STM JOURNALS

Research & Reviews: Journal of
Agricultural Science and Technology

https://journals.stmjournals.com/rrjoast

ISSN: 2278-2206 (Online)
ISSN: 2349-3682 (Print)
Volume 15, Issue 2, 2026
May–August
DOI (Journal): 10.37591/RRJoAST

Research RRJoAST

Adoption of Major Improved Crop Varieties in Selected Districts of the Southwest Ethiopia Region

Amanuel Afeto[1,*], Tesfaye Gafaro[1], Zelalem Abate[1]

Abstract

Agriculture forms the backbone of the Ethiopian economy and significantly contributes to the livelihoods of most of the population. It remains a central pillar of food security, employment, and rural development across the country. The present study aims to examine the adoption of improved major crop varieties and to identify the key factors influencing their uptake in the Southwest Ethiopia region. The research was carried out in the districts of Bita, Chena, Andiracha, and Sheyi Bench, located in southwestern Ethiopia. Data for this study were collected through household individual survey interviews, key informant interviews, and focus group discussions from primary sources and published and unpublished secondary sources. Descriptive statistics and binary logistic regression of econometric models were employed to indicate the finding of this study. The adoption of major improved crop varieties was lower, only 34.90% of the sample households were used improved crop varieties in 2022/2023 production year Improved maize, wheat, common bean, and faba bean varieties were distributed in 2022/2023 production year in the area. Improved maize adopters were 25.3%; wheat adopters were 11.49%; common bean was 2.68% and 0.76% were faba bean adopters. Binary logistic regression results indicate that educational status, total annual income, and frequency of extension agent contact positively and significantly affect adoption of major improved crop varieties. The main challenges to adoption were supply problems, inflated improved seed price, lower productivity difference with local landraces and disease attack, and land shortage. Regional, zonal, and district governments should work on accessing quality improved seed of farmers' interest on time and needed amount, and special attention should be given to districts with the least adoption rate by creating awareness, training, demonstration, and accessing agricultural inputs to achieve better technology adoption levels.

Keywords: Adoption, binary logistic, improved varieties, maize, southwest, wheat

INTRODUCTION

Agriculture is the mainstay of the Ethiopian economy, and more than 85% of the rural population is engaged in agriculture and plays a substantial role in the life and livelihood of most Ethiopians. However, the agricultural production system in Ethiopia is traditional and less supported by technologies such as irrigation, improved varieties, and improved practices [1]. Most smallholder farmers depend on conventional methods of production, which have impaired production and productivity [2]. To intensify the agricultural sector of the county through technology, governmental and non-governmental bodies have made many efforts in the past two decades [3]. The central aim of this process is to boost agricultural production and productivity.

***Author for Correspondence**
Amanuel Afeto
E-mail: amanyaster@gmail.com

[1]Agricultural Economics Researcher, Department of Agriculture Economics and Gender Directorate, Southwest Ethiopia Agricultural Research Institute; Bonga Agricultural Research Center, Bonga, Ethiopia

Received Date: February 12, 2026
Accepted Date: February 26, 2026
Published Date: June 15, 2026

Citation: Amanuel Afeto, Tesfaye Gafaro, Zelalem Abate. Adoption of Major Improved Crop Varieties in Selected Districts of the Southwest Ethiopia Region. Research & Reviews: Journal of Agricultural Science and Technology. 2026; 15(2): 18–31p.

© STM Journals 2026. All Rights Reserved

The adoption of enhanced agricultural technologies is a technique for boosting productivity in the agricultural sector, alleviating poverty, and ensuring food security [4]. In the agricultural sector, technological improvements include the utilization of irrigation, mechanization, improved cultivars, soil fertility improvement, and pest control mechanisms that enhance the productivity per unit area of land and bring about a rapid increase in production [1]. Technological adoption in the agricultural sector can increase agricultural products, improve household income and livelihoods, and have a spillover effect on other sectors, such as industry and manufacturing, and the economy of the whole country. In a country like Ethiopia, where most of the population is under poverty and has large agricultural resources like arable land, water, and human resources, agriculture is a strong option for economic development and to overcome poverty [2]. To improve the agricultural technology adoption of farmers, non-governmental and governmental bodies have supported different ways to improve agricultural productivity and livelihoods of farmers, but it is still below expected [1]. Almost half of the cropland is covered without fertilizer, utilization of pesticide is below 20%, irrigated land is nearly 1%, and only 10% of cropped land is covered by improved varieties.

Many improved agricultural technologies that boost farmers' production and productivity have been introduced and disseminated by agricultural offices, research centers, and universities in the study area [5]. However, most farmers in the study area are still using their traditional way of farming practices, such as utilization of local seed, oxen-based land preparation, rain-fed agriculture, lower soil fertility improvement measure, lower pest, disease, and weed control that slow progress in smallholders' agriculture [6]. The lower application of the recommended technology that improves the entire agricultural sector and the livelihood of producers did not achieve its objective, and subsistence production is still practiced in the area. Farmers cannot easily adopt improved agricultural technology because of various socio-economic, demographic, and institutional factors [7–9]. including gender, land size, family size, age, income, credit access, extension service access, and access to markets. However, some studies have reported multiple barriers to the adoption of improved crop varieties, including lower technology awareness, farmers' risk aversion to technology, institutional restrictions on supplying and disseminating technologies, farmers limitations in human and financial capital to access technologies, and infrastructure problems in accessing and supplying products to meet demand [4].

During our earlier studies in the area, farmers needed assessment and agricultural production problem assessment studies. We recognized that only a few farmers were using the recommended improved technologies, which resulted in lower crop productivity than the potential of the area and crops. In addition, during the period of improved seed demand assessment, we recognized that the utilization of improved seed was lower than in other areas of the region. Therefore, why are farmers in these zones reluctant to use improved seeds to improve their production and productivity?

Objective of the Study

This study aimed to identify and analyze the factors influencing the adoption of major improved crop seeds among farmers in the study area.

RESEARCH METHODOLOGY

Description of the Study Area

Kaffa, Sheka, and Bench-Sheko zone was three zones from Southwest Ethiopia region selected for this study. Four sample districts were selected: two districts, Bita and Chena, from the Kaffa zone; Sheyi-Bench district from the Bench-Sheko zone; and Andiracha district from the Sheka zone. Bita is a district in the Kaffa zone, located 523 km southwest of Addis Ababa, the Capital of Ethiopia. It is geographically located between 7°12′33″ and 7°35′00″ North latitudes and 30°29′15″–35°51′00″ East longitudes. The Bita district covers an area of 109,247 ha in the Kaffa zone. The district shares a border to the East by Chena district of the Kaffa Zone, to the west with the Yeki district of the Sheka Zone, to the north with the Gesha district of the Kaffa Zone, and to the northeast with the Gawata district of the Kaffa Zone. The elevation ranges from 950 to 2570 masl. It receives a mean annual rainfall of 1571–1862 mm, with a maximum between June and September. The average monthly temperature was

© STM Journals 2026. All Rights Reserved

22.6°C, with a maximum of 32.9°C and a minimum of 13.5°C. Agriculture remains the major means of livelihood in the district, and the major crops grown in the district are permanent crops, cereals, pulses, vegetables, and root crops.

Chena is another district selected for this study from the Kaffa zone. It is located at 07º18′48″N Latitude and 36º16′25″E Longitude and at an altitude of 2020 masl. The district is bordered by Decha to the east, the Bench-Sheko zone to the south, Gimbo to the northeast, Bita to the west, and Gawata to the north. The agro-ecology of the highland covers 15%, midland 80%, and lowland 5%. The district has a mean annual temperature of 19°C, with a minimum of 16°C and a maximum of 28°C, and a mean annual rainfall of 1800 mm. The Chena district has a total area of 901.92 km^2 with a crop-livestock mixed farming system. Enset, coffee, maize, barley, potato, sorghum, teff, beans, and wheat are the major crops grown in the district.

The district selected from the Bench-Sheko zone was the Sheyi-Bench district having a 46,315.04 ha of total area coverage. The agro-ecology of the district was 70% mid-land and 30% low land. Menit-Goldiya bordered the district from the east and south, the Debub Bench from the west, the Semen Bench from the northwest, and the Kaffa Zone from the north. Sheyi-Bench district receives an average annual rainfall of 803.35 mm and average temperature ranging 15°C to 25°C. The crop-livestock mixed farming system practiced in the district with major crops grown include maize, wheat, taro, enset, teff, common bean, faba bean, and sorghum.

The Andiracha district is one of the selected districts for this study from the Sheka zone, with two low land, 10 midland, and five highland kebeles. It is geographically located between 7°25′ and 7°45′ N, and 35°05′ and 35°35′ E. It is bordered to the northwest by the Oromia region, to the south by Yeki, to the southwest by the Gambella region, to the north by Masha, and to the east by the Kaffa Zone. The district receives annual rainfall ranging from 1800 to 2200 mm, and the annual temperature ranges from 17 °C to 29°C. The district has a total area of 200,869.5 ha, with 36.94% covered by forests. A mixed farming system is practiced in the district with an agroforestry system, and the main crops produced in the district include enset, coffee, maize, and potato.

Sampling Technique and Sample Size Determination

A multistage sampling procedure was employed to select sample households. Two districts from the Kaffa zone, one from Sheka, and one from the Bench-Sheko zone were randomly selected from the FSRP districts. To take proportion to the size of each zone, we took two districts from the Kaffa zone and one from the other zones. Second, two sample kebeles were randomly selected from each district. Sample households were then selected randomly from the list of households in the selected kebele.

The sample size for this study was determined using the formula developed by Yamane [10].

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

where n is the number of sample households selected and interviewed, N is the total population of the sample area, and e is the error level. A total of 261 sample households were interviewed using a structured questionnaire on the adoption of major improved crop varieties, as shown in Table 1.

Data Type, Source, and Collection Technique

Data for this study were collected from primary and secondary sources, including quantitative and qualitative data. The data collection methods employed for this study included key informant interviews, focus group discussions, and individual household survey interviews using structured questionnaires. Key informant interviews were conducted at the Woreda and kebele levels, which have better information about the type of improved crop seed distributed in the areas. Focus group discussions were conducted in all kebeles of the four districts, including different community members, which provided better information on trends and adoption of agricultural inputs. A household survey was conducted in all eight Kebeles with 261 sample households of different sizes, proportional to households in each Kebele.

© STM Journals 2026. All Rights Reserved

The primary data were the socioeconomic characteristics of households, type and amount of improved crop varieties cultivated in 2022/2023, and challenges to improved crop seed utilization. Secondary data were collected from published and unpublished sources, including website reports, annual and quarterly reports of respected government offices, and other sources.

Method of Data Analysis

The analytical method used to indicate the findings of this study includes both descriptive statistics and econometric models.

Descriptive Statistics

Descriptive statistics, such as mean, frequency, percentage, and standard deviation, were used to indicate the sample household's utilization of improved seed, respondents' demographic, socio-economic conditions, type, and amount of improved crop varieties used using SPSS and Stata package. T-test and $\chi 2$ test were employed to determine the mean difference and frequency variation between adopter and non-adopter.

Econometric Analysis

To estimate the factors determining the adoption of major improved crop seeds by farming households, a binary logistic model was used. Binary logistic regression better estimates the adoption of major improved varieties of households with factors of magnitude; however, the probit model estimates only the probability of adoption. The binary logistic model estimates the magnitude of the factors' effect with their direction by the odds ratio. The output of the binary logistic regression indicates the extent to which the change in the independent variable can increase or decrease the dependent variable. However, many binary models only indicate the probability of occurrence of an event. In this study, the dependent variable is the utilization of major improved crop varieties in the 2022/2023 production year. The dependent variable is binary, with 1 when the household is an adopter and 0 when it is not.

The model is specified mathematically by:

$$Pi = E(Y = 1/xi) = 1/1+e\text{-}z = e^{z}/1+e^{z} \quad (2)$$

Where Pi represents the probability of adoption of major improved crop seed, Yi = 1, and exp (Zi) is the odds ratio "e to the power of Zi". In the case of explanation, equation (2) is written as:

$$Pi = 1/1+e\text{-}Z \quad (3)$$

Where, $Zi = \beta 0 + \beta iXi$.

The probability of a respondent choosing to adopt improved crop seed successfully is given by Equation (3), and the probability of a respondent not adopting improved crop seed is given by Equation (4).

$$Pi = 1\text{-}pi/xi = 1/1+e^{Zi} \quad (4)$$

If Pi is the probability of an adopter, then the non-adopter is (1 − Pi). So, 1 − Pi =1/1+eZi and

$$P_i/1\text{-}p_i = \frac{1+e^{Zi}}{1+e^{-Zi}} = e^{Zi} = e^{(\beta 0+\beta 1X1i+\cdots+\beta kXki+Ui).} \quad (5)$$

Pi/1-Pi is an odds ratio that favors adopters. That is the probability that a particular farmer participates in the adoption of improved seeds and does not participate in the adoption.

Then, taking the log to both sides.

$$Y = \ln (Pi/1\text{-}Pi) = Zi = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3... + \beta iXi + Ui \quad (6)$$

Equation 6 was the binary logistic model in which a regression was conducted.

© STM Journals 2026. All Rights Reserved

Factors Affecting the Adoption of Improved Crop Varieties

Many studies have indicated that different factors affect household decisions regarding the use of improved crop varieties. The most common determinant factors indicated by many authors include the sex of the household head, educational status, family size, age of the household head, land size, livestock size, credit access, extension agent contact, and total annual income [4, 7–9, 11–16].

The sex of the household head affects the adoption of improved crop varieties, and male-headed households are more likely to adopt improved crop varieties than female-headed households [7, 11]. The age of the household head has both increasing and decreasing effects on the adoption of improved varieties due to the purchasing capacity and awareness level of the household head. Finding in Southern Ethiopia indicated age have positive effect on adoption of improved crop varieties [12]. and has negative effect in central Ethiopia and Kaduna State, Nigeria, said that as age of household head increase utilization of improved crop varieties decrease [4, 9]. The family size of the household head has a positive effect on the adoption of improved crop varieties because additional family members add labor and capital for better management and purchasing of seeds [9, 13]. The landholding size of the household is also an important factor for farmers, whether to use or not improved crop varieties. The size of farmers' land holdings has a positive effect on the likelihood of adopting major improved crop varieties [4, 11]. The educational status of farmers affects the decision to adopt improved crop varieties, as more literate farmers are better aware of the advantages of improved varieties, have information, and easily decide whether to adopt or not [7, 8].

Institutional factors, such as access to the market, measured by distance from the market, are important for farmers, whether to adopt or not, as many farmers produce for selling. Many studies have found that as the distance from the market increases, households' likelihood of adopting improved crop varieties decreases due to the difficulty of providing their product to the market and profitability issues [7, 14]. Household income affects the purchasing power of inputs such as improved crop varieties, as there is only a cash payment system for input delivery. There is a positive relationship between household income and the likelihood of adopting improved crop varieties [7, 12]. The livestock size of farmers had both positive and negative effects on the likelihood of adopting improved varieties. The volatile nature of livestock, which is easy to sell and convert to cash, can positively affect the adoption of improved crop varieties [7, 11]. However, many other authors have found a negative relationship between livestock size and improved crop variety adoption due to resource competition between livestock and crop production [4]. Credit access positively affects the adoption of improved crop varieties, which can improve the purchasing capacity of farmers facing cash shortages [9, 12]. The findings of many studies indicate that the adoption of improved crops positively relates to the frequency of extension agent contact. Extension agent contact improves farmers' adoption of improved crop varieties by providing advice, training, and better awareness about variety, management, disease control, and inputs [7, 9, 11]. The hypothesized explanatory variables that are expected to affect the adoption of major improved crop seeds are indicated with their expected effects in Table 2.

RESULTS AND DISCUSSION

Demographic And Socioeconomic Characteristics of the Sample Households

The majority (87.74%) of the sample households were male-headed, and only 12.26% were female-headed. There is a significant variation between male-headed and female-headed households at 1%, with a chi-square value of 10.436. This indicates that female-headed households are less likely to adopt improved crop varieties than male-headed households. This might be because women are mainly engaged in caring for the family and working within the home, have lower information access, and have lower cash income access and resource control, which lowers their adoption rate compared with male heads. This agrees with the findings in the Arsi highland and Bale zone Oromia region of Ethiopia, where male-headed households were more likely to adopt improved varieties than their female counterparts [8, 11]. The majority (97.70%) of the sample households were married, 0.4% were single, 1.5% were divorced, and 0.4% were widowed. However, there was no significant relationship between the adoption of major improved crop varieties and marital status (Table 3).

© STM Journals 2026. All Rights Reserved

Approximately 42.53% of the sample household heads have access to credit from formal and informal sources, including farmers' cooperatives, Omo micro-finance, relatives, and friends, while 57.47% have no credit access. The Pearson chi-square test indicates a significant variation in credit access to adopters and non-adopters of major improved crop varieties, with a chi-square value of 37.47. Households with credit access are more likely to adopt improved crop varieties than those without credit access, which agrees with findings in Wolaita, Ethiopia, and Kaduna State, Nigeria [9, 12]. which highlighted that access to credit can strengthen farmers' input purchasing capacity when farmers have income shortages.

In the 2022/2023 summer and winter cropping seasons, approximately 36.40% of the sample households received training in crop production, while 63.6% did not receive any training on crop production. The relationship between training access and the adoption of major improved crop varieties was statistically significant, with a chi-square value of 115.892. Household heads with access to training are more likely to adopt improved crop seeds than those without training access. Capacity building through training is crucial for the adoption of improved varieties, and training promotes the adoption of improved technologies [12, 13]. Farmers in the study area contact extension agents for input needs, advice on crop management and disease control, credit access, and other support. Of the sample households, 54.02% contacted extension agents in the 2022/2023 cropping season. There is a significant relationship between the adoption of major improved crop varieties and contacting extension agents, with a chi-square value of 87.246. Most farmers who contacted extension agents adopted improved crop seeds, while those who had no contact with extension agents did not. This is consistent with the findings of the South Omo zone of Ethiopia and Kaduna State of Nigeria, which stated that household extension contact promotes the adoption of improved crop varieties [7, 9].

Information on improved crop varieties is a very important tool for farmers to adopt; approximately 36.40% of the sample households have access to information on improved crop varieties distributed in the area from the agricultural office, extension agent, neighbor farmer, radio, and television. This finding indicates that there is a significant effect of information on improved crop varieties on household adoption at the 1% significance level. The majority of farmers who have access to information are adopters of improved crop varieties compared to those with no information access, which is consistent with the findings in the Bale zone, Ethiopia [11].

Agricultural cooperative membership is an important factor in adopting improved crop seeds. Approximately 10.34% of the sample households were members of agricultural cooperatives, such as coffee suppliers' unions and Participatory Forest Management (PFM) members. The results indicate that agricultural cooperative membership has an effect on the adoption of improved crop varieties at the 1% significance level, with a chi-square value of 10.469. This finding indicates that agricultural cooperative members are more likely to adopt major improved crop seeds than non-members, which is consistent with the findings in the Bale zone, Ethiopia [11]. Membership in agricultural cooperatives supports farmers by providing access to credit, seeds or seedlings, improved livestock breeds, training, and awareness of agricultural technology and livelihood improvement.

The mean age of the sample households was 43.38 years, with a minimum of 22 years and a maximum of 75 years. The mean age of non-adopters was 48.10 years, and that of adopters was 34.57 years; the mean age difference was statistically significant at 1%. This indicates that older household heads are less likely to adopt solar energy than younger household heads. This finding is in line with the findings in Kaduna State, Nigeria, which stated that it is indicative of the predilection for younger farmers to embrace improved practices than older farmers [9]. and disagrees with the findings in Wolaita, Ethiopia [12]. The mean educational status of the sample household was 4.84 years. Adopters of major improved seed had a mean of 5.74 years of schooling, while non-adopters had 2.47 years of schooling. The findings indicate that more educated household heads are more likely to adopt major improved seeds than less educated household heads, which is consistent with the findings in the Arsi highland of Ethiopia and Kaduna state, Nigeria [8, 9].

© STM Journals 2026. All Rights Reserved

Table 1. Sample households taken from each kebele.

District	Kebele	Sample households
Bita	Sheda	37
	Dacha-Difa	35
Chena	Boba-gota	30
	Boba-bela	34
Andiracha	Shebena	27
	Chegecha	32
Sheyi Bench	Mazi	34
	Shapa-guyidi	32

Table 2. Definition of variables, their measurement, and expected effects.

Variable	Type and measurement	Expected effect	Supporting studies
Dependent variable			
Adoption IMV	Dummy (1=adopter, 0=non=adopter)		
Independent variable			
Sex	Dummy (1=male, 0=female)	+	7,8,11
Age	Continuous (age in year)	+/-	12/4,9
FMLSIZ	Continuous (number of family member)	+	9,13
LNDSIZ	Continuous (size of land holding in hectare)	+	4,9,11
EDUSTAT	Continuous (year of schooling)	+	7,8,9,11
DSTMRKT	Continuous (desistance in kilometer)	-	7,14
LOGTTINC	Continuous (logarithm of annual income in percent)	+	4,7,12
TLU	Continuous (livestock owning size in TLU)	+/-	7,11/ 4
CRDACSS	Dummy (1=yes, 0=no)	+	9,11,12
FRQEXTCNT	Continuous (times of extension contact per year)	+	7,9,11

Table 3. Discrete Socio-economic and institutional characteristics of sample households.

Variable		Total sample (N=261)	Adopter (N=91)	Non-Adopter (N=170)	Chi-Square (χ^2)
Sex	Male	229	88	141	10.436***
	Female	32	3	29	
Marital status	Single	1	1	0	4.56
	Married	255	90	165	
	Divorced	4	0	4	
	Widowed	1	0	1	
Credit access	Yes	111	62	49	37.47***
	No	150	29	121	
Access Training	Yes	95	73	22	115.892***
	No	166	18	148	
Extension agent contact	yes	141	85	56	87.246***
	No	120	6	114	
Access to information	yes	95	68	27	88.652***
	No	166	23	143	
Agricultural cooperative membership	Yes	27	17	10	10.469***
	No	234	74	160	

Significant levels are indicated by ***, **, and *, *which are P<0.01, P<0.05, and P<0.1, respectively*

© STM Journals 2026. All Rights Reserved

Table 4. Continuous socio-economic and demographic characteristics of sample households

Variable	Total sample (N=261)		Adopter (N=91)		Non-adopter (N=170)		Sig.
	Mean	*Sta. dev*	*Mean*	*Sta. dev*	*Mean*	*Sta. dev*	
Age of HH head	43.38	10.58	34.57	6.47	48.10	9.71	0.000***
Educational status	4.84	3.75	5.74	3.8	2.47	2.34	0.000***
Family size	6.49	2.07	6.47	2.29	6.51	1.95	0.902
Land size	2.04	1.54	2.12	1.54	1.99	1.55	0.526
Distance from market	5	1.99	4.60	2.32	5.21	1.76	0.020**
Distance from FTC	1.55	0.68	0.82	0.23	1.95	0.488	0.000***
Livestock owning	2.55	1.11	2.42	0.97	2.63	1.17	0.142
Total income	83,881.22	55,869.89	119,538.46	52,985.17	64,794.11	47,497	0.000***

Significant levels are indicated by ***, **, and *, *which are P<0.01, P<0.05, and P<0.1, respectively*

The mean distance of the sample households from the market to home was 5 km, while adopters of major improved crop varieties were located 4.60 km away from the market, and non-adopters had a mean distance of 5.21 km from the market. The mean difference was significant at 5% (Table 4). This finding indicates that households close to the market are more likely to adopt improved varieties than households far from the market, which is consistent with the findings in the North Wollo zone, Ethiopia [14]. This was due to road infrastructure problems that resulted in higher transportation costs, hindering households' adoption of improved varieties. Market access is one of the determinants for the adoption of improved varieties, as most adopters produce for the market or sell [17]. The sample households were 1.55 km away from the farmers' training center, while adopters of major improved crop seeds were 0.82 km and non-adopters were 1.92 km away from the Farmer Training Center (FTC), and the mean difference was significant at 1%. The findings show that the farmer training center is a center of agricultural technology, and farmers close to the FTC are more likely to adopt improved crop varieties than those far from the FTC.

The sample households generated a mean annual income of 83,881.22 Ethiopian Birr (ETB), while adopters of major improved crop seeds generated a mean total annual income of 119,538.46 ETB, and non-adopters received 64,794.11 ETB from different sources. The mean difference was statistically significant at the 1% significance level. The results indicate that households that generate higher incomes are adopters of major improved crop seeds than households that generate lower income. As household income increases, the tendency to adopt technology increases, which means that the adoption of technology is affected by the total income and purchasing power of households [7, 12].

Adoption of Major Improved Crop Varieties

The major improved crop seeds distributed to farmers in the 2022/2023 production year were maize, wheat, common beans, and faba beans. Approximately 34.90% of the sample households adopted major improved crop varieties in the 2022/2023 cropping season. The adoption level in the area was higher than that in the East Shewa zone of the Oromia region and the North Shewa zone of the Amhara region, Ethiopia, where only 29% of farmers adopted improved varieties [4]. However, the adoption level in the study area was less than the adoption level in South Ari Woreda (51.41%), Damote Gale Woreda (55%), and Arsi highland (42.66%) of Ethiopia [7, 12, 8]. This current lower adoption level in the study area might be due to lower technology demonstration and dissemination levels, lower awareness and knowledge about the variety distributed, inflated price of seed supplied, and lower supply of varieties of farmers interested in time, quantity, and quality. Approximately 72.40% of the sample households had experience using improved varieties before; when we compare with current adopters, the trend of adoption of improved varieties was decreasing. The main reasons that respondents raised for the decreased adoption level were delivery problems, lower productivity differences with local varieties, and inflated prices.

© STM Journals 2026. All Rights Reserved

There is a difference in the adoption of improved crop varieties between the sample districts, and the difference is significant at the 1% significance level. The adoption levels of major improved seeds in the Sheyi Bench District were 57.58%, Bita district, 31.94% in the Chena district was 34.37%, and 13.55% in the Andiracha District in the 2022/2023 production year. Households in the Sheyibench district were better adopters than those in other districts, while households in the Andiracha district were the least adopters of improved crop seeds compared to others. This variation might be due to the availability of some productive, disease-resistant, and locally adapted varieties in the area.

Types of Improved Crop Varieties Adopted

Approximately 25.3% of the total sample households adopted improved maize varieties in the 2022/2023 production year. This is more than the finding in central Ethiopia, where only 12% of farmers adopted improved maize, and the rest relied on their local landrace [4]. However, the adoption level of maize in the study area was less than that found in Damote Gale Woreda of Wolayta Zone, Ethiopia, where approximately 55% of farmers adopted the improved maize variety [12]. The types of improved maize varieties distributed in the area include Shone, BH-661, and DK-777. There is a variation in the adoption of improved maize varieties between districts, and the Pearson chi-square test was significant at the 1% level. Of the sample households from each district, 29.68% were from the Chena district, 13.89% from the Bita district, 13.55% from the Andiracha district, and 43.94% from the Sheyi Bench district were adopters of improved maize varieties. Households in the Sheyi-Bench district were better adopters, and households in the Bita and Andiracha districts were less likely to adopt improved maize varieties (Table 5).

Improved wheat variety adopters were 11.49% of the total sample households, which is less than the findings in Arsi highland Ethiopia, where 55% were adopters of improved bread wheat [8]. Shorima, Kingbird, and Ogolcha were the types of improved wheat varieties distributed in the 2022/2023 production year in the area. There is a significant variation in improved wheat adoption between districts at a 10% significance level by the chi-square test, which indicates that there is very low variation in the adoption of improved wheat between sample districts. Of the sample households from each district, 8.33% of the Bita district, 7.8% of the Chena district, 6.77% of the Andiracha district, and 22.72% of the Sheyi Bench district were adopters of improved wheat varieties. This finding indicates a very low adoption level of improved wheat varieties in the area compared to central Ethiopia and the southern highlands of Ethiopia, where 42% and 55% of the sample households utilize improved wheat varieties, respectively [4, 8]. Comparatively, households in the Sheyi Bench district were better adopters than those in other districts.

Approximately 2.68% of the sampled households utilized improved common beans in the 2022/2023 production year, and there was no significant variation in the adoption of improved common beans between districts. The adoption level of common beans in the area was very low and less than that found in the Kucha district of southern Ethiopia, where 45.73% of the sample households adopted the Nasir variety. Nasir is an improved common bean variety that is distributed in the area. The lower adoption of improved common beans in the area may be due to a lower supply, lower awareness of variety, and agroecological factors.

Of the sample households, only two households (0.76%) used improved faba beans in the 2022/2023 production year. The adoption level of farmers in the area was less than that in the Central Highlands of Ethiopia, where 23.2% of the sample households adopted improved fava bean varieties [18]. Only the Gabelicho variety was distributed in the 2022/2023 production year; however, in the central highland of Ethiopia, five varieties of fava beans were distributed, including Walki, Dosha, Gebelicho, Dagim, and Lalo [19]. According to respondents, there is a high demand for improved faba bean seed in the area due to the availability of suitable agro-ecology in the area, but the lower adoption was due to a shortage of fava bean seed in the area.

© STM Journals 2026. All Rights Reserved

Determinants of the Adoption of Major Improved Crop Varieties

To estimate the factors determining the adoption of major improved crop varieties in Southwest Ethiopia, a binary logistic regression model was employed. The dependent variable is the adoption of major improved varieties (if the household was an adopter=1, otherwise=0). The independent variables included age, sex, educational status of the household head, family size, land size, livestock ownership by TLU, logarithm of total annual income, credit access, distance of home from the market, and frequency of extension agent contact. The results of the analysis in Table 6 indicate that the model is jointly significant at the 1% chi-square test level and that the data fit the model well. An explanatory variable explained 65.56% of the variation in the dependent variable, with a pseudo R2 value of 0.6556. Out of ten explanatory variables, the age of the household head, educational status of the household head, logarithm of the total annual income of the household, and frequency of extension agent contact significantly affected household decisions on adoption of major improved crop varieties [20]. However, the sex of the household head, family size, land size, distance from the market, livestock size, and credit access were not statistically significant. The main reason for the insignificant effect of those variables in the econometric model was that the mean difference between adopters and non-adopters was small, frequency variation was small, and the effect of those variables was lower in the area.

Household Heads Age (AGE)

The results of the analysis indicate that the age of the household head negatively affects the likelihood of adoption of major improved crop varieties at the 1% significance level (Table 6). An increase in the household head's age by one year decreases the likelihood of adoption of major crop varieties by a factor of 0.827, keeping other variables constant and odds-ratio disfavor. This indicates that older household heads are less likely to adopt than younger household heads. This might be because older household heads choose their local seed, have a lower education level, knowledge, information access, and awareness. The finding was in line with studies at North Wollo, Ethiopia, and Kaduna state of Nigeria, where there is a negative relationship of age of household head with probability of adopting improved Teff and maize varieties, which is consistent with the postulate that older farmers are restore their old ways and averse to innovating [9, 14].

Household Heads of Educational Status (EDUSTAT)

There is a positive and significant relationship between the education level of the household head and the likelihood of adopting major improved crop varieties at the 1% significance level. An additional year of schooling of the household head increases the likelihood of adoption of major improved crop varieties by a factor of 3,707, keeping other factors constant [21, 22]. This finding indicates that less-educated household heads are less likely to adopt improved crop varieties than educated household heads. This might be because better-educated farmers are more rational in considering new technologies and becoming aware of them, and this awareness enhances the adoption of technologies [14]. The findings were similar to those of studies in Abuna Gindeberat, Ethiopia, and Kaduna State, Nigeria, suggesting that education endows respondents with greater intellectual capacity and know-how to dissect and assimilate the strengths and drawbacks of new technologies and in deciding whether to adopt them [9, 13].

Household's Annual Income (LOGTTINC)

There is a positive significant relationship between household annual income and the likelihood of adopting major improved crop cultivars at the 5% significance level. The finding indicates that farmers generating lower income are less likely to adopt improved crop varieties than those generating higher income. Other things being equal, an increase in the logarithm of total annual income by 1% increases the adoption of major improved crop varieties by a factor of 19.65 odds ratio favors. Farmers' annual income improves their purchasing capacity, and the cash payment system of agricultural input delivery favors households with higher income to utilize improved crop varieties. These findings are in line with studies in the Central and South Omo Zones of Ethiopia, which found that households with higher incomes have a higher likelihood of adopting improved crop varieties than those with lower incomes [4, 7].

© STM Journals 2026. All Rights Reserved

Frequency of Extension Agent Contact (FRQEXTCNT)

The likelihood of adopting major improved crop varieties is positively influenced by the frequency of extension agent contact at the 5% significance level. Keeping other variables constant, one more time contact with extension agents increases the likelihood of adoption of improved crop varieties by a factor of 1.799. Contacting extension agents is one of the tools to improve farmers technology adoption levels in rural areas; farmers who frequently contact extension agents are more likely to adopt improved varieties than those who do not frequently contact extension agents [4, 8, 13]. Extension service delivery, advisory services of extension agents, improved technology supply, management practices, and recommended input and management services advised by extension agents are very important to farmers.

Challenges of the Adoption of Major Improved Crop Varieties

The main challenges for the adoption of major improved varieties were ranked by comparing their effects on sample households. The main challenges identified for the adoption of major improved crop varieties were ranked by the index ranking method, including supply problems, inflated seed prices, lower productivity difference with local landraces and disease attack, and land shortage in their order of rank (Table 7).

Table 5. Adoption of major improved varieties.

Types of improved crop	Total sample		Bita		Chena		Adndiracha		Sheyi bench		Chi-Square (χ^2)
	Yes	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	
Maize	66	195	10	62	19	45	8	51	29	37	22.06***
Wheat	30	231	6	66	5	59	4	55	15	51	11.04*
Common bean	7	254	3	69	2	62	0	59	2	64	2.313
Faba bean	2	259	0	72	0	64	1	58	1	65	2.206

Source own survey 2023/2024

Table 6. Results of binary logistic regression of major improved crop varieties adoption.

Independent variables	Odds ratio	Coef.	St. Err.	P>|z|
SEX	0.337	-1.086	1.420	0.445
AGE	0.827***	-0.190	0.073	0.009
EDUSTAT	3.707***	1.310	0.315	0.000
FMLSIZ	0.799	-0.223	0.211	0.291
LNDSIZ	1.078	0.075	0.380	0.843
DSTMRKT	0.738	-0.303	0.235	0.197
LOGTTINC	19.65**	2.978	1.310	0.023
TLU	0.745	-0.295	0.392	0.452
FRQEXTCNT	1.799**	0.588	0.237	0.013
CRDACSS	0.398	-0.921	0.924	0.319
Constant	$1.58e^{-5}$	-11.055	7.280	0.129

Sample (N) =261, LR chi2 (10) = 231.13, Pseudo R2 = 0.6556, Probability > chi2= 0.000; Log likelihood = -60.719
*Significant levels are indicated by ***, **, and *, which are P<0.01, P<0.05, and P<0.1, respectively*

Table 7. Ranking of challenges to the adoption of major improved crop varieties.

Factors	Ranks			Sum	Index	Rank
	1	*2*	*3*			
Supply problem	107	68	51	508	0.324	1
Inflated seed price	72	63	55	397	0.254	2
Lower productivity difference and disease resistance	45	59	88	341	0.218	3
Land shortage	37	71	67	320	0.204	4

© STM Journals 2026. All Rights Reserved

Supply Problem

The supply problem is related to affording quality seeds of farmer interest at the right time and in the required amount. According to respondents, seed supplying bodies do not supply the type of seed of farmers' interest at the right time. Seeds are supplied by the district agricultural office through a development agent at the peasant association level, but they are supplied late in the season and sometimes after farmers have sown their local land race. In addition, district agricultural offices were not supplying the type of seed farmers were interested in. Farmers are mainly interested in specific varieties based on their productivity, disease and pest resistance, adaptability to the area, and early maturity. The quality of the seeds was another issue, especially with maize and wheat, and sometimes seeds of poor quality were supplied. In the supply procedure, farmers may not receive the amount of seed they want due to a seed shortage. The seed supply issue is the primary challenge to the adoption of improved varieties; accessing quality seeds of farmer interest at the right time promotes the adoption of improved seeds [4, 9, 15, 19].

Unaffordable Price of Seed

According to the respondents, the price of seeds is one of the most challenging issues for farmers. Farmers perceive that these improved varieties are too expensive compared to the local landrace, and they are beyond the purchasing capacity of some farmers. Farmers with purchasing capacity look for the productivity and profitability of purchasing and using those seeds. The high cost of improved crop seeds is one of the challenges for the adoption of improved varieties [4, 19].

Lower Productivity Difference with the Local Landrace and Disease Attack

The main issue for farmers interested in improved crop varieties was their higher productivity advantage over local landraces. However, farmers in the study area are now experiencing a lower productivity difference with local ones, which may not afford them much profit. The non-difference of certified seeds from local seeds was one of the reasons for farmers in the East Shewa zone of the Oromiya region and North Shewa zone of the Amhara region, Ethiopia [4]. The other main problem was disease attack on improved crop varieties, especially wheat, and the control mechanisms were difficult to implement.

Land Shortage

Currently, owing to population growth, land fragmentation is common in Ethiopia, particularly in the study area [18]. Even though the land holdings of households in the area were higher than those in other areas, they were mainly covered by perennial crops, coffee and enseth. Households, especially youth interested in adopting improved varieties, have lower land holdings and are using improved varieties on land they were cultivating by share in were too costly for them.

CONCLUSION

Household socioeconomic, demographic, and institutional factors are related to household adoption of improved crop seeds. The adoption of major improved crop varieties was low in the area. The Sheyi Bench district had a better adoption rate, and households in the Andiracha district were the least adopters. Approximately a quarter of the sample households used improved maize varieties, while 11.49% adopted improved wheat varieties, and 2.68% and 0.76% adopted common bean and faba bean varieties, respectively. Shone, BH-661, and DK-777 are improved maize varieties; Shorima, Kingbird, and Ogolcha are improved wheat varieties; Nasir is a common bean variety; and Gabalicho is a faba bean variety distributed in the 2022/2023 production year in the area. The adoption of major improved crop varieties in the area was positively influenced by income level, frequency of extension contacts, and educational level. Supply related problems, inflated seed prices, lower productivity differences with local land races, disease attacks, and land shortages were challenges for farmers in adopting improved varieties.

Recommendation

To improve the adoption of improved crop technologies, the government should work on improving awareness and knowledge to become more rational in decision-making by improving their educational

© STM Journals 2026. All Rights Reserved

status. Governments and NGOs work to improve farmers' income and access market opportunities that empower their input purchasing capacity by promoting market-oriented production. Frequent contact of farmers with extension agents for advice, input supply, and support is influential for technology adoption; thus, extension agents should be accessible to farmers for support. Frequent training and access to agricultural input information for farmers are other tools to promote the adoption of improved crop varieties.

Regional, zonal, and district governments should work on accessing quality-improved crop seeds of farmers' interest in a timely manner and in the required amount by participating in private sectors. There is a variation in agricultural technology adoption between districts; therefore, the regional and zonal governments should give special attention to districts with the lowest adoption rate by creating awareness, training, demonstration, and accessing agricultural inputs of farmers' interest to achieve a better technology adoption level.

REFERENCES

1. Shita A, Kumar N, Singh S. Agricultural technology adoption and its determinants in Ethiopia: a reviewed paper. Asia Pac J Res. 2018;1(55):99-104.
2. Tamirat N. Adoption of chemical fertilizer technology and household food security in Southern Ethiopia: in case of Soro District in Hadiya Zone. Technol Eng Manag J Agron Technol Eng Manag. 2021;2021:558-76.
3. World Bank. World development report: Ethiopia at a glance. Washington (DC): World Bank; 2015. Available from: http://devdata.worldbank.org/AAG/eth_aag.pdf
4. Tekeste K, Degefa T, Admasu S, Dawit A. Determinants of adoption of improved varieties of wheat (Triticum aestivum), teff (Eragrostis teff), and maize (Zea mays L.) in Central Ethiopia. J Agric Ext. 2023;27(2):1-4. doi:10.4314/jae.v27i2.1
5. Yu B, Nin-Pratt A, Funes J, Gemessa SA. Cereal production and technology adoption in Ethiopia. ESSP II Working Paper 31. Addis Ababa: International Food Policy Research Institute; 2015.
6. Teklewold A, Alemu D, Kiyoshi S, Kirub A. Seed demand assessment: practices, challenges, and options. FRG II Project Empowering Farmers' Innovation Series No. 5. Addis Ababa: Ethiopian Institute of Agricultural Research; 2012.
7. Nigatu G, Mare Y, Abebe A. Determinants of adoption of improved (BH-140) maize variety and management practice in the case of South Ari Woreda, South Omo Zone, SNNPRS, Ethiopia. Int J Res Stud Biosci. 2018;6(9):35-43. doi:10.20431/2349-0365.0609004
8. Zeleke BD, Geleto AK, Komicha HH, Asefa S. Determinants of adopting improved bread wheat varieties in Arsi Highland, Oromia Region, Ethiopia: a double-hurdle approach. Cogent Econ Finance. 2021;9(1):1932040. doi:10.1080/23322039.2021.1932040
9. Chete OB. Factors influencing adoption of improved maize seed varieties among smallholder farmers in Kaduna State, Nigeria. J Agric Ext Rural Dev. 2021;13(2):107-14. doi:10.5897/JAERD2019.1032
10. Yamane T. Statistics: an introductory analysis. 2nd ed. New York (NY): Harper and Row; 1967. 886 p.
11. Abda N. Adoption of improved wheat varieties by wheat producers in the Bale Zone of Ethiopia. Int J Agric Ext Rural Dev Stud. 2022;9(2):1-9. doi:10.37745/ijaerds.15vol9n2119
12. Ayalew AB, Tesafa F, Berhanie ZE. Determinants of maize (Zea mays) supply to the market in northwestern Ethiopia. Asian J Adv Res. 2021;11(4):188-99.
13. Amante A. Determinants of adoption of improved maize varieties by smallholder farmers in Abuna Gindeberat, Ethiopia [Preprint]. Research Square. 2023. doi:10.21203/rs.3.rs-2623495/v1
14. Teshome S. Determinants of adoption of improved teff varieties by smallholder farmers: the case of Kobo District, North Wollo, Amhara Region, Ethiopia [master's thesis]. Haramaya: Haramaya University; 2017.
15. Alene AD, Poonyth D, Hassan RM. Determinants of adoption and intensity of use of improved maize varieties in central highlands of Ethiopia: a Tobit analysis. Agrekon. 2000;39(4).

© STM Journals 2026. All Rights Reserved

16. Hullo AM. Determinants of farmers' adoption decision of improved crop varieties in Ethiopia: systematic review. Afr J Agric Res. 2021;17(7):953-60. doi:10.5897/AJAR2020.15197
17. Afeto A, Tesfaye Y. Contribution of forest products to rural household's income and factors determining forest income in Masha District of Sheka Zone, SWEPR, Ethiopia. Int J Agric Res Innov Technol. 2022;12(2):46-52. doi:10.3329/ijarit.v12i2.64084
18. Dessalegn B, Asnake W, Tigabie A, Le QB. Challenges to adoption of improved legume varieties: a gendered perspective. Sustainability. 2022;14:2150. doi:10.3390/su14042150
19. Kassa Y, Giziew A, Ayalew D. Determinants of adoption and intensity of improved faba bean cultivars in the central highlands of Ethiopia: a double-hurdle approach. CABI Agric Biosci. 2021;2(1):24. doi:10.1186/s43170-021-00045-8
20. Demissie A, Abebe A, Samuel T. Determinants of adoption of haricot bean (Nasir variety) and its effects on household income: the case of Kucha Woreda, Southern Ethiopia. Int J Res. 2020;8(8):32-41. doi:10.20431/2349-0365.0808003
21. Regasa Megerssa G, Negash R, Bekele AE, Nemera DB. Smallholder market participation and its associated factors: evidence from Ethiopian vegetable producers. Cogent Food Agric. 2020;6(1):1783173. doi:10.1080/23311932.2020.1783173
22. Afeto A. Determinants of the adoption of chemical fertilizer in Kaffa, Bench Sheko and Sheka Zones of Southwest Ethiopia. Res Rev J Agric Sci Technol. 2025;15(1):1-1.

© STM Journals 2026. All Rights Reserved