 100\% = 25.8\%$$

Conclusion and recommendations

The activity was conducted at Arsirobe district of Arsi zone of Oromia regional state,Ethiopia with the objectives of to analyze the agricultural extension gap among bread wheat producers of improved bread wheat varieties and yield advantages of each variety over the check.

Four improved bread wheat varieties namely Honkolo,DEKA,Hidase and Lemu of extension packages were demonstrated.

The yield advantage analysis showed that Honkolo variety had a 43.8 %yield advantage over the standard check, DEKA had a 16.4% yield advantage over the standard check, and the variety Lemu had a negative -25.8% yield loss or below the standard check and the author conclude that both Honkolo and DEKA varieties are the first and second option for the farmers whereas the variety Lemu is not recommended due to low productivity in the study area and others areas having similar agro-ecologies.

The agricultural extension gap analysis showed that Honkolo variety producers produce 65.7quintals per hectare which was 2.7quintals additional or 4.3% yield advantages then the research field potential based on this result the author conclude that there was no extension gap among Honkolo variety producers farmers at the study areas and those farmers practice should be scaled up to other areas having similar agro-ecologies to the study areas.

Therefore, the author recommend both Hidase and Lemu not to produce in the study areas and other with similar agro-ecological conditions in the south eastern districts.And again the author recommend both Honkolo and DEKA varieties were recommended for Arsi Robe district and other areas with similar agro-ecological conditions in the south eastern districts.

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