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SENIOUR RESEARCH ON DETERMINANTS OF ADOPTION OF IMPROVED WHEAT VARIETIES AMONGE SMALL HOLDER FARMERS (THE CASE CHEHA WOREDA OF GURAGE)

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ACRONYMS AND ABBREVIATIONS

AC	Access to Credit
ADC	Agricultural Development Center
ADLI	Agricultural Development Led Industrialization
AIWS	Adoption of Improved Wheat Seed
AOFI	Availability of Off-Farm income
CIMMYT	International Maize and Wheat Improved Center
CSA	Central Statistical Agency
DMC	Distance to Market center
EDUS	Education status
FAO	Food and Agricultural Organization
FS	Family Size
GTP	Growth and Transformation Plan
HHs	Households
LH	Land Holding
NGOS	Non Governmental Organizations
SNNPRS	South Nations, Nationalities and People Regional State
USAD	United State Development Agency
USAID	United State Agency for International Development

ABSTRACT

Adoption of improved wheat varieties is one of the most promising ways to reduce food insecurity in Ethiopia. However, adoptions of these wheat varieties are constrained by various factors. This study examined the factor that affects farmers adoption of improved wheat varieties with 100 samples of households (70 male and 30 female) selected from 2kebeles in Chahe Woreda's of Dage climatic zone, Gurage Zone, SNNPRS. In this area, wheat is an important crop, which serves as a source of both food and cash. Qualitative and quantitative data were collected using structured questionnaire. The results of descriptive analysis indicated that among 100 sample size 46% and 54% were adopters and non adopters respectively. As the results of logit model indicated that from 11 identified explanatory variables 5 of them significantly determined adoption of improved wheat varieties; such as sex of household, education level of the household, land holding, on farm income and access to credit at significant level of 10% ,5% ,5% ,10% ,and 10% respectively . This results of the logit model indicated that the relative influence of different variables on probability of adoption of improved wheat varieties. Education level of household, on farm income, land holding, and access to credit were affected adoption positively: where as sex of household negatively influenced adoption of improved wheat varieties.Therefore, the study suggested the above mentioned significant variables have important for policy implications in that development programs may give fruitful attention so as to mitigate the variation of adoption of improved new wheat seed varieties by farmers in the production of wheat in study area.

Key word; Adoption, Logit Model

1. INTRODUCTION

1.1 Background the Study

Agricultural production is the bases for domestic food consumption and one of the mitigating mechanisms for the problem of food insecurity in Ethiopia. The government of Ethiopia has developed different ways of agricultural production strategy to enhance the productivity of smallholders, among various approaches Agricultural Development Led Industrialization (ADLI) is the one that had supposed to exploit the existing agricultural potential of the country, its prominence is for enhancement of productivity of the smallholder and industrialization through utilization of the domestic raw materials by using improved labor technologies.

After (ADLI) the government of Ethiopia has also developed Five Year Growth and Transformation Plan (GTP) established ambitious targets for the agriculture sector from 2011-2015. The Plan's objectives focus on enhancing productivity and production of smallholder farmers and expanding the amount of land under irrigation and reducing the number of chronically food insecure households in Ethiopia.

Based on the data of CSA (2016/17), Ethiopia has enormous potential for wheat production with a total area 1.69 million hectare of land with the productivity of 26.75Qt/hectare however, this huge potential has not executed as planned due to several political, economic and social impediment.

Agricultural production can be increased through extensively (i.e. through expansion of farmlands) or intensification (i.e. by using more inputs and technologies per unit of land). However, increasing horizontal production is not a viable strategy to increase agricultural production for most of the food insecure countries where high population pressure is a critical bottleneck. Where land is scarce, intensification, which entails investments in modern inputs and technologies, is a better option to increase agricultural production and reduce food insecurity.

Intensification of smallholder wheat production typically involves the adoption of improved wheat seed production and other complementary inputs. (e.g., production of improved wheat varieties, purchased fertilizer, pest control measures (pesticides, herbicide and insecticide). In developing countries like Ethiopia, agriculture is a strong option for spurring growth, overcoming poverty, and enhancing food security, and this

has necessitated the need to increase agricultural productivity through the introduction and use of improved agricultural technologies (Belele*et al,* (2014).

Wheat is one of the major crops grown in the study area. It is characterized by low production and productivity per unit area. One of the limiting factors contributed to low yield of wheat may be using the same varieties from year to year (i.e. low adoption of new verities). Moreover, there may be among other things institutional problems, financial problems, inappropriate extension system, etc.

The households of Cheha Woreda have been adopting new technologies in different degrees, some of them have been adopting new technology and others are using traditional seed verities and manure fertilizers. So, according to CSA (2016/17) the productivity of wheat in Ethiopia is 26.75Qt/ha and in SNNP is (25.84Qt/ha), and especially in Gurage zone wheat production was 37006 tones CSA (2014); FAO (2015).

1.2 Statement of the Problem

Wheat is the most widely grown cereal crop in the world, with an ever-increasing demand. It plays a fundamental role in food security and a major challenge is to meet the additional requirements with new cultivars and improved cropping technologies. Wheat is a primary source of calories and protein for 4.5 billion people in more than 100 countries (Sanjaya, 2014).

Wheat is grown on over 240 million hectares worldwide, this shows area coverage of wheat is more than any other crops and over 80 percent of this land is located in the developing world. Therefore, improving yields of this crop is very important since the diets of human beings on every continent rely on this staple crop. As per FAOSTAT (2014) now a day wheat production has shown increasing rate due to increase in area coverage but, productivity in a unit area of land is not as expected. The Same data shows that for the last five years wheat production trend has shown fluctuation of an increasing and a decreasing rate during the year of 2009 to 2014 world wheat production was 685.6, and 220 million metric tons respectively, this shows that some years increase and some years decrease. But to this end, the average production of wheat has been increasing by 1.1.6 percent in the world.

According to Hundie *et al.* (2000) even if the area coverage of wheat in Ethiopia is higher, the mean national yield is (2.1ton/ha) 19 percent and 49 percent below the mean yield for Africa and the World respectively. This relatively low mean national yield may be partially attributed to the low level of adoption of improved wheat production technologies.

Majority of Ethiopia's farmers have been using traditional way of agricultural practices. This has contributed for low productivity of the agricultural sector. To solve these problems, governmental and non-governmental bodies have made restless efforts to bring about change in agricultural production system of farmers. They have introduced improved agricultural technologies like use of fertilizers, high yielding varieties of seeds, and improved farm implements tool, etc. in relation to crops which seem better in yield.

This indicates that there are different factors directly or indirectly influencing the adoption of technologies that are believed to bring change in farmers' productivity (Endrias, 2003).

Wheat is a staple food crop for most households in rural and urban areas in Ethiopia. However, wheat yield is low and unstable due to several technical and socio-economic constraints. Weed competition, low or declining soil fertility, diseases, particularly rust, in appropriate use of agronomic practices such as seeding rate, sub-optimal fertilizer application and herbicide use are some of the major technical constraints. Limited supply of improved seeds varieties, law level technology adoption; high price and unavailability of augmenting technologies like fertilizer and herbicides in required quantity and at required time, and inadequate cash or credit for purchase of inputs are the major socio-economic constraints (Kenea *et al.*, 2000).

The adoption decision of improved wheat by farmers is usually determined by various factors. The major purpose of this study focus on, to investigate the adoption level improved wheat technology by farmer in Cheha Woreda; to verify the major determinants of improved wheat technology adoption and to recommend possible solutions based on findings.

1.3 Objective of the Study

The general objective of this study is to find out the major factors that determines the adoption of new wheat production technologies. Specifically the study aims:-

- ❖ To identify the adoption level of wheat production technology by small holder farmers.
- ❖ To identify the main factors that influences the adoption of improved wheat seed.

1.4. Research Questions

1. To what extent the smallholder in the study area have adopted improved wheat technology?
2. What are the major factors that influence adoption of improved wheat technology in the study area? .

1.5. Significance of the Study

The importance of the study on detriments affecting farmers adoption of improved wheat varieties in Cheha Woreda was used for farmers, research and extension staff, rural development institutions, policymakers and NGO'S with valuable information that improve the efficiency of communication among them in promoting available technologies. Apart from this, acquired information from such studies could enhance the efficiency of agricultural research, technology transfer, input provision, and agricultural policy formulation.

1.6. Scope and Limitations of the Study

This study was undertaken only in *Chahe Woreda* district, in *Gurage* Zone of Southern Nations, Nationalities and Peoples Regional State (SNNPRS), Ethiopia. Conceptually, the coverage of the study was limited to assessing detriment of adoption of improved wheat varieties among farmers in two *Kebele* of *Degas* climatic zone administration of the district. The scope of this study was limited to cover and analyses only those determinants influencing adoption of improved wheat varieties. Family size, Access to credit, Education of household head, Livestock owned, Extension contact, Age of household head, Land holding, Time taken to the market center, Off-farm income, Sex of household Participation in social organization and Availability of input. Limited financial availability and transportation

cost were the factors which limits this study in two *Kebeles*, namely *Moche* and *Dakuna*. This study has faced some challenges when raw data were collected from the respondents.

1.7 Organization of the Paper.

The paper was outlined in to five major chapters. The first chapter was introduction which consists background of the study, statement of the problems, objective of the study and significance of the study, the second chapter was provided the literature review of the study, the third chapter was provided research methodology and the fourth chapter was provided the discussion and analysis of the study and finally the fifth chapter was the conclusion and recommendation.

2. LITERATURE REVIEW

2.1 Theoretical Literature Review

2.1. 1 Definition and concepts of adoption

Many authors have defined the term adoption at different times. Rogers (2003) defined adoption as the mental process through which an individual passes from first hearing about an innovation to final adoption. With regard to this idea, adoption process includes five stages; such as awareness, interest, evaluation, trial and adoption.

- **Awareness:** A person first learns about a new idea, product or practice. He/ she have only general knowledge about it and know nothing of its special qualities or its usefulness;
- **Interest:** At this stage the person is not satisfied with just knowing that the ideas exist. He/ she want more detailed information about what it's, what it will do and how it will work;
- **Evaluation:** He/ she evaluate all the information he/ she have and decide whether the new idea is good for him/ her;
- **Trial:** Once he/ she decide that he/ she like the idea, he/ she will give it a trial. This may be for a long period of time or on a limited scale; and
- **Adoption:** This is the stage where he/ she firmly adopts the idea and then may even encourage others to do so.

He also defines adoption as a decision to continue use of an innovation. This definition implies that the adopter is satisfied with the innovation.

According to Dasgupta (1989, as cited in Gezahagn, 2008), define adoption as a decision to make full use of new ideas as the best course of action available. As they indicate the adoption or rejection of an innovation is a decision by an individual. If he adopts, he begins using a new idea, practice, or object and cease using the idea he was using before the innovation. The term adoption refers to the continued use by individuals or groups of a recommended idea or practice over a reasonably long period Dasgupta (1989, as cited in Gezahagn, 2008).

Colman and Young (1989, cited as Mulugeta, 2009) define adoption as it relates to the use or non-use of a particular innovation by individuals or farmers at a point in time or

during an extended period of time. Adoption, therefore, presupposes that the innovation (technological change) exists and studies of the adoption process analyze the reasons or determinants of whether and when adoption takes place. In the words of Yapaand Mayfield the adoption of an entrepreneurial innovation by an individual requires the satisfaction of at least three conditions. These are (i) the availability of sufficient information (ii) the existence of a favorable attitude towards the innovation, and (iii) the physical availability of the innovation.

According to Hailu (2008), technologies play an important role in economic development. Adoption technology concepts describe the decision to use or not use and the spread of a given technology among economic units over a period of time. Adoption of any innovation is not a one step process as it takes time for adoption to complete. First time adopters may continue or cease to use the new technology. The duration of adoption of a technology vary among economic unit, regions and attributes of the technology itself. The technology adoption is defined as the percentage of farmers who have adopted a given technology. On the other hand, the intensity of adoption is defined as the level of adoption of a given technological package.

2.1.2 Definition of technology adoption

Any definition of technology encompasses a wide range of phenomena. In the broadest sense, technology is defined as the translation of scientific laws into machines, tools, mechanical devices, instruments, innovation, procedures and techniques to accomplish tangible ends, attain specific needs, or manipulate the environment for practical purposes (Shahin, 2004).

Technology adoption concept and idea of technology adoption was started with the exploration of the economics of technological change Goshu *et al* (2008) cited in Griliches (1957), and the proper adoption and diffusion models applied by Mansfield (1963), Feder*et al.* (1985) and then by Green and Ng‟ong‟ola (1993). After a while adoption and diffusion have been conceived as the processes governing the utilization of innovations, and studies of adoption behavior emphasize factors that affect the adoption of agricultural technologies.

In a social system adoption of new technology/innovation has been done through adoption by individuals or groups (Feder*et al.* 1985). Adoption may be defined as the

integration of an innovation into farmers‟ normal farming activities over an extended period of time. It is also noted that adoption however, is not a permanent behavior. This implies that an individual may decide to discontinue the use of an innovation for a variety of personal, institutional, and social reasons one of which might be the availability of another practice that is better in satisfying farmers‟ needs.

2.1.3 Adoption/diffusion theories

People by its nature don't adopt technology through overnight; they normally need some time to adopt. Such a time might continue for several years before even trying to implement the idea for the first time. (Shahin, 2004), technology adoption is not an easy task for the adopter because, there are factors that contribute to the failure to adopt technology such as lack or scarcity of information; high costs of obtaining information; complexity of the system; technology expense; excessive labor requirements and planning; limited availability and accessibility of supporting resources; inadequate managerial skill; and lastly little or no control over the adoption decision.

In contrast, Shahin (2004) gives unwillingness to adopt as another barrier to technology adoption. Shahin (2004) offer the following factors as attributes to the unwillingness to adopt such as information conflicts or inconsistency, poor applicability and relevance of information, conflicts between current production goals and the new technology, ignorance on the part of the farmer or promoter of the technology, inappropriate for the physical setting, increased risk of negative outcomes, and belief in traditional practices are some of them.

2.1.4 Wheat technologies uptake and its determinants

The implementation of new agricultural technologies has become a driving force for management change on smallholder farms. Identifying technologies and management practices could enhance the sustainability of agricultural production, as well as constraints to their uptake, is therefore an important element in attaining sustainable smallholder farming systems.

Economic viability is a fundamental condition for the wide spread uptake of technologies and management practices that will help to achieve the goal of sustainable agriculture in general, and wheat production in particular. Studies on the factors that influence uptake of agricultural technologies often focus on household resource endowments,

characteristics of the household head, location of the household, the nature and extent of information provided before uptake, and characteristics of the technology (Feder*et al.*, 1985).

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According to Rogers (1995), socioeconomic characteristics, personality values and communication behavior of individuals influence their way of adopting innovations such that some individuals adopt innovations earlier than others.

Numerous studies have examined the influence of socio-economic variables on farmers‟ adoption decisions of agricultural technologies using either the probit/logit model (Kabede*et al.* 1990, Kaliba*et al.,* 1997) or the ordinary least squares linear regression model (Rezvanfar 2007; Rahman 2007). The linear regression model has a continuous dependent variable, while the probit or logit model involves a binary dependent variable. In these models, the dependent variable is specified as a function of farmer-specific attributes (e.g. gender, age, experience, education, household size, income, extension contact), and farm attributes (e.g. farm size, farm type, location). High school education is found to be significant and positively related to adoption level.

Controlling for other factors, high school education would increase adoption. In other words technologies. Education makes people to realize the importance and benefits of adopting new technologies. Therefore educated people can be more willing to adopt and apply the new innovations in their farms. Access to off-farm employment income has a significant positive effect on adoption of wheat technologies. This entails that increased access to off-farm employment income can lead to increased adoption of wheat technologies. One explanation for this result is that off-farm income provides supplemental income to finance technology expenditures for example: purchase of various inputs.

The distance from the agricultural developmental center (ADC) has a significant negative influence on the adoption of wheat technologies. An increase in distance causes a decrease in adoption level. The ADC is usually strategically located within the farming areas and it is the place where the local extension worker is stationed. As distance from the ADC increases, wheat technology adoption decreases because this causes transport cost incurred in obtaining information on technologies and inputs to increase. Farmers are less likely to adopt the wheat technologies as the distance increases from the ADC (Rezvanfar A., 2007).

2.2 Empirical Literature Review

2.2.1 Wheat production in Ethiopia

Ethiopia is the second largest wheat producer in sub-Saharan Africa, after South Africa. Although most of the wheat grown in Ethiopia is bread wheat, there is some durum wheat which is often grown mixed with bread wheat. Wheat is among the most important crops in Ethiopia, ranking fourth in total cereals production 16% next to maize, sorghum and Teff (CSA, 2007). It is grown as a staple food in the highlands at altitudes ranging from 1500 to 3000 m.a.s.l. nearly all wheat in country is produced under rain-fed conditions predominantly by small farmers.

A few governments owned large-scale (state) farms and commercial farms also produce wheat. Despite the recent expansion, Ethiopia falls short of being self-sufficient in wheat production, and is currently a net importer of wheat grain. Wheat ranks fourth in terms of area production and yield among food crops. Production of wheat increased from 2.2 (000T) in 2004/2005 (CSA, 1998) to 2.8 (000 t) in 2010/2011 (CSA, 2000) an increase of 31%. However, the share of wheat in total cereal area decreased 12.4% over the same period, mainly due to a shift in cropping patterns towards sorghum. Wheat yield in Ethiopia is also lagging behind other major producers in Africa: average yield was 1.68 ton/ ha during the same period, about 32% and 39% below Kenyan and South African averages, respectively (FAOSTAT).

According to Ganesh *et al.(*1996) the process of technology adoption is not under stood. They pointed- out that most studies considered technological adoption as a discrete phenomena on adopters as non- adopter rather than continue that reflects the intensity use

various techniques. They also pointed out that one modern input is adopted and then other last another improved input is adopted

According to Tesfaye*et al.* (2001) cited several factors that hiders the productivity of wheat in the nation such as low soil fertility, herbal infection (weed), water logging in vertisol, less adoption of different improved technologies, resistance to disease and pest infestation and water deficits in short rainy seasons are the major ones. At present, wheat is produced solely under rain fed conditions. Currently, bread wheat accounts roughly 60% of total wheat production and durum wheat accounts for most of the remaining 40%.

The study conducted by Itana (1985); Chilot*et al.* (1996) and Tesfaye*et al.* (2001), have reported that education had positive and significant relationship with adoption. In the same line Freeman *et al.* (1996); Habtemariam (2004), reported significant and positive relationships that exist between formal education and literacy level and adoption.

Factors influencing adoption of improved technology includes characteristics of household including education, age, and family size, farm characteristics, technology characteristics, wealth (economic status), contact with extension agents, price, access to credit, position of farmer in farmers‟ organization (see Legesse 1992, Teressa 1997, and Mulugeta 2000).

Tesfaye*et al.* (2001) reported that farm size, participation in on farm demonstration, attendance at training courses, access to credit, education level and extension contact contributed positively in farmers‟ adoption of improved wheat varieties. Extension activity, represented by farmer's attendance in the field day was found to significantly and positively influencing adoption of improved maize variety.

In the study of Techane (2002) Tobit model was employed to analyze factors influencing adoption and intensity of fertilizer use among smallholder farmers fourteen variables were found to be significant such as access to extension service, access to input credit, access to hired labor, area under improved seed and regional differentials, gender differential, education, supply of family labor, total number of livestock owned, health status of the household head, off-farm income and slope of cultivated land.

Asres (2005) revealed that large family size provides sufficient labor for farming operation and those farmers who have access to labor are expected to adopt new technologies. This is in agreement with the studies conducted by Deginet *et al.* (2001).

Minyahel (2008) on the contrary, studies conducted by Million and Belay (2004) indicated that family size negatively affects adoption of physical soil conservation.

In Girmachew (2005) the result of the findings shows that explanatory variables: - farm experience, total household labor, extension agent's visit, and perception of the farmer are significantly related to adoption of new technologies by farmers.

By Yishak (2005) the study output revealed that variables such as farm size, TLU, ownership of oxen, availability of fertilizer on time, availability of cash for down payment, access to formal credit, ownership of radio and attending on demonstration were positively and significantly influenced. On the other hand, input price and distance to market were negatively and significantly related to adoption.

Minyahel (2007) indicated that sex, education, annual farm income, credit use, participation in extension events, farmers knowledge about production package were important variable which had positive and significantly influenced adoption and intensity of adoption of improved wheat production and market had shown negative and significant relationship with adoption and intensity of improved Bread Wheat production.

It is seen that smallholder farmers are respond slowly to new technologies. This initiated researchers to investigate the major reasons behind it. The result of researches in different areas indicates that some variables which are highly significant is not significant in other areas, this calls for a continuous study on the matter (as cited in Abayineh *etal.* (2005).

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

This study was conducted in *Cheha Woreda*, is located in *Gurage Zone* of Southern Nations, Nationalities and Peoples Regional State (SNNPRS), Ethiopia. The capital of the Woreda, *Imdbir,* is located at 185 km distance south west of *Addis Ababa* on the way to *Wolkite t*own, the capital of the Zone. The Woreda constitutes 40 rural Kebele (the lowest administrative unit) of which 39 are rural and 1 is rural town.

Based on the 2007 Census conducted by the CSA, *Cheha Woreda* has a total population of 115,951, of whom 56,851 were men and 59,100 women; 8,992 or 7.76% of its population are urban dwellers. The plurality of the inhabitants were reported as Muslim, with 42.98% of the population reporting that belief, while 36.31% practiced Ethiopian Orthodox Christianity, 12.87% were Protestants, and 7.73% were Roman Catholics.

The major cereal crops produced in the Woreda include Teff, Maize, Wheat, and have different fruits and vegetable crops also grown. Farmers of the *Woreda* also widely produce Enset for different purposes like for medical purpose and for food in the form of *Kocho, bulla, Amicho*. The leaves were also used for different purposes.

3.2 Sources and Methods of Data Collection

The study was used both primary and secondary data sources. The secondary data was collected from different books, internet and *Woreda* rural and agricultural development office and other related organizations. The Primary data was collected through questionnaires by distributing and interviewing the household farmers and Woreda agricultural extension.

3.3 Sampling Techniques

Cheha Woreda is firstly divided in to three climatic zones such as, Dega, woynedega and Kolla, secondly two kebeles namely *Moche* and *Dakuna* was selected randomly from seven kebeles in Dega climatic zone only, because it is the potential area for wheat production. Thus this study was collected the data from the total of 100 farmers all over the *Cheha Woreda*.

Woreda

Climatic zone (3) _____ first stage

(2) Kebeles from Dega climatic zone_____ Second stage

(100) from Dega climatic zone _____ third stage

For this research multi- stage random sampling technique were used, because it is relatively convenient, less time consuming give equal chance all choice and less expensive method of sampling. The sample determined by using a simplified formula provided by Yamane (1967), in order to determine the required sample size at 90% confidence level and with the level of precision of= 10% because of this study limited with in terms of time and experience as result ,study used 10% precision level to reduce the number of respondent .

The formula was given as, n= N/ 1+N (e) 2

N=626 from the total of 680 household.

e=10%

n=626/1+626(0.1)2

n= 626/1+626(0.01) n = 100

Where n is sample size, N is the numbers of households that produces wheat in *Mocha* and *Dakune Kebele's* of Dega climatic zone, and "e" is the level of precision. According to the above formula, the sample size was 100. From this the sample size proportion in *Moche* =M/N*n =353/626*100 =56, and in *Dakune* = D/N*n=273/626*100= 44. Finally use simple randome sampling techinic used to take 100 sample.

3.4 Method of Data Analysis and Interpretation

The collected data was analyzed by deceptive analysis and Econometric Models. Descriptive statistics was used to analyze mean, standard deviation, frequency and percentage with table and graph. The primary data was collected regarding on the determinants of wheat technology adoption was subjected to be an econometric (regression) analysis. The models commonly used to analysis adoption studies are Logit, Probit and Tobit because they accommodate qualitative (categorical or discrete) responses (Cramer, 1991). The probit and logit models are standard and have similar shapes but, latter data concentrated in the tails (Cramer, 1991). There is no a significant differences between Logit and Probit model estimation except logit model can easily explain the result and there is thickness difference around tile however, it is overcome by increasing the sample size (Cramer, 1991). Therefore this study was used logit model, because the result of logit model can easily explain and interpret the result.

$Yi=f(zi)$……(1)

This means there is a functional relationship (f) between the observed survey and the latent index function zi.

Where $zi= bo+ƐbiX$…….(2)

Y is the response for the i^{th} observation with binary variables 1 for adopters and 0 for non adaptors of technology and z_i is the latent index function for the i^{th} observation. There is a threshold index for each farmers z*, such that $z_i^*<z_i$ the farmer was considered as an adopter and zi*>zi the farmer was non adopter.

The probability of the farmers who adopt the technology is presented as follow

pi=…….(3)

Where $zi= \beta0+ \beta1X1+ \beta2X2+ \beta3\ X3+…….+ \beta kXk+ui$ ……..…….(4)

Where β0 is the intercept and β1 is the slope of parameter of the model. The slope tells how the log-odds in favor of adopting improved wheat technology change as the independent variable changed by a unit. The model is specified as follow;

$Y= ((\ln\{p(xi))/(\ln(1-p(xi)=(a_i x_i+u_i)$…….(5)

Y= It is the natural legalisms of the probability adopting wheat technology (P) divided by probability of not adopting it (1-P), αi= Coefficient of factors influencing adoption of wheat technology

X_i= Factors influencing adoption of wheat technology which are hypothesized to influence adoption.

u_i= Error terms The model is specified as shown in equation Y = f (location, farmer's resources (human and physical) and institutional factors.

3.5 Hypothesis and Variable Definition

Variable defining is one of the tasks during research working hence; the data was covered the necessary information regarding to social-economic characteristics, wheat production, and factors of wheat technology adoption in the study area. Both continuous and dummy variables were used on economic theories and the findings of different empirical studies. Consequently, to investigate the research questions of the study, the following variables were identified.

A. Dependent Variables

Adoption of Improved Wheat Seed (AIWS): Is a dummy variable that represents the probability of the household adopting wheat variety or not. For the household who adopts wheat variety, variable takes value one and otherwise take value zero.

B. Independent (explanatory) Variables

There are different independent variables that correlate with wheat technology adoption; some of the variables are as follow:-

1. Gender: This is dummy variable that takes a value of one if the household head is male and zero otherwise. In smallholder framer's household, both men and women take part in wheat production. Sex difference is one of the factors expected to influence adoption of new technologies. Due to many socio-cultural values and norms, males have freedom of mobility and participation in different meetings and consequently have greater access to information (Techane, 2002).

2. Family Size (FS): It is a discrete variable and measured in numbers. It is expected that as the size of the household increases the adoption of new technology increase. Farmers who have relatively large cultivated land size were more initiated to adopt improved technologies (Bayissa, 2010). This indicates the family with large number could thus have a positive effect on a farmer's decision to adopt improved wheat varieties.

3. Distance to Market Center (DMC): It is a continuous variable which is measured in kilometer. When the farm area is near to the market the potential of the farmer to sell their product is high and there is no high cost incurred by the households while transportation. Moreover, the household can access the required inputs in the nearby market because many of input providers are settled around the main market; Amaze

(2008) distance from the market has a negative impact on technology adoption; as distance is increased from the market the inputs supply will decrease.

4. Education Status (EDUS): This is a category variable. Measured in terms of 1, illiterate 2, read and write 3, 1-4 grade, 4, 5-8 grade, 5, high school. According to Nkonya *et al.*, 1997, Croppenstedt *et al.*, 1999) farmers with ability to read and write are expected to have an advantage in obtaining information and understand the benefit of improved seed use. Therefore, education was hypothesized to positively influence willingness to pay decision and intensity of improved seed use.

5. Age: It is a continuous variable and measured in years. Age is a proxy measure of farming experience of household which is expected to influence adoption of wheat varieties (technologies).

6. Availability of Off-Farm Income (AOFI): it is dummy variable taking a value of one if households have off farm income and other wise zero. Households have off-farm income are expected to have better income and can easily purchase agricultural inputs.

7.On-Farm Income: It is a continuous variable and refers to the total annual cash earning to the families from selling of crops, livestock and livestock products after meeting family's requirements. This is believed to be the main source of capital for purchasing agricultural inputs (Kidane, 2001). Thus, those households with a relatively higher level of farm income are likely to purchase improved seeds or other essential agricultural inputs. It is measured by the amount of birr obtained from sale of farm produces.

8. Land Holding (LH): It is a continuous variable and measured in hectares. It is hypothesized that there is a direct relationship between size of land and wheat technology adoption. According to Mulugeta and Hundie (2012) size of cultivated area of land has a significant influence on technology adoption decision of wheat production.

9. Access To Credit (AC): Access to credit is measured as a dummy variable taking a value of one if the household has access to credit and zero otherwise. This variable is will be expected to influence improved wheat technology adoption decision of households because there is high initial cost of improved seeds which may not afford easily.

10. Frequency of Contact with Extension Agent: This refers to the number of contacts per year that the respondent made with extension agents and it is a continuous variable.

The effort to disseminate new agricultural technologies is within the field of communication between the change agent (extension agent) and the farmers at the grass root level (Girmachew, 2005). Here, the frequency of contact between the extension agent and the farmers is hypothesized to be the potential force which accelerates the effective dissemination of adequate agricultural information to the farmers.

11. Availability of improved wheat seed: On time availability of inputs determines the adoption decision of new improved wheat varieties Thus, it was hypothesized that timely availability of inputs has a positively associated with adoption of improved wheat technology.

Table 1: Definition and unit of measures of variables

Independent Variables			
Variable's name	Type's of variables	Description	Hypothesized sign/ effect
Family size	Discrete	Numbers of family size	+
Sex	Dummy	Sex of house hold(1=male0=female)	+
Education status	Categorical	Education status of household (1. Illiterate 2. Read and write 3. 1-4 grade, 4. 5-8 grade, 5.high school.	+
Extension	Dummy	Access to extension service (=1,if yes; = 0,if no)	+
Availability of Off farm income	Dummy	If house hold have =1,others wise zero	+
Age	Continuous	Age of household	-
Land holding	Continuous (hector)	Total farm land owned and/or contracted by the Household	+
Distance to market	Continuous (kilometer)	Estimated round trip traveling distance to input Market	-
Access to credit	Dummy	If access=1 if not=0	+
On farm income	Dummy	If access=1 if not zero.	+
Availability of improved wheat seed	Dummy	If access=1 if not zero.	+

4. RESULTS AND DISCUSSIONS

This chapter summarizes the major findings of the study. Both descriptive statistics and econometric analysis were used to analyze the primary data. Descriptive statistics were employed to describe the socio-demographic characteristics of sample farmers. Econometric analysis was used to identify the by how much the variation of different variable lead probability to influence adoption of improved wheat varieties by small holder farmer in the study area.

4.1. Descriptive Results

In this section of analyses descriptive statistics such as mean, standard deviation, frequency, and percentage of different current status of adoption, socio- economic and demographic characteristics of respondent.

4.1.1. Current status of adoption and demographic characteristics of HHs

Practicing adoption of new technology is the best solution as compared to another alternatives and recommendations for smallholder farmers to improve and enhance the production and productivity. Smallholders use same technologies but in variable adoption level, this different level of adoption may be related to several reasons or factors. Therefore, it is important to know and needs scientific research's why farmers adopt a single component of package while refusing the others. Improved wheat technology has various practical packages which were recommended by the researchers and were being promoted by extension systems, such as use of improved varieties, land preparation, application of fertilizer, application of chemicals, weed management, seeding rate, planting space etc. It is difficult to put in practices all agricultural extension packages as the recommended way especially at farmers level hence, for this study only improved wheat variety was adopted and the remaining inputs are being remained constant since, farmers usually use different application rate due to financial constraints and luck of extension services. This variability created problems to get reliable data consequently, only improved wheat variety was considered and others were excluded. Having these facts about technology adoption package, level of improved wheat technology adoption is indicated in the figure 1 below.

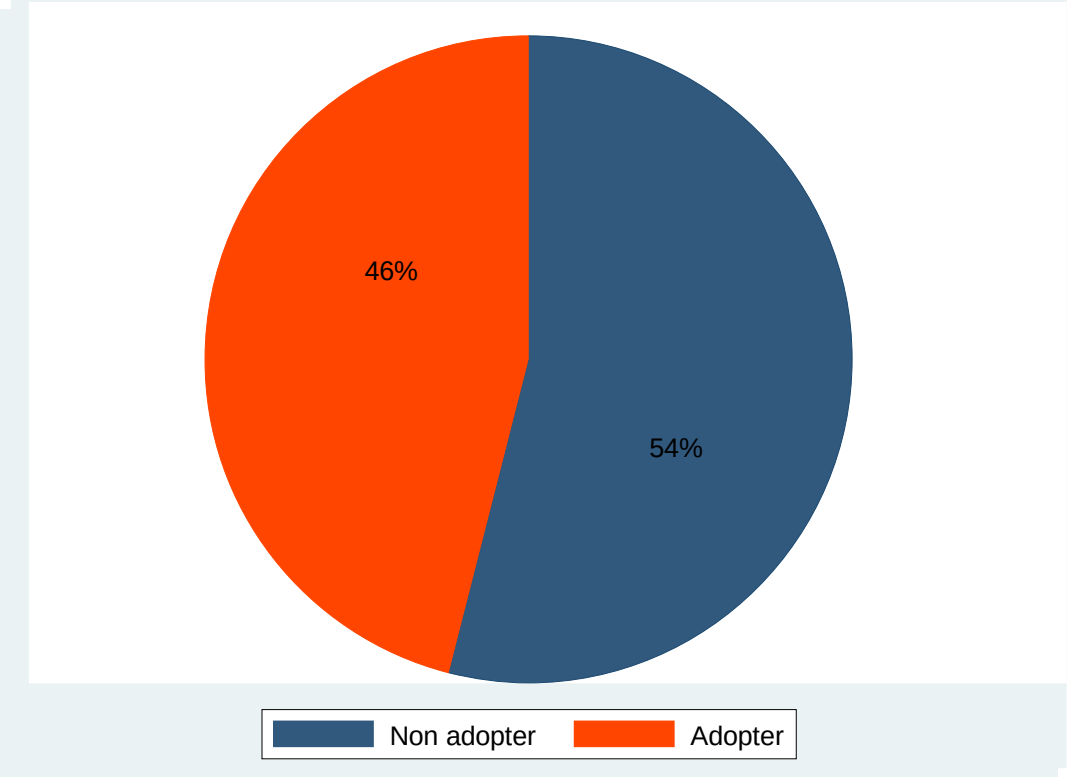

Figure 1: Percentages of Respondant by the level of Adoption N(=100)

Source: Computed from own survey data, 2011 EC.

The study was considered 100 randomly selected households as a total sample size and from this 46% were adopters and 54% were non-adopters. The figure shows that the percentage of adopters were less than non-adopters.

A.Adoption Status and Sex of Household

Table 2: Distribution of Sample HHs by sex N(=100)

Description	Sex of household with %		Total
	Male	Female	
Adopter	36	10	46
Non adopter	34	20	54
Total	70	30	100

Source: Computed from own survey data, 2011 EC.

The sample was composed of male and female households, of which 70 percent were male headed farmers and the rest 30 percent were female headed farmers. As table above table show male householed head respondent were higher in both adopter as well an non adopter than female mean while the overall percentage of adopters were found 46 percent and 54 percent were non-adopters. This shows that from the total sample adopters were less than non-adopters.

Table 3 : Distribution of Sample HHs by age N(=100)

Age of respondant	Frequence	Percentage
29-39	40	40%
40-49	31	31%
50-59	23	23%
60-65	6	6%
Total	100	100%

Source: Computed from own survey data, 2011 EC.

The sample was composed of different age groups ,from this most of they were gruoped under 29 to 39 age, which is 40%.This indicates that most of the respondents in the study area grouped us productive ages,and from the total sampled household least of they were grouped under 60 to 65 age,which is 6%. This indicates that the least of respondents in the study area grouped us non productive age.

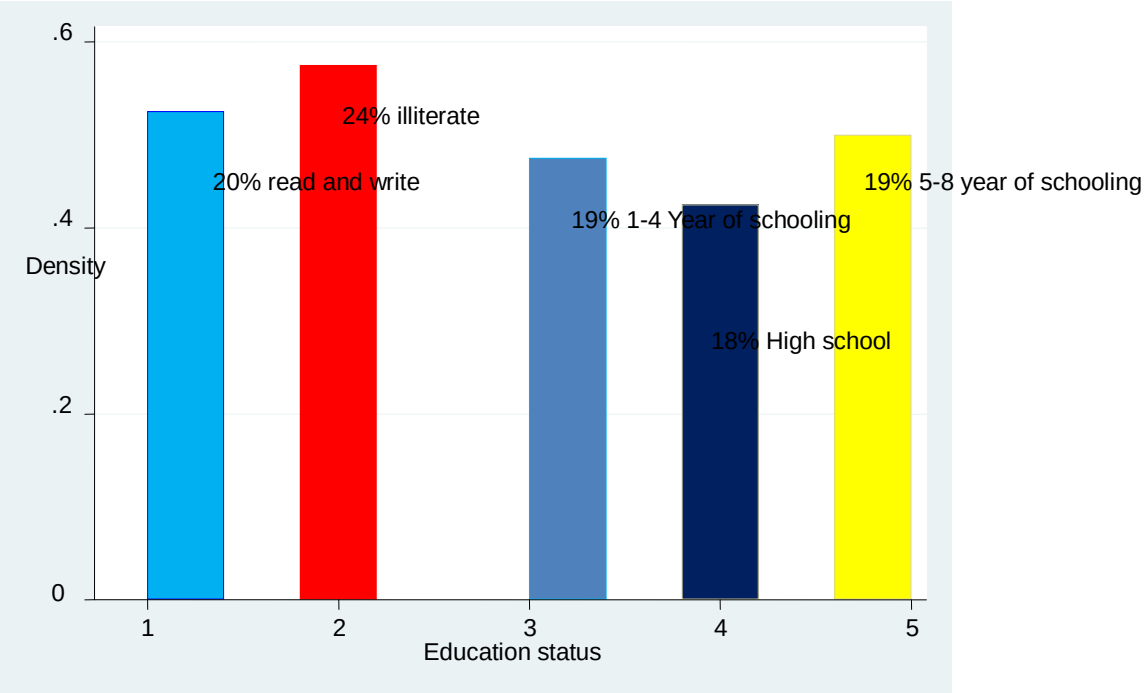

Figure 2: Education Status of Respondents N(=100)

The above figure shows that most of the respondents about 24% were illitrate and also 20% were only read and write which means that of the respondents were can not learn formal educations.The number of respondatnt who follow own high schoool was only 18% from the total sample.

Table 4 : Household Family size per house

Family size	Frequency	Percent
3	3	2.6
4	21	17.5
5	10	13.3
6	32	26.7
7	21	20
8	6	13.3
9	5	5.8
10	2	0.8
Total	100	100

Source: Computed from own survey data, 2011 EC.

As indicated in the table 4 above the households have family size ranges from 3 to 10. Those households have 3 family size accounted for 2.6 percent,4 accounted for 17.5 percent, 5 accounted for 13.3 percent, 6 accounted for 26.7 percent, 7 accounted for 20

percent, 8 accounted for 13.3 percent,9 accounted for 5.8 percent,and 10 accounted for 0.8 percent. Therefore, as the above table show that most of the sampled householed have 6 numbers and the smallest sampled have 10 number of family per householed.

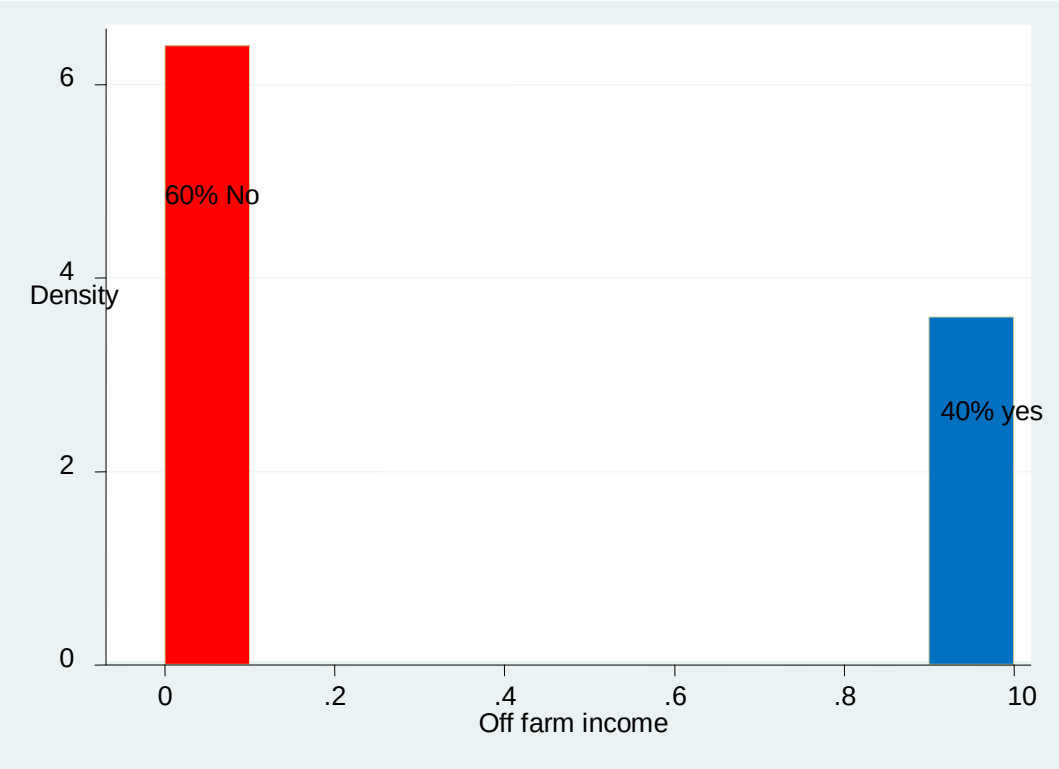

Figure 3: The respondents off farm income response, N= (100)

Source: Computed from own survey data, 2011 EC

The above figure shows that most of the respondents have no offfarm income ,which accuonted 60 percent from the total sampled, and only 40 percent of total sampled have offfarm income.

Table 5: Distribution of Sample HHs by on farm income N(=100)

Adoption of HHs	On farm income in birr					
	20-37	40-56	57-85	86-123	130-200	Total
Non adopter Adopter	24 0	26 4	3 13	1 20	1 8	
Total	24	30	16	21	9	100

Source: Computed from own survey data, 2011 EC

As table 5 indicates that most of the households that have income interval from 20 to 37birr per day all of them was non adopters, and in contrast from this the household that have on farm income from 130 to 200 birr from 9 sampled 8 of them was adopters.

B.Farme and Resource Ownership

Table 6: The landholdings of the respondent N(=100)

Landholdings of HH	Adoption of hh		Total
	Non adopter	Adopter	
0.3-1 ha	39	18	57
1.25-3ha	15	28	43
Total	54	46	100

Source: Computed from own survey data, 2011 EC

As the above table show that from the total number of sampled householed about 39 number of non adopter have 0.3-l hactar of the land and also 15 number of non adopter sampled household have 1.25-3 hactar of the land .In addition to this from adopter householed about 18 number of sampled have 0.3-1 hactar of land and the remaine 28 number of householed have 1.25-3 hactar of land.

C. Institutional and exentensoin services

Table 7: The responses of respondents of access tocredit N(=100)

Access of credit	Adoption of hh		Total
	Non adopter	Adopter	
No	48	10	58
Yes	6	36	42

Source: Computed from own survey data, 2011 EC

As table 7 reaveled that from the non adopter of sampled housholed 48 number of sampled stated that they have not got any credit access and also from the adopter sampled householed about 36 number of respondant stated they have got credit access in study area. But from the total sampled most(58) of the respondant have not got any credit access, and least(42) of the respondant have credit access.

Table 8: the frequence of extention contacts of the sample size N(=100)

frequunce of extension	adoption of hh		Total
	non adopter	adopter	
Once per week	1	5	6
Twise per week	3	10	13
Every three weeks	5	11	16
Once per month	7	14	21
More than once per semi-annual	38	6	44
Total	54	46	100

Source: Computed from own survey data, 2011 EC

As table 8 display from the over all respondent about 44 number of respondant were meeted with their extension worker more than once per semi-annualy and also form the total sampled about 6 number of respondant were meeted with their extension worker once per week.

D.Response to Tchnologies

Table 9: availabilities of improved wheat seed of the sample size ofN(=100)

Availability of improved wheat seed	Adoption of HH		Total
	Not adopter	Adopter	
No	38	0	38
Yes	16	46	62
Total	54	46	100

Source: Computed from own survey data, 2011 EC

According to table 9 from 100 sampled housholed 62 of the respondant stated that with some extent there was availablity of improved seed and 38 number of respondant stated than there was not any improved wheat seed availability in study area .

E. Distance to Market

Market is the place where buyers, sellers and traders meet to buy and sale and exchange of various information about their product Techane, (2002). Households living to the nearby to market center can travel more frequently than who lives far. Distance is also another important situational or institutional variable which influences the adoption

decision of new technology. Farmers living close to the market had an access to the market services like they can easily purchase improved agricultural inputs and sale their output to market to a short distance with a better price. These were initiated the farmers‟ to use improved agricultural technology.The mean score registered by the respondents related to access to market was presented in the table below.

Table 10: The mean score for market distance of the sample size N(=100)

Varaibles	Obs	Mean	Std.Dev	Min	Max
Distance	100	5.3475	2.459275	1.5	13

Source: Computed from own survey data, 2011 EC

Therefore ,as table 10 show that the average distance of the market for the sampled household was 5.34 kelometre, and the minimum and maximum distance of market for the sampled household was 1.5 and 13 respectively.

4.2. Econometric Modle Results

4.2.1 Logistic model estimates and their results

Two groups of farmers were identified; (a) technology adopters and (b) non-adopter and adopters were represented by 1 and non-adopters were 0. Moreover, these models relate household and technological characteristics to the probability that a household will adopt a technology or not. Typically, factors included in the model are exogenous which are not controlled by the households. In this section, binary logit econometric model was used to see the relative influence of different variables on adoption and status of adoption of improved wheat varieties. Estimates of the parameters of the variables expected to determine the adoption of improved wheat varieties. Different researchers came out with different results as to what factors influenced (determents) farmers' adoption decisions of new technology (Feder *et al.*, 1985). Once, the analytical procedure of the study is known, identifying potential explanatory variables become necessary. The variables hypothesized to influence improved wheat varieties has been analyzed using the binary regression model of the logit analysis, explained below.

As The results of logit model in table 11 indicates that from a total of 11 explanatory variables five variables were found to be significantly influence adoption of improved wheat varieties; such as , sex of household head, Education level of the household head, on farm income, land holding, and credit.

Education level of households head had a positive and a highly significant (at less than 5% significance level) in influencing the probability of adoption improved wheat varieties.

Sex of the household had negative and significant influence on the adoption of improved wheat varieties at 10% significance level. Hence, sex of household head was hypothesized to increase a farmer's adoption of improved wheat varieties

Total land holding of the households had positive and significant impact on the adoption of improved wheat varieties at 5% significance level.

Access to credit had positive and significant impact on the adoption of improved wheat varieties at 10% significance level.

Table 11: Binary logit model results of explanatory variables

adoption	Coef.	Std. Err.	Z	P>z
Sex	-2.506282	1.304992	-1.92	0.055*
Age	-.1177732	.0879051	-1.34	0.180
Education	1.346919	.5524357	2.44	0.015**
Family size	-.109785	.3052783	-0.36	0.719
On farm income	.0359862	.0213964	1.68	0.093*
Off farm income	1.064823	1.144971	0.93	0.352
Land holding	2.774551	1.207453	2.30	0.022**
Credit	2.994149	1.613212	1.86	0.063*
Extension	.7516598	.537545	1.40	0.162
Input	1.109447	1.475489	0.75	0.452
Distance	-.1252574	.2534242	0.49	0.621

Cons	-8.885571	5.255902	-1.69	0.091

Note;*, **,* represents 1%, 5% and 10% level of significance respectively.*
Source: model output

Log likelihood = -18.043914

Number of observation = 100

Pseudo R2 = 0.7385

LR ChiR(11) = 101.90

4.2.2. Effects of changes in explanatory variables (Logit interpretation of the above logit model results)

Sex of household head: - Being female of the head of household, the log of likilihood lower by 2.5 and statistically significant. This is because; most of the time female has low opportunity to get information about the use of improved wheat varieties for improving productivity than female in different mechanisms**.** The result of this study was consistent with research findings carried out by Techane, (2002).

Education level of head:-As education level of the head household increases by one year, the log of likilihood increased by 1.35 and statistically significant. This study is similar result as per various empirical findings were conducted in different parts of Ethiopia by different author's education and technology adoption have a strong positive relation. For instance, Mulat, (1999); Assefa, (1995); Abay and Assefa, (1996); Getu, (1997); Mohammed, (1999); Techane, (2002); Hailekiros, (2007); Minyahel, (2007); Rahmatu, (2007); Tadesse, (2008); Mulugeta (2009).

On farm income:-As on farm income of households increased by one birr, the level of adoption of improved wheat varieties would increase by 0.036. The result of this study is consistent with research findings carried out by Degnet and Belay (2001), Kidane (2001), Getahun (2004) and Taha (2007) were reported farm income is positively influence adoption of improved technologies.

Land holding: - As land size of the head of the household increases by one hectare, the adoption of improved wheat varieties would increase by 2.7. This finding were confirmed by various empirical studies and was found the same result with Getahun (2004), Mesfin (2005), Rahmeto (2007) and Taha (2007).

Credit:-As the access of credit that households get from different financial source increased by one level, the log of likilihood increased by 2.994 and statistically significant.

Marginal effects after logit

y = Pr(adoption) (predict)

= .33675867

Table 12: Marginal effects after logit

variable	dy/dx	Std. Err.	Z	P>z
sex*	-.5527026	.22898	-2.41	0.016
age	-.0263049	.01969	-1.34	0.182
educat~n	.3008374	.12682	2.37	0.018
family~e	-.0245207	.06874	-0.36	0.721
onfarm	.0080376	.0053	1.52	0.129
offfarm*	.2431975	.26462	0.92	0.358
landho~g	.6197022	.2795	2.22	0.027
credit*	. .6247271	.25732	2.43	0.015
extent~n	.1678849	.12825	1.31	0.191
input*	.2339029	.26801	0.87	0.383

distance	.0279765	.05745	0.49	0.626

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Interpretations of marginal effect result of the above result

Sex of Households':- As being female heads of household decreases the probability of adopting wheat varieties by 55.27%.This because most of the time females have no awareness about new technology utilization.

Education level of head:-As Education levels of household increases by one year the probability of adoption of improved wheat varieties would increased by 30.084%.

Land holding: - As land size increased by one hectare, the probability of adoption of improved wheat varieties of the household would increase by 61.97%.

Credit:-As the access of credit that households get from different financial source increased by one unit, the probability of adoption levels of wheat varieties would increase by 62.5%.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1. Summary

The government of Ethiopia has been implementing growth and transformation plan in order to boost the national economy. Agricultural production has been planned to have enormous contribution to overcome the problem of food security, shortage of export earnings, and provision of employment creating incomes and improving the livelihood of the population. Having these facts, participating and implementing a sustainable and knowledge based utilization of improved technologies are critical to enhance growth and productivity in general and particularly agriculture is one of the focusing areas.

Wheat is the second crop next to maize in terms of production and area coverage in Ethiopia and it is playing a critical role on the reduction of food security problem throughout the country and different researchers has provided substantial and better attention on this crop. This situation makes to transfer improved wheat technology to smallholder farmers‟ level for the enhancement of productivity. However, the availability of potential land could not execute as planned because of several political, economic and social impediment consequently, only small proportion of the farmers adopted these technology.

Therefore, it is appropriate to identify the specific factors affecting the adoption decision of smallholders and determine the current rate and pattern of adoption of technologies and this will be expected to suggest possible area of intervention for improving the proficiency of agricultural technology generation and dissemination.

This study was conducted in *Chahe Woreda*, which is located in *Gurage* zone SNNPRS of Ethiopia. In this area, wheat was an important crop, which serves as a source of food and cash. The main objective of this study was to determine factors affecting adoption decision of smallholders and to see adoption level of farmers in the study area.

A sampling procedure was applied to draw the required number of sample units for the study. In the first stage, three climatic zones were selected in *cheha worade*, in the second stage selected two kebeles in *Dega* climatic zone and finally 100 sample respondent was selected. From total of 100 sampled households (70 male and 30 female) selected from 2 *Kebeles* of the *Woreda* were interviewed using structured interview schedule. The data was collected from both primary and secondary sources.

The descriptive statistic and logit econometrics model was employed to analysis different characteristics of respondent and estimate the effects of hypothesized independent variables on dependent variable. The descriptive analysis revealed that from sampled farmers in *Cheha Woreda* about 46%, 54% adopter and non-adopters respectively.

Finally, the output of the model showed the independent variables like education level of the household, on farm income, land holding and access to credit were positively influenced the probability of adoption of improved wheat varieties. However sexes of the household head were negatively influenced the probability of adoption of improved wheat varieties in study area.

5.2 Conclusion and Recommendations

The government should take in to consideration the above important variables when various policies and programs is designed to implement for the enhancement of agricultural productivity in the country in general and in the study area in particular specially with regards to the types of innovation related to improved wheat technology. The following recommendations are forwarded in this study area based on the above findings;-

- ✓ Education level of the house hold head was found to have a positive relationship with the adoption of improved wheat varieties. Develop suitable strategies for better education are important issue that should get proper attention.
- ✓ Ethiopia's food insecurity problem that were farmers has small lands could be solved only through high investment in agriculture technology and expansion of modern improved seed which could exploit the maximum yield on existing cultivated land. Hence, the cultivated land size on the farmer's adoption decision is significant; there is a need to minimize constraints that hinder farmers from adopting the improved wheat varieties. These include developing the awareness

about the agricultural technology to farmers and providing appropriate training to farmers and agricultural development agents. Therefore the government should increase investment in agriculture technology and expansion of modern improved seed which could exploit the maximum yield on existing cultivated land

- ✓ Sex is one of variables was significant and that affects negatively the level of adoption according to above findings. Because the participation of women in agricultural activities in general and in adoption of improved wheat technology in particular is low in the study area. Therefore the government should give attention for the encouragement of women's participation in agricultural activities, provide awareness of the role of women's in agricultural activities to the society and they should also be encouraged women's to participate in agricultural extension.
- ✓ According to this research finding credit also be significant and positively affect adoption of improved wheat seed. In the study area there are formal credit provider institutions, However, the interest rate was too much and it was not affordable at farmers level to payback their loan. This situation by itself was an impediment to adopt new technology at smallholder framer's level. Therefore, the government should alleviate this problem through providing a special way of credit scheme to the farmers to purchase inputs with a reasonable amount of interest rate and after production the government should create linkage and network access to market to easily sale their products with reasonable price.
- ✓ Based on the above finding that on farm income of households had positive and significant effect on adoption status, to make non adopter households to adopt improved wheat varieties there is a need to further improve the rural households' income through diversifying their agricultural activities and income source by engaging in nonfarm/off farm activities.

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7. APPENDIXES

WOLKITE UNIVERSITY

COLLEGE OF AGRICULTURE AND NATURAL RESOURCE

DEPARTMENT OF AGRICULTURAL ECONOMICS

This questionnaire will be provided to know the farmers adoption of improved wheat technology. (Case *of Chahe Woreda, SNNPR)*

A) Personal and household characteristics

1) Sex of respondent male ☐ Female ☐

2) Age of respondent _____

3) Keble _____

4) Educational status i) illiterate ☐iv) 5-8 years of schooling

ii) Read and write iii) 1-4 years of schooling ☐ V) high school ☐

5) Marriage status Married ☐ Divorced☐

Single ☐ Widowed ☐

6) Number of household male ☐ Female ☐

7) How many of your family members participate agricultural production?

Age	Sex in number		
	Male	Female	Total
1-10			
11 -20			
21 -45			
>45			

8) Is the numbers of your labor requirement is enough for production activity

Yes ☐ No ☐

9) What is your job? Farmer ☐ Government employee ☐

Merchant ☐ Both farer and merchant☐

10) Do you have any other means of income other than farming?

Yes ☐ No ☐

11) How much income do gain per day_____

12) Do you have any off- farm income? 1. Yes 2. No

13) If yes, indicate the type of work and annual income for the last one year.

Description of activities	Annual income(in birr)	Remark
Trade		
Sales of fire wood		
Sale of labor		
Remittance		
Other		

B) Farm and Resource ownership

1) What is your total size of farm land?

Land utilized ☐ other purpose ☐

Bare land ☐ Total land ☐

2) Land use pattern

No	Crop type	No	Crop type
1		3	
2		4	

C) Institutional and extensions services

1. Are you acquitted with wheat technology (high yield variety/ Hyv)?

Yes ☐ No ☐

If yes, which technology?

If no, why?

Lack awareness lack of access to improve seed

Expensive ☐ Unfavorable weather condition ☐

2. Have you got training on wheat production technology? Yes ☐ No ☐

If, no, why?

Lack of extension service☐ lack of information ☐

Lack of skilled person ☐ Far from center ☐

3) Do you have access to credit facilities?

Yes ☐ No ☐

If yes, how and from where do you get?

4) How many times contact with extension agents? 1. Once per week 2. Twice per week

3. Every three weeks 4. Once per month 5. Others_____

D) Response to technologies

1) Do you use chemical fertilizers? Yes ☐ No ☐

If yes, do you use recommended amount" yes ☐ No ☐

If no, why?

Expensive ☐ lack of access to fertilizers & credit ☐

Lack of awareness ☐ if others _____

C) General ideas

1) What do you feel about wheat production?

Satisfied ☐ dissatisfied ☐

If dissatisfied why?

Low yield ☐ unsatisfactory price of out put ☐

Disease problem ☐ others pacify _____

2) What assistant do you expect from the government?

_____.

3) How long it takes (on foot, one way) to reach to the nearest market from your house (in walking hour)? _____

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. tab1 adoption sex education onfarm credit extention input

-> tabulation of adoption
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adoption of hh	Freq.	Percent	Cum.
non adopter	54	54.00	54.00
adopter	46	46.00	100.00
Total	100	100.00	

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-> tabulation of sex
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sex of hh	Freq.	Percent	Cum.
female	30	30.00	30.00
male	70	70.00	100.00
Total	100	100.00	

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-> tabulation of education
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education status	Freq.	Percent	Cum.
illitrate	24	24.00	24.00
read and write	20	20.00	44.00
1-4 year of schooling	19	19.00	63.00
5-8 years of schooling	19	19.00	82.00
high school	18	18.00	100.00
Total	100	100.00	

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Logistic regression                             Number of obs   =        100
                                                LR chi2(11)     =     101.90
                                                Prob > chi2     =     0.0000
Log likelihood = -18.043914                     Pseudo R2       =     0.7385
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adoption	Coef.	Std. Err.	z	P>|z|	[90% Conf.	Interval]
sex	-2.506282	1.304992	-1.92	0.055	-4.652802	-.3597615
age	-.1177732	.0879051	-1.34	0.180	-.2623642	.0268178
education	1.346919	.5524357	2.44	0.015	.4382429	2.255595
familysize	-.109785	.3052783	-0.36	0.719	-.6119232	.3923531
onfarm	.0359862	.0213964	1.68	0.093	.0007923	.0711802
offfarm	1.064823	1.144971	0.93	0.352	-.8184867	2.948133
landholding	2.774551	1.207453	2.30	0.022	.7884681	4.760634
credit	2.994149	1.613212	1.86	0.063	.3406515	5.647646
extention	.7516598	.537545	1.40	0.162	-.1325231	1.635843
input	1.109447	1.475489	0.75	0.452	-1.317517	3.536411
distance	.1252574	.2534242	0.49	0.621	-.2915883	.5421031
education	0	(omitted)				
_cons	-8.885571	5.255902	-1.69	0.091	-17.53076	-.2403805