P-ISSN: 2305-6622; E-ISSN: 2306-3599
International Journal of Agriculture and Biosciences
www.ijagbio.com; editor@ijagbio.com

Research Article

Economic Analysis of Factors Influencing Adoption of Barley HB1307 Variety in Western Shewa Highlands: the Case of Elfeta District

Dawit Milkias[1] and Gadisa Muleta[2]

[1]Ethiopian Institute of Agricultural Research, Ambo Agricultural Research Center, Ambo, Ethiopia
[2]Ethiopian Institute of Agricultural Research, National Agricultural Biotechnology, Research Center, Holeta, Ethiopia
***Corresponding author:** johnmeskerem1@gmail.com

Article History: Received: 12-Mar-21 Revised: 20-App-21 Accepted: 25-May-21

ABSTRACT

Barley is the fourth most important cereal crop in the world after wheat, maize, and rice, and is among the top ten crop plants in the world. Ethiopia being the second largest producer in Africa, next to Morocco, accounting for about 25% of the total barley production in the continent. This study assessed the determinants of adoption of barley varieties in Elfeta district, West Showa, Ethiopia. A cross-sectional data collected from 150 randomly selected barley farmers from seven rural kebeles of the district were used. Binary logistic regression model was used to examine determinant factors that influence adoption of barley technology in the study area. The model results revealed that the adoption of improved barley variety was significantly influenced by age of sampled respondents, level of education, barley farming experience, participation on off-farm activities, membership of cooperative groups, distance from the nearest market and availability of credit service. The study recommends that needs to further promote agricultural new technologies by designing an approach based on farmer's problem and need.

Key words: Determinants, Adoption, Barley technology, Elfeta, West Showa.

INTRODUCTION

Agriculture in the Ethiopian economy prominently is the largest contributor to the national economic development and the main income-generating sector for the majority of the rural population. Agricultural technology is among the most impactful area of modern technology; play a key role in enhancing agricultural yield, poverty reduction and in improving national food security. It creates spillover effects to the remaining sectors (World Bank 2014). However, production and productivity of the agricultural sector is low in developing countries due to low technological adoption and techniques among others (Abraham, *et al.,* 2014). As a result, food insecurity and poverty are prevalent in developing countries (Alemitu 2011). The situation in Ethiopia is not any different. Problem such as low technology adoption, low use of recommended farm inputs, broadcast farming and rain-fall are the prime bottlenecks behind the poor performance of the sector (Lulit, *et al.,* 2012). Barley is the fourth most important cereal crop in the world after wheat, maize, and rice, and is among the top ten crop plants in the world (Akar *et al.* 2004). Globally, European Union, Russian Federation, Ukraine, Turkey and Canada are the top five largest world Barley producers where, European union's produce the greatest quantities of barley with an estimated production of nearly 60 million tons followed by Russian federations with a production of about 20 million tons according to Untied state of Agricultural institute estimate in 2014. On the African continent, Morocco, Ethiopia, Algeria, Tunisia and south Africa were the top five largest barley producers for the year 2014 with estimated production of approximately 2.1 million tones,1.7 million tones,1.3 million tones,0.9 million tones and 0.307 million tons respectively.

Barley is an important grain crop in Ethiopia and has diverse ecologies being grown from1800 to 3400 m altitude in different seasons and production systems (Muluken 2013) and makes Ethiopia being the second largest producer in Africa, next to Morocco, accounting for about 25% of the total barley production in the continent (FAO 2014) and recognized as one of the world's most ancient food crop, which is believed to have first domesticated about 10,000 years ago from its wild relatives in the Fertile Crescent of the Near East and center of diversity in Ethiopia. According to the 2014/2015 forecasts from

Cite This Article as: Milkias D and Muleta G, 2021. Economic analysis of factors influencing adoption of barley HB1307 variety In western shewa highlands: the case of Elfeta District. Int J Agri Biosci, 10(2): 94-100. www.ijagbio.com

Ethiopia's Central Statistics Authority, of the 12.6 million hectares under cultivation of the grain crops, 80.78% was under cereals which contributed 87.36% of the grain production and Barley took up about 8 and 7 percent of the grain crop area, and production respectively (CSA 2014/2015). Between 2003/04 and 2013/14, the number of smallholders growing barley increased from 3.5 million to 4.5 million; yields increased from 1.17 metric tons per hectare to 1.87 metric tons per hectare; and total production grew from 1.0 million tons in 2005 to about 1.9 million tons in 2014 (CSA 2005; CSA 2014).

There are two types of barley that farmers grow in Ethiopia: food barley and malt barley. The majority of barley that farmers grow is food barley and it is the main ingredient for several staple dishes such as injera, porridge, and bread. Food barely is a cheaper cereal than maize, wheat, and teff and is often used as a substitute for lower income families. In the country across different region, there are known potential areas for their agro ecology suitability and rich biodiversity to produce barley, but they are not producing to expected extent due to observable and unobservable reasons. Elfeta district is one of the major barleys growing areas in West Showa zone of Oromia regional state. They are known for cultivation of many crops which include, among others, cereals such as barley, Faba bean, Field pea, potato and etc. In this district, despite its vital role in production improvement, there was no empirical information so far on the adoption of barley technologies, and there are no studies focused on its adoption and intensity which could help to broaden the use of technology.

To solve this problem new barley (HB1307 variety) was introduced in different kebeles of the district by Ambo agricultural research Center Extension team. In the district adaptation and demonstration of various barley varieties were conducted in 2017 and consequently production of the crop was started at farmers' field (CASCAPE 2013). With the introduction of new crop varieties, Participatory varietal selection, trial adaptation, training, demonstration, promotion and adoption are the key sequential steps foreseen by the Ambo agricultural research and extension system. Even though new barley technology package such as improved varieties, new planting techniques (row planting and spacing) and new management practice (fertilizer application rate, seeding rate, chemical application) were introduced. The adoption of barely HB1307 variety has not been evaluated. All farmers were not adopting the new technology package because of different adoption behavior and other exogenous factors.

Therefore, the objective of this study was investigation of personal, demographic, socioeconomic and institutional determinants manipulating adoption of barley technology in the study district. This will help researchers and other governmental organization to estimate the true welfare effects of technology adoption decision by controlling for selection biases on production and adoption decision.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in Oromia National Regional State, West Showa administrative zone Elfeta district. The district was located 71 km far from Ambo town and 112 km from Addis Ababa the district is bounded from East by Jaldu district from North by Chobi district, from West by Ambo from south by Dendi district. The total area of district is covered about 39342 hectares and arable land is about 25807 hectares, forest 2514 and grass land is around 8150.5 hectares. A mixed farming system in practice in this district mainly crop production which rain fed subsistence agricultural crop production.

The population of the district is male 43297 and female 43734 totals 87031 are living in the 17(2 urban and 15 rural) of kebeles of the district. The total population of urban and rural area of district where: males 6657 and females 6678, male 38717 and females 34979 in urban and rural area respectively. Geographically the altitude varies from 1500-3200 masl. The temperature of the district is 11^{o}c - 23^{0}c and annual rainfall ranges from 800ml – 1100 ml. Major crops produced in the district are barley, faba bean field pea, potato, wheat, teff, Maize, sorghum, chick pea and etc (District Annual Report 2019).

Sampling Procedure

The data were collected using multi-stage random sampling method. At the first stage, Elfeta district where barley is one of the major crops grown was purposely selected. At the second stage, seven Kebeles (Hara tufticha, Gosso Mikael, Jirma korphessa, Dhaba Medhanialem, Tosegni gefere, Gute sado and Qalicha) were randomly selected for this study. The Kebele identification was made through reviewing secondary data on production potential of barley and dissemination of the technologies and area coverage of the crop. Finally, through systematic sampling techniques 150 barley farmers from selected villages were personally interviewed using the well-designed detailed survey questionnaires. The sample keeping the proportion to each kebeles were selected by using Yamane (1967) sample size formula and 8 % Precision Level Where Confidence Level is 95%.

$$n = \frac{N}{1 + N(e)^2}$$

$$= \frac{4425}{1 + 4425(0.08)2} \approx 150$$

Where n is the sample size for the study, N is the total households of the study area which is 4425, e is the maximum variability or margin of error or which is 0.08 in this study, 1 is the probability of the event occurring. The sample size from each kebeles' was determined based on their proportion to total share of households residing in each kebeles.

Methods of Data Collection

The data has been collected from primary and secondary sources. Primary data was collected from Elfeta district barley producers and extension workers by using a structured questionnaire. Experienced researchers and technical assistants from Ambo Agricultural research Center and Holeta national agricultural biotechnology research center who can listen and speak the local language were employed for data collection. The data were collected during the fiscal year of March 2019. The secondary data sources were collected from Elfeta district Office of Agriculture and published and unpublished materials, which include books, journals, scientific research works

and office records. The collected data were arranged into coding sheet and inserted into computer statistical software SPSS/PC and analyzed using appropriate statistical techniques.

Methods of Data Analysis

To achieve the objective of the research different approaches of analysis were adopted. In view of that, both descriptive statistics and econometrics model have used to analyze the data. Descriptive statistics such as average mean, frequency and percentages were used. Chi-square and t-tests were used to see the presence of the significant association between the dependent and explanatory variables between the adopters and non-adopters of barley producers. Statistical packages including SPSS and STATA were used to run data entry and analysis purposes.

The logistic regression was fitted employing method of barley technology adoption as dependent variable and the listed demographic, institutional and socioeconomic variables as independent variables which is assumed to determine barley technology adoption. This model (logit) is selected for this study and it was also used when the response of the respondents is binary (yes or no). Here, the dependent variable is adoption categories for adoption of barley variety: 1 if the farmers adopt this improved variety and 0 otherwise. The independent variables were (X_i):

X_1 = Age of the farmer (Years) X8 = Participation on training
X_2 = Educational Status of the farmer X9 = Participation on Demonstration
X_3 = Sex of the farmer X_{10} = Farm Income
X_4 = Labor availability X_{11}= Distance from Main market
X_5 = Area of Land Cultivated (Ha) X_{11}= Cooperative Membership
X_6 = Participation on off farming X_{12}= Use of credit
X_7 = Extension contact X_{13}= Farming Experience

RESULTS AND DISCUSSION

Demographic and socio-economic characteristics of Respondents

A total of 150 households from sampled kebeles of the district were covered in this study. Of these, about 59.33 % households were adopters i.e., they planted at least one or more season the improved barley (HB1307) variety before the 2019 cropping season. Accordingly, the results in Table 2, show the relationship between the continuous variables with the adoption categories of the respondents at different probability level were discussed as below.

Surveyed result shows that overall mean age of sampled respondent was 49.12 having standard deviation of 9.8. Maximum and minimum age was 58 and 18 respectively. The mean age of the adopters and non-adopters were 46.2 having standard deviation 9.8 and 53.4 with standard deviation of 8.2 years respectively. This implies the majority of smallholder farmer's ages are in the category of active labor forces. Result of mean test indicated that ages of sampled respondent mean difference among adoption categories is significant at 1 percent level.

With mean barley farming experience of 16.55 years having the standard deviation of 9.33 years for sampled respondents, the adopters have more average farming experience (20.3 years) than non-adopters (11.02 years) and this difference is significant at 1% significance level.

Area cultivated and owner-ship is the series part for agricultural production and adoption of agricultural innovation for the farm society. In this study, the average land cultivated of sampled respondents was found to be 1.15 hectares with standard deviation of 0.225 hectares. The maximum land size owned by the sample households was 1.75 hectare while the minimum is 0.50 hectare. The average landholding for adopter respondent was 1.2 hectare while that of non-adopter is 1.01. The t-test result shows that there is a significant mean difference between adopters and non-adopters at 10 % probability level.

With regard to the annual income of the respondents, the household farm income was estimated based on the sales of crops and livestock and livestock products and the average annual income of sales of sample households who adopt barley technology was 8755.4 birr/year and mean income of non-adopter of barley technology was 5955.2 birr/year. Therefore, the t-test analysis result revealed that, total annual household income shows that there is significant mean difference with the adoption categories of sample respondents at 1% level of significance which consistent with the hypothesized relationship with adoption decision.

Sample households were located at a mean distance of 2.4 kilometers away from the nearest market. Adopters were far a mean of 2.03 kilometers away from their nearest market while non-adopters were 2.6 kilometers far. The t-test result shows that there is statistically significant mean difference between both adoption categories in terms of distance to the nearest market.

Table 3, shows the association between the dependent variables (adoption groups) and the dummy explanatory variables at different probability level. With regard to the education level of respondents, 32 %, 40 %, 24 %, 12 %, and 4 % of the respondents were with the non-formal education level, primary education level, secondary education level, and college and above education level respectively. Mean years of schooling for sampled respondents was 2 having the standard deviation of 0.85. However, no significant difference was observed in the education level of sampled respondents among adoption categories.

From the adopter sample respondents, 88.76 % and 11.24 % were male and female-headed households respectively. The majority of female household adopters were found in low adoption category which indicates that they are less capable in adopting improved barley varieties as compared to their male household counterparts in the study area. There is no significant difference observed among adoption categories.

About 85.39 % adopters had access to credit while the rest were not accessed to it. About 31.15 % of non-adopters were accessible for credit while 68.85 % were not accessible. Overall, about 63.3% of respondents were accessible for credit. Therefore, the result revealed that, access to credit service shows statistically significant association with the adoption decision at 1% level of significance.

The average frequency of extension contact in a year was 98.88 for adopters and 60.66 for non-adopters. Therefore, the t-test analysis result shows that there was significant mean difference between both adoption categories in terms frequency of contact with the extension agent at 1% significance level. Participation on training and information on improved barley varieties had also positive and significant effect on increasing adoption status of

Table 1: Number of respondents from each selected Kebele

No.	Selected Kebeles	Total Number of Barley producers	Total Sample distribution	
			Number	Percent
1	Hara tufticha	888	30	20.0
2	Gosso Mikael	861	29	19.4
3	Jirma korphessa	447	15	10.0
4	Dhaba Medhanialem	678	23	15.4
5	Tosegni gefere	809	27	18.0
6	Gute sado	297	11	7.20
7	Qalicha	445	15	10.0
	Total	4425	150	100

Sources; District Office of Agriculture.

Table 2: Summary of descriptive statistics for continuous variables.

Variables	Mean across adoption Categories				t-test	Pr
	Adopter(N=89)		Non-adopter (N=61)			
	Mean	SD	Mean	SD		
Age of the farmer (Years)	46.2	9.8	53.4	8.2	4.72***	0.00
Barley farming Experience	20.34	7.2	11.02	9.4	6.88***	0.00
Land Cultivated (ha)	1.2	0.21	1.01	0.2	1.8*	0.07
Farm Income	8755.4	2656.8	5955.2	3701.98	5.4***	0.00
Labor availability	5.01	1.3	4.84	1.17	0.82	0.20
Dist.to nearest market	2.03	1.3	2.6	0.95	3.42***	0.00

Source: Model output, ***, * represents 1%, and 10% level of significant.

Table 3: Summary of descriptive statistics for Dummy/Categorical variables

Variables	Mean across adoption Categories				X2	t-test
	Adopter		Non-adopter			
	N	%	N	%		
Education level					2.7	0.45
- Illiterate	25	28.09	23	37.7		
- Primary	37	41.57	23	37.7		
- Secondary	22	24.72	14	22.95		
- - College 5		5.62	1	1.64		
Part. In off-farming					12.79***	0.00
- No	48	53.93	15	24.59		
- Yes	41	46.07	46	75.41		
Cooperative Membership					9.94***	0.00
- No	51	57.3	19	31.15		
- Yes	38	42.7	42	68.85		
Extension contact					38.06***	0.00
- No	1	1.12	24	39.34		
- Yes	88	98.88	37	60.66		
Use of credit					45.86***	0.00
- No	13	14.61	42	68.85		
- Yes	76	85.39	19	31.15		
Part. Training					25.93***	0.00
- No	56	62.92	60	98.36		
- Yes	33	37.08	1	1.64		
Part. Demonstration					14.76***	0.00
- No	30	33.71	40	65.57		
- Yes	59	66.29	21	34.43		
Sex of household						
- Female	10	11.24	10	16.39	0.8	0.36
- Male	79	88.76	51	83.61		

Source: Model output, ***, represents 1% level of significant.

sampled respondents. The result of chi-square is significant at 1% probability level. Trainers at peasant association level were experts from district agricultural office, development agent and other non-governmental organizations.

The survey result depicts very limited membership to cooperative between adopters (68.85%) and non-adopters (68.85%) implying significant difference at 1% significance level. In contrast, non-adopters are not mostly participating in cooperative groups (57.14%) compared to adopters (37.76%) with significant difference at 1% significance level. Out of the total households interviewed, adopter and non-adopter sample households participated on off-farm activities were 46.07% and 75.41 %, respectively. Participation in off-farm activities had significant relationship with adoption of barley variety at 1 % probability level.

The sample adopter and non-adopter sample households selected for the study participated on demonstration were 66.29 % and 34.43 %, respectively. The chi-square result indicates that the association between participation in demonstration and the two adoption categories of barley variety is statistically significant at 1% probability level.

Table 4: Reasons for non-adoption and stopping Adoption of improved *Barley* varieties

No.	Reasons for non-adoption	Frequency	Percent
1	Lack of access to credit	19	31.15
2	Un- availability of seed	22	36.06
3	Shortage of land	11	18.03
4	High price of input	9	14.75

Sources: own survey 2019, result

Table 5: The maximum likelihood estimates of the logit model

Variables	Coefficient	Std. Err.	Z	P>|Z|	Odds ratio
Age of the farmer	-0.3202	0.0925	-3.46***	0.001	-0.0122
Education level	1.0852	0.614	1.77*	0.077	0.0412
Sex of the farmer	-0.8699	1.3294	-0.65	0.513	-0.0252
Barley farming Experience	0.3563	0.1026	3.47***	0.001	0.0135
Land cultivated	0.5171	1.7114	0.3	0.763	0.0196
Income of household	-0.0942	0.0131	-0.72	0.472	-0.3561
Part. Off-farm	1.9784	1.0416	1.9*	0.058	0.0736
Labor availability	-0.0413	0.3492	-0.12	0.906	-0.0015
Cooperative Membership	5.1645	2.0475	2.52**	0.012	0.3895
Dist. nearest market	-1.1484	0.5584	-2.06**	0.041	0.0436
Extension contact	1.6896	2.2216	0.01	0.994	0.0975
Credit availability	5.3068	2.065	2.57**	0.012	0.5372
Part. Training	2.4062	1.2216	0.01	0.991	0.9061
Part. Demonstration	-0.5505	1.2753	-0.43	0.660	-0.0279
- *Cons*	-1.0799	0.2221	0.000	0.996	

No. of observation=150; Wald $\chi 2$ (14) =156. 06***; Prob>Chi2=0.00; Pseudo R2=0.4100; Log likelihood=-101.34; Source: Model output, ***, **,* represents 1%, 5% and 10% level of significant

Adoption and Non-Adoption of Improved Barley (HB1307) Variety in the Study District

The survey results showed that Barley (HB1307) is the most preferred variety by about 59.33 % of the sample households. The remaining sample households which 40.67 % households do not respond to the varietal preference for Barley crop. Some of non-adopters had an experience of practicing use of improved barley variety and then stopped adopting the new improved varieties due to the problem indicated in the Table 4.

As indicated on the Table 4 above about 36.06 %, were due unavailability of improved seeds in the area, 31.15% were due to un availability of credit, about 18.03 % due to shortage of farm land and 14.75 % were due to high price required for purchasing inputs (improved seeds, chemicals and fertilizers), respectively. Furthermore, due to unavailability of improved seeds, shortage of farmland, traction power, high price of improved seeds the households did not adopt and stopped adoption of improved varieties.

Econometric (logit) Model Analysis Result

The results in Table 5 indicated that logit model was used to identify Determinants of Adoption of Barley (HB1307) technology adoption decision in the west Showa highland area. Among fourteen explanatory variables, seven of them significantly influenced respondents' decision to adopt the technology. The result of the model shows that the explanatory variable age of sample respondents was found negatively and significantly influence adoption decision of improved barley variety, whereas, education level, barley farming experience, participation on off-farming, participation on cooperative groups, distance to the nearest market and credit availability were found positively statistical significant with adoption of improved barley variety at 1%, 5% and 10 % level of significance. The chi-square result also shows that the parameters are significantly different from zero at P<0.01 for the adoption of barley HB1307 variety.

As indicated in Table 5 above the logistic model result used to study determinants of improved barley varieties adoption decision are shown. Variables contributing significantly to the model were selected and the main effect and interactions were further investigated. Among the fourteen variables used in the model, seven variables were significant with respect to adoption of improved barley varieties with less than 1%, 5% and 10% of the probability level. These variables include age of respondents, level of education, barley farming experience, participation on off-farming, membership of cooperative groups, distance to the nearest market, and availability of credit in the study area. The effect of the significant explanatory variables on adoption is discussed below:

Barley farming experience was hypothesized to have positive effect on farmers` level of adoption of barley variety in the study area. It was significant and positive effect on the adoption of improved barley variety at 1% significance level. All other variables remain constant; the odds ratio suggests that one unit increase in barley farming experience would increase farmers` adoption by the factor of 1. The implication is that farmers who have more years of farm experience are more likely to adopt improved barley (HB1307) variety than those farmers who have less years of farm experience.

The level of formal education was positive and statistically significant at 10 % level. All other variables remain constant; the odds ratio suggests that one unit increase in years of schooling would increase farmers` adoption decision by the factor of 40%. This finding agree with Paulos, *et al.*, (2004), who clearly shows as farmers year of schooling increases the level of awareness and hence farmers can easily adopt new variety on their fields for further management practices. The more educated a farmer, the more he is to diagnose and observe the benefits

of new technologies. Participation in off-farm activity had positive and significant effect on the adoption of improved barley variety at 10% significance level. The value odds ratio indicated that participation in off-farm income generating activity improves the likelihood of adopting barley HB1307 variety by 70%. Many farmers can earn additional income by engaging in various non-farm activities. This is believed to raise financial position to acquire new inputs.

The odds ratio implies that a unit increase in age of a household heads will reduce the probability of adopting the barley (HB1307) by 1%. In other words, as age increases the probability of adopting the variety decreases. This might be due to need for high physical labor. The elders are physically weak to adopt improved barley variety. According to them, age is one of the factors that determine decision making of a person. Household heads with advanced age are more reluctant to accept new technology than younger household heads.

Participant farmer in cooperative groups has increases farmers ability in technology adoption and dissemination and also creates favorable condition to farmers in exchanging information and participates in different agricultural training and the result was statistically significant at 5% level. The value of odds ratio implies that being member of cooperative group favors the adoption of improved barley HB1307 variety by 38%. Organizing of farmers to be a member of cooperative group would help them to get access to seed, credit, access to extension information and also access to market. The findings from the studies by (Dawit 2020) are consistent with this result.

The variable access to credit had positive and significant influence on the likelihood of adoption of barley variety at less 1% significance level. If a recommendation implies a significant cash investment for farmers, its adoption may be facilitated by an efficient credit program. From this result it can be stated that those farmers who have access to formal credit, from agricultural Office or from cooperative and cooperative farmers (farmers who are members of cooperative) are more probable to adopt barley HB1307 variety than those who have no access to formal credit. The result of the model shows that the odds ratio in favor of farmers' adoption barley increases by the factor of 53% when there is access to credit services. This reveals that access to credit increases farmer's opportunity to adopt Barley variety and the findings of confirms (Garba 2016; Kafle 2011).

Farmers residing at a farther distance from the nearest market were found not to be better adopters of barley technology compared to those residing at a distance located closer to the nearest market. A kilometer increase in farmers' distance from the nearest market results in a decrease in adoption of barley HB1307 variety by a factor of 4 %, keeping other factors constant and it is negatively and statistically significant at 5 percent level. This further shows that as the nearest market distance decreases, adoption of the variety by the household raises. The result is consistent with the finding of (Milkias 2020; Yishak 2005).

Conclusion and Recommendation

In Ethiopia, farmers have been adopting and using different agricultural technologies, the adoption of technologies has not completely optimal yet. The study investigated the determinants of adoption of barley HB1307 variety using the binary logit econometric model. The objective of the study was investigation of personal, demographic, socioeconomic and institutional determinants manipulating adoption of barley technology in the study district. The study applied cross sectional household level data collected in 2019 cropping season from 150 sampled household's head. The main determinants affecting adoption of barley technology include age of sampled respondents, level of education, barley farming experience, participation on off-farming, membership of cooperative groups, distance to the nearest market, and availability of credit in the study area. Farmers quoted several reasons for not adopting improved technologies. The main reasons for non-adoption and stopping adoption of improved *Barley* varieties are lack of access to credit services, unavailability of improved seeds (Seed supply has been constrained by inefficient public seed enterprises, poor seed promotion, poor transportation, and inappropriate agricultural and pricing policies). When seeds or fertilizer are unavailable, (it is challenging to ascertain whether the issue is a problem with the distribution network or lack of effective demand), shortage of land and high price of input in the study district. The limited availability of fertilizer further constrained the use of improved seed.

Therefore, by solving the above problems changing the attitudes of farmers is an important factor in adopting barley HB1307 variety technology. Increasing the number of cooperatives organization in the rural area in which the farmers will be able to get credit are basis in enhancing the adopting technology. Thus, the credit facility should target poor farmers especially those who were not adopting the technology due to lack of operating capital. Now it is time to look improved extension approach which needs participation of different stakeholders. Therefore, it needs to further promote agricultural new technologies by designing an approach based on farmer's problem and need.

Acknowledgments

Our thanks go to Elfeta district office of Agriculture staff that provided us with all the necessary information and facilitating timely implementation of the study. Finally, we would like to thank all the farmers of the study area who gave us their unreserved effort and contribution while we fill the questionnaire.

REFERENCES

Abraham B, H Araya, T Berhe, S Edwards, B Gujja, R Khadka, D Sen, Y Koma, A Sharif and E Styger, 2014. The system of crop intensification: Reports from the field on Improving agricultural production, food security and resilience to climate change for multiple crops. Addis Ababa, Ethiopia.

Alemitu M, 2011. Factors Affecting Adoption of Improved Haricot Bean Varieties and Associated Agronomic Practice in Dale Woreda, SNNPRS. MA Thesis a Hawassa University, Hawassa. 40p. District office of ARD, 2018: Activity performance reports. Elfeta district, West showa zone, Oromia region Ethiopia.

Capacity Building and Scaling up of best Agricultural Practice in Ethiopia (CASCAPE), 2013. Annual report. Unpublished.

CSA (Central Statistical Authority), 2013. Federal Democratic Republic of Ethiopia, Agricultural Sample Survey on major crop production, Addis Ababa, Ethiopia.

CSA (Central Statistical Authority), 2015. Agriculture Sample Survey 2014/2015 (2007 E.C). Report on Area and Production of Major Crops (Private Peasant holdings, Meher seasons). Addis Ababa Ethiopia, The FDRE statistical bulletin Volume 01-578.

Central Statistical Agency (CSA), 2014. Agricultural sample survey: Report on area and production of crops, Addis Ababa, Ethiopia.

Dawit M, 2020; Factors Affecting High Yielding Teff Varieties Adoption Intensity by Small Holder Farmers in West Showa Zone, Ethiopia. International Journal of Economy, Energy and Environment. Vol. 5, No. 1, 2020, pp. 6-13. doi: 10.11648/j.ijeee.20200501.12

District Annual Report, 2019: Anual performance reports. Elfeta district, West Showa Zone, Oromia region Ethiopia.

FAO, 2014. The potato sector profile. Food and Agriculture Organization of the United Nations, Rome, Italy. http://www.potatao.com/ethiopia/potato-statistics

Garba U, 2016. Factors influencing adoption of recommended Irish potato production practices in Kudan and Giwa local Government Areas of Kaduna State, Nigeria.

Kafle B, 2011. Factors affecting adoption of organic vegetable farming in Chitwan District, Nepal. – World Journal of Agricultural Sciences, 7: 604–606

Lulit M, E Ermias and H Zelalem, 2012. Public investment in irrigation and training for agriculture-Led development: a CGE approach for Ethiopia. Addis Ababa, Ethiopia.

Milkias DK, 2020. Analysis on Determinants of Adoption of Improved Wheat Technology in Liben Jewi District, Oromia Region, Ethiopia. International Journal of Applied Agricultural Sciences, Vol. 6, No. 3, 2020, pp. 36-43.. doi: 10.11648/j.ijaas.20200603.12

Muluken, 2013, Study on malting barley genotypes under diverse Agro-ecologies of north western Ethiopia

Paulos A, B Kassa and H Desta, 2004. Determinants of Farmers' Willingness to Pay for Soil Conservation Practices in the Southeastern Highlands of Ethiopia: Land Degradation and Development 15:pp423-438

Yamane T, 1967. Statistics: An Introductory Analysis, 2nd Ed., New York: Harper and Row. Zodpey, S P (2004): Sample size and power analysis in medical research, Indian J. Dermatol. Venereol.Leprol, 70 (2), 123-128.

Yishak G, 2005. Determinants of Adoption of improved Maize Technology in Damote Gale Woreda, Wolaita, Ethiopia. Msc. Thesis. Presented to School of Graduate Study of Alemaya University.

World Bank, 2014. Ethiopia poverty Assessment. Land Degradation and Development 15:pp423-438

World Bank, 2014. Ethiopia poverty Assessment. Document of the WB for official use only.

Zodpey S, 2004: Sample size and power analysis in medical research, Indian J. Dermatol. Venereol. Leprol, 70: 123-128.