FACTOR AFFECTING WHEAT PRODUCTIVITY OF FARM HOUSEHOLDS IN GONCHA SISO ENESE DISTRICT, EAST GOJJAM ZONE,AMHARA REGIONAL STATES

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ACRONOMY/ ABBREVIATION

CSA ……..Central Statistical Agency

ETB ……...Ethiopia Birr

FAO…… Food and Agriculture Organization

FAOSTAT……..Food and Agricultural organization of United Nation

GDP……Gross Domestic Product

HHs……..Households

HYV……Improved Variety Seed

MOE…… Margin Of Error

MOFED…… Ministry of Finance and Economic Development

NGO……...Non-Governmental Organization

SAS……Statistical Analysis System

WHO ……World Health Organization

1. INTRODUCTION

1.1. Background of the study

In Ethiopia, grain crop production is the most widely spread crop production activity both in terms of the extent of cropped land area and volume of production. Cereal crops that are classified within the grain crops category are also produced in greater volume compared to the other crops by commercial farms because they are the principal staple crops and export commodities. But, the majority of the farmers in Ethiopia are smallholder farmers, producing mostly for own consumption and generating only a small marketed surplus (Bishaw, et al,. 2010). Especially, five major bowls of cereal (teff, maize, sorghum, barley, and wheat) are the core of Ethiopia's agriculture, accounting for about 75% of the total area cultivated. Among cereal crops, wheat ranks third in total grain production and second in yield next to maize. In Ethiopia, wheat is one of the largest produced cereal crops in terms of the area coverage (1.6 million hectares), the volume produced (3.9 million tons), and the number of farmers engaged in wheat production (4.7 million farmers) with an average productivity of 2.4 tons per hectare; which is too low as compared to the other parts of the world (Ajao et al,. 2013)

Ethiopia is the largest wheat producer in Sub-Saharan Africa with the cultivated land of 1.1 million ha (Mohammed, 2017). Of the cereal crops, wheat is one of the staple crop in Ethiopia whose share in cereal acreage has remained constant since the 1980s unlike that of maize which has increased substantially over time. Wheat is also among the most important staple food crops grown in Ethiopia. There are two varieties of wheat grown in Ethiopia: durum wheat, accounting for 60 percent of production, and bread wheat, accounting for the remaining 40 percent. Both bread wheat and durum wheat are grown in Ethiopia and. Of which, about 87% is grown during the main growing season (*meher*). While durum wheat is indigenous and mainly grown in the Central and Northern highlands bread wheat is a recent

introduction to Ethiopia. Durum wheat was the main wheat crop both in terms of area and production, but this has altered dramatically since the mid-1980s with the release and diffusion of semi dwarf, high yielding and adaptable bread wheat varieties (Bekele *et al.*, 2014).

Wheat is the staple food for poor people living in rural environments of the Andean Zone North African, East Asia and Ethiopia. It is traditional growth as rain fed crop often in place when the rainfalls limited, wheat is an indigenous, metalloid species and one of the predominant crop species growth in Ethiopia, but currently the size of land under cultivation is shirked. It is possesses immense diversity and Ethiopia has been recognized as secondary center of diversity for wheat. It is possesses immense diversity and Ethiopia has been recognized as secondary center of diversity for wheat (Efrem, 2015).

In Ethiopia, wheat has been selected as one of the target crops in the strategic goal of attaining national food self-sufficiency. Additionally, wheat is also an important market-oriented commodity and a major source of income for many smallholder farmers in Ethiopia. Even though it has a huge potential, the productivity of the crop is very low and out of the total wheat production only 20% is sold, while 80% of its total production is used for human consumption, seed, in-kind payments for labor, and animal feed (Degefu *et al*,.2017).

The smallholders in the country are improving their way of life through increasing their wheat production through improving its productivity and selling wheat produce so that the government promotes them to produce more for alleviating poverty. But, smallholder farmers producing wheat in different parts of the country are mostly with low level of productivity and they are used mainly for subsistence and not for commercial purposes. Due to this two reason, smallholder wheat producers in the

country are not well benefited from their production and earn little economic benefit. Transformation of this low productivity and subsistence production of wheat is an essential corridor to achieve food security at the national and household level (Birhanu 2014).

It is concerned with the lack of engagement on farm input utilization due to demographic and socio-economic determinants of households. The farmers produce low amount of wheat yield, and supply in large amount to the market for hording business- persons in the harvesting period and expose to food crop shortage and related economic problems after a few months. This problem is widely experiencing quandary in rural livelihood including the study area. Although, all of the rural areas in the zone confronting this problem, the Goncha siso enese District will be selected in case of more exposure to the problem due to the proximity for large market of zonal city. The low amount of wheat production problem of smallholders ware diversed and inter-related multiple dimensions. It ranges from households feature to limited farm inputs utilization and the related marketing practice for wheat yield . (Tsedeke Abate, 2011)

1.2. Statement of the problem

In Ethiopia, although there is favorable climatic condition and rich in natural resources, food problem have not been eliminated. The above situations are true in the case of Goncha siso enese District. Wheat is the main crop grown in district . Wheat production was the highest portion of all other crops. By considering these and other related concepts the study tries to asses with the identification of overall factor of wheat crop production in this Woreda. Agriculture is the main income earner, livelihood and way of living for about 85 percent of Ethiopians living in rural areas. Ethiopia’s agricultural production is by and large rain-fed and dominated by small scale farmers and enterprises. Given the large rural share of the total population, there is a strong correlation between recent agricultural growth and the significant reduction in rural

poverty (WB, 2012).

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 (SanjayaRajaram, 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.

The major challenges facing most of developing countries such as Ethiopia is improving rural as well as attaining food security and to stimulate underlying food system development. There is an ever-increasing concern that it is becoming more and more difficult to achieve and sustain the needed increase in agricultural production based on intensification, because there are limited opportunities for area expansion. Hence, the solution to food problem would depend on measures, which help to increase yield through intensification (Techane, 2012).

In many developing countries, like Ethiopia, it has become obvious that generating new technology alone has not provided solution to enable poor farmers to increase agricultural productivity and achieve higher standards of living (Bedilu et al,.2015). According to previous researches conducted in different parts of the country, in Ethiopia there are different socio-economic, demographic and other factors were highly contributed to low productivity of wheat. The unavailability of appropriate technologies, low level of the adoption of improved wheat technologies, unavailability and high cost of required inputs, lack of access to and high interest rates on credit, and policies that discourage improved technology adoption such as promotion of state farms are some of the factors that different researchers were confirmed as the influencing factor (Hailu, 2008).

Thus, the examination of responsible factors for low level of wheat productivity problem of peasant households wereimportant to provide nation-wide solutions with appropriate strategies across the different socio economic status. Indeed, this problem of society attracted to conduct a detailed and in-depth research to contribute possible solutions to improve the current low wheat productivity of smallholders in order to increase the income and to forward remedies for food crop shortage in the post-harvesting period in the household level by taking different measures to reserve for own consumption.

Most of the previous empirical evidences in study area or elsewhere had tried to address the question of rural food security, poverty reduction and coping strategy. However, the examination of the main determinants influence on wheat productivity of the farm households remains a long-standing problem in some remote parts of the country including the study area. Moreover, Research on low amount of wheat productivity related income problem and inconsistency has not adequately undertaken specifically in the study area. Therefore, It is important to make further study for identifying the factors affecting the productivity of wheat in the study area. Hence, this study examines the influence of different factors on wheat productivity of peasant households is the main drive of this study to guide policy decisions, appropriate interventions through integrated efforts to struggle to improve level of wheat productivity and livelihood insecurity and to find further and better strategies in the District.

1.3. Objective of the study

1.3.1. General objective

To examine the factor affecting wheat productivity of rural households in Goncha siso enese district.

1.3.2. Specific objective

- ✓ To identify the factor that affecting wheat productivity in the study area,
- ✓ To assess the status of smallholder farmers wheat production in the study area.

1.4. Research questions

1. What were the most common factor that affect wheat productivity of farm Household in study area?

2. How is the production status of wheat at smallholders farmers in the study area? Is ist attractive? or is it poor; which needs further improvement from respective responsible bodies?

1.5. Significance of the study

As stated in the problem, over 80 percent of Ethiopian population lives in rural area are heavily dependent on rain-fed agriculture; and extremely vulnerable to changes in weather conditions in terms of productivity andincome they earn per year (Abduselam, March 2, 2017). This study was needed to examine the main factor affecting of wheat production of the small holder households. The problem of low wheat production was happened per year andmakes livelihood of farmers stagnant. Because of the farm households in the rural area, use limited amount or not at all the decisive factors of wheat production.Therefore, this study was important to forward relevant to provide use full information for researchers, wheat producers, policy makers and other responsible bodies on the main determining factors of wheat productivity and possible remedies, to minimize the influence of each factor affecting of wheat productivity of farmer households.

1.6. Scope of the study and limitation

Eventough, there are a number areas which need further consideration this study was targeted to identify the factors limiting the wheat productivity. Due to the availability

of different limiting factors and constraints, the study was covered only one district. Moreover, there are a number of ways and methods to identify the factors affecting wheat productivity, the researcher was planned to use multiple linear regression model to analyze the relationship between wheat productivity and different explanatory variable hypothesized to affect the wheat productivity. In addition, the study did not address macro factors affecting agricultural production like inflation, real exchange rate and GDP-per capita.

1.7. Organization of the study

This paper of the study comprises five chapters. The first chapter is the introduction part of the study and consists of the background of the study, statement of the problem, the research questions, objectives, significance. While, the second chapter is only the review of the related literatures to wheat production pattern of farm households and the third chapter consists the research methods to be used while conducting the study, Description of the study variables and conceptual framework of the study. The fourth chapter inclu

2. REVIEW OF THE RELATED LITERATURES

2.1 definition

Wheat is believed to have originated in southwestern Asia. Some of the earliest remains of the crop have been found in Syria, Jordan, and Turkey. Primitive relatives of present day wheat have been discovered in some of the oldest excavations of the world in eastern Iraq, which date back 9,000 years. Other archeological findings show that bread

wheat was grown in the Nile Valley about 5,000 B.C. as well as in India, China and even England at about the same time. Wheat was first grown in the United States in 1602 onan island off the Massachusetts coast. Man has depended upon the wheat plant for him self and his beasts for thousands of years.

wheat is grown successfully under a wide range of soil conditions, but it is best adapted to fertile, well-drained silt and clay loam soils. It can be also grown successfully under a wide range of rainfall and temperature conditions. In addition, it can withstand areas quite well; yet it grows successfully in hot climates if the humidity is not too high. In Ethiopia, there are two types of wheat grown: bread wheat (Triticumaestivum) and durum wheat (Triticum durum). Durum wheat is indigenous and the most dominant type of wheat grown, while, bread wheat is believed to be of recent introduction, perhaps brought-in by Portuguese explorers in the 18th century (Hailu et al., 2015, as cited in Getahun, 2017).

Wheat (*Triticumaestivum*L.) is one of the globally produced and marketed cereal crops which covers 15% of the total sowing areas of cereal crops in the world (Kiss, 2011). It is an important industrial and food grain which ranks second among the most important cereal crops in the world after rice and traded internationally (Abdulselam, 2017). In sub-Saharan African countries, wheat is also a strategic commodity which generates farm income and improves food security status (Njane and Philis. 2017). Many African countries are producing wheat for both consumption and sale, but the level of production and sale is varied between countries.

2.2. The Contribution of Wheat Crop to Agricultural Sector

Among the edible crops, cereal grains grown in greater quantities and provide more food energy worldwide than any other type of crop and are therefore staple crops. In

some developing countries, grain in the form of rice, wheat, millet, or maize constitutes a majority of daily sustenance. Most cereal crops are annual plants; consequently, one planting yields one harvest. Maize, wheat, and rice together accounted for 89% of all cereal production worldwide in 2012, and 43% of all food calories in 2009. Other cereals worthy of notice, but not included in FAO statistics include: Teff, an ancient grain that is a staple in Ethiopia. It is high in fiber and protein. Cereals alone provide about 70% of the average Ethiopian's calorie intake (Laduber, 2016). The wheat is most important protein source in developing countries (20%) and 2nd most important food calories source (19%) after rice.

In Ethiopia, Maize, Wheat, and Teff had selected, since they constitute more than 40% of the cropped land and around 59% of total grain production. Although cereals are grown in almost all regions of Ethiopia with notable variations in the extent of areas planted and the volume of production obtained, three regions— Oromia, Amhara and the Southern Nations, Nationalities and Peoples` Region account for more than 90% of area cultivated and covered by the three crops in the year 2008/09. The agricultural Sample Surveys was been conducted annually. These surveys consist of four parts: Crop Production Forecast Survey, Meher Season, Post-Harvest Survey, and Belg Season Survey (Zerihun, 2012.)

2.3. Wheat Production and Productivity in Ethiopia

In 2020, wheat production for Ethiopia was 5,100 thousand tonnes. Before wheat production of Ethiopia started to increase to reach a level of 5,100 thousand tonnes in 2020, it went through a trough reaching a low of 429 thousand tonnes in 1977. Wheat is a major renewable resource for food, feed and industrial raw materials, and among major crops grown on the largest area worldwide. G20 members produce 75% of all wheat and currently wheat is: The most widely grown crop worldwide on over 200 million ha; the 2nd most abundant staple crop grown worldwide; providing globally 20% of all food calories (Arslan, 2014). There are two agricultural production seasons; meher (long rainy season) and belg (short rainy season). The meher rains start in June and extends up to mid-September, while the belg rainy season start from March and lasts to

May (Chiemeke and Evwiekpaefe, 2011).

During meher crop season, most parts of the country receive 60 to 90 percent of their annual rainfall and produce 90 to 95 percent of the food in the country. Belg is a short and moderate rainy season that lasts from February to May. The belg harvest accounts for only 5 to 10 percent of the total annual grain production of the country (Zerihun, 2012). Compared to global average wheat productivity (i.e., 3.3 tons/ha), the average wheat productivity in SSA is 1.68 tons/ha; e.g. ca. 50% below the world average). However, some of the world's highest spring wheat yields obtained in Africa. Egypt averages 7t/ha, Ethiopian farmers have obtained more than 8t/ha, new varieties introduced through SARD-SC in Nigeria yield up to 7t/ha. However, the yield gap between onfarm and potential yield remains very high, often greater than 5 fold. Wheat-based systems productivity, production and wheat quality in most of Africa are much lower than the potential (Khonje et al,.2015).

Cereal production occupies the major share of agricultural production in Ethiopia, of which teff, maize, wheat and sorghum are most important cereals in terms of area cultivate, yield and consumption. Teff constitutes almost 24% of total grain production, followed by maize (17%), sorghum (15%) and wheat (14%) (CSA, 2014).Most smallholder farmers are located in the moisture-reliable cereal based highlands accounting for 59% of all farm area; on the other hand, the farm area in the drought-prone highlands represents 27% of the total area cultivated (Khonje*et al*,.2015).

Ethiopia is one of the largest wheat producers in terms of total wheat area cultivated and total production (CSA, 2014). Wheat and wheat products represent 14%of the total calorie intake in the country which makes wheat the second-most important food behind maize (19%) and ahead of teff (10%), sorghum (11%) and enset (12%).In Ethiopia, wheat ranks fourth after teff, maize and sorghum in area coverage and third after maize and teff in total production (CSA, 2014). But, the production of wheat is tremendously of a subsistence nature and dominated by the country's numerous smallholder farmers that cultivate more of wheat for consumption and less of it for the market. It is clear

that in the country small-scale wheat farmers dominate large-scale commercial farms, and it has its own negative influence on production and productivity in the country and it affects the competitiveness of wheat quality at the world market (Sharmaand Rajhans, 2014).

Ethiopia is one of the countries with low productivity of wheat in the sub-Saharan Africa, with over 80 percent of its population living at subsistence levels and dependent on farm production which is highly vulnerable to severe droughts for several times over the past 30 years. About 40 percent of the country's population is food insecure (Abduselam, 2017), average consumption of approximately 1770 kilocalories per capita, which is lower than the FAO/WHO recommended rate (2100 kilocalories per person per a day) (Simtowe*et al*,.2015).

Due to the backwardness and mislead livelihood system, in addition to socio-economic challenges after the farmers sold their wheat yield in the harvesting period cheaply by low price exposed to serious food crop shortage and starving within a few months. Then, the households purchase their own products expensively by high price for the survival of family. Out of harvesting period, for farmers, it is difficult to get a bit of money simply for any demands, but no choice, so by any means they have get money and buy the cereal crops in expensive price for consumption. This problem is severe in the families with large size result in lack of food nutrition and per capita kilocalories for each family member especially children and the olds are lead to low resistance to different diseases. Later on, it may have great impact on the ability of further production whichlead the people to further poverty (Thabit, 2015).

2.4. Factor Affecting Wheat Productivity

Tesfaye (2021) conducted to on identifying the factors of wheat production of farm households SodoZuriya District, Wolaita Zone, Snnprs of Ethiopia using the data from randomly selected 101 sample households. He was used the econometric Multiple linear regression technique to identify the factors affecting wheat production and to analyze the relationship between wheat production and its determinant factors. The

estimated result of regression model revealed that, male headed peasant households, educational level and farm land size, use of chemical fertilizer and HYV seed use, use of tractor, credit access and asset of HH had a significant positive effect on income from wheat production. On counterpart, age of HH head, family size and market price 4.72% extent had a significant negative effect on income from wheat production. Based on his finding he was mainly recommended in increasing strong efforts on the three major fronts: first create deep awareness on peasant HHs, second supply decisive wheat production tools and inputs, third formulate new or reform the existing institutions responsible for peasant households' income enhancement and strengthen the linkage between wheat producer farmers.

According to (Sosina*et al,.* 2014) a study conducted in Oromia region, Ethiopia, credit access, household head sex, field day participation, access to all weather roads, access to credit, active family force, district and market distance as being key determinants production of wheat. According to Shumet (2011) a study conducted in North Wollo, the level of active labor ratio negatively and significantly affects adoption and intensity of improved wheat varieties which directly affects the wheat productivity. Another determinant factor according to his study was the extent of livestock ownership which significantly and positively affects affects the wheat productivity. Contrary to (Hailu, 2018) found out that Farm size as determinant factor which negatively and significantly affects the wheat productivity.

Although agricultural production system in Ethiopia is small-scale, cereal crops are the most important food crops that the majority of the rural households produce for consumption and receive income by selling the product. Usually commercialization discussed with respect to large-scale farming systems and ignoring smallholders and poor farm households' participation. Sharma et al. 2014, argued that markets allow households to increase their incomes by producing the highest returns to land and labor. This cash used to buy necessary household goods rather than be constrained to produce everything that the household needs. Considering the fact that small farmers produce only a little surplus, the earned income may not help them to

overcome the poverty trap.

According to Straub (2009), smallholders are unable to benefit from the commercialization process due to low yielding crop varieties, poor rural infrastructure and high translation cost, and inadequate services. Tariku (2012) also reported it is an unfortunate fact that the poor and those in remote areas have so far gained little from commercializing subsistence agriculture. Although public agricultural extension programs in terms of new technology awareness creation resulted with positive effect among the rural households, output side investment is poorly functioning.

Thabit (2015) also reported that education and training of producers and traders sadly neglected in Ethiopia, and hence detailed studies of the training needs of various sectors of the grain marketing system are required. The marketing routes of wheat crop in Ethiopia ranges from local assemblers and traders to inter-regional grain traders and brokers. Due to free marketing system, traders are more or less setting the price during transactions. Besides, the high transaction costs force rural farmers to sell their farm output in village market, at a lower price relative to price in the urban markets. Hence, farmers are unable to take advantage of a potentially high crop output price. To support rural farmers, central and local government authorities support farmers to sell either cooperative unions or other organizations (Worku and Yishak, 2017).

2.5. Conceptual Framework

The dependent variable is the Small holder household, and the explanatory variables are different demographic, cultural and socio-economic factors. The relationship between dependent variable and the independent variables show that marginal propensity to change of income of peasant households due to the influence

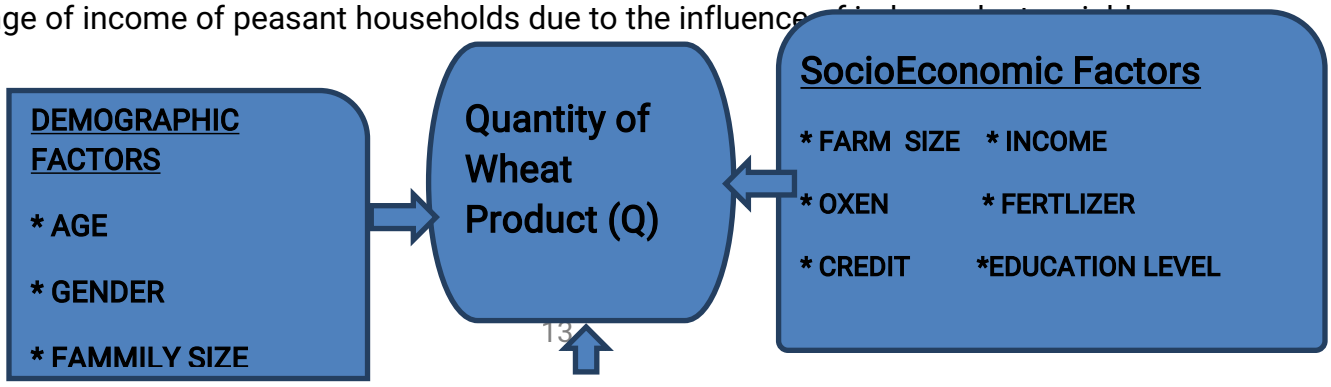

Figure 2.1 – Conceptual Framework of the Study.

3. METHODOLOGY

3.1. Description of the Study Area

GonchaSisoEnese is one of the woredas in the Amhara Region of Ethiopia. Part of the East Gojjam Zone. It has 2 town and 41 rural kebeles. GonchaSisoEnese is bordered on the south by EnarjEnawga, on the west by HuletEjEnese, on the north by the Abay River which separates it from the Debub Gondar Zone, and on the east by EnbiseSarMidir. The major town in GonchaSisoEnese is GindeWeyin.

Goncha siso enese District is one of 18 rural District administrations in east Gojjam zone (Amhara Regional State). The District is located at a distance of 334 km from Addis Ababa. Based on 2007 national census reported a total population for this woreda of 124,705 in 24,491 households, of whom 62,304 were men and 62,400 were women; 3,952 or 3.42% of its population were urban dwellers.

Majority of the population resides in the rural areas and their livelihood mainly depends on subsistence agriculture. There are two agricultural production seasons; meher or summer (long rainy season) and belg or spring (short rainy season).

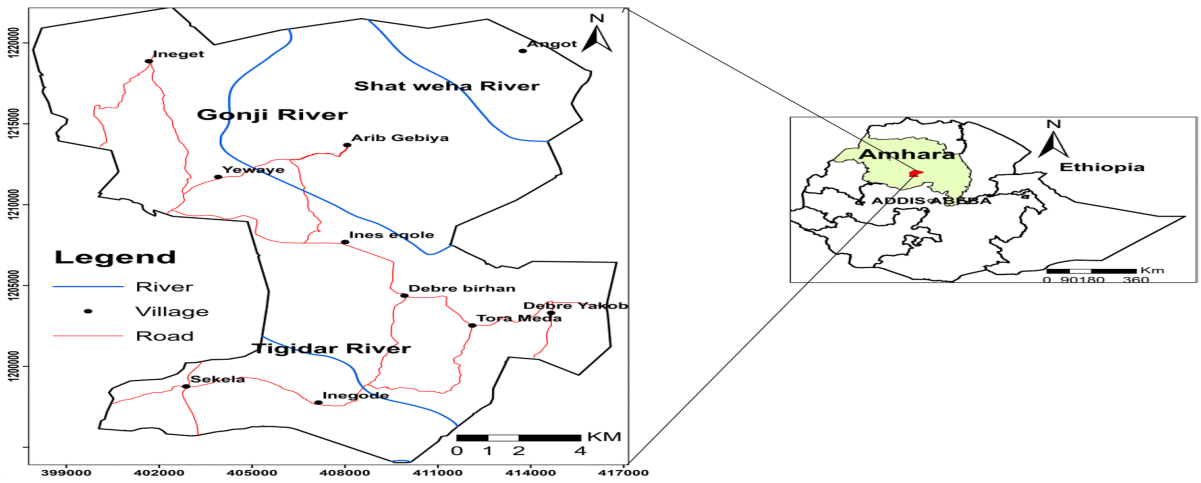

Figure: 3.1. Geographic map of the study area

3.2. Data Types, Source and Methods of Collection

Both primary and secondary data was used. The cross-sectional primary data was collected through wheat producer farmers in the study area through survey or questioning by using semi-structured questionnaire. Whereas the secondary data for this study was obtained from reviewing different related literature and production summaries, marketing and sales studies, books, periodicals, university publications (thesis, dissertations, etc.), policy documents, statistical compilations, research report, proceedings, personal documents (historical studies) etc.

3.3. Sampling Technique

The sample respondents for this study were selected using multi-stage sampling technique. In the first stage, the Goncha siso enese district was selected purposively as it is the major wheat-producing area from 18 rural districts in the zone. In the second stage, five sub-districts or kebeles was selected purposely from forty one kebeles in consideration of agro-ecologically suitability for wheat production. In the third stage, the list of wheat producing households in the selected kebeles was prepared in cooperation with the districts administration and the sample respondent households were selected randomly among the listed households.

There were different possible ways of sample size determination with different approaches in determining error terms and precision levels. While calculating the published tables as a guide for sample size determination, Israel (1992) had used a formula developed by Yamane (1967) with the precision level of ± 3, ±5, ±7 and ±10. Therefore, due to this and the commensurately known use of precision levels starting from ±1 to ±10 (because of the target population is homogeneous). The size of the sample respondents for this study are determined by using Yemane's(1967) formula with a precision level of ±5. The Yamane formula for determine the sample size given by:

$n=\frac{N}{(1+N(e)^2}$ Where n = corrected sample size, N = Population size (Total number of households in the district), and e = Margin of Error (MoE)

Based on this, the size of the sample respondents for this study with the total number of households in the district 24,941 and 10 % level of precision (because the populations are homogeneous that all of them are wheat producers, their methodology is almost similar and factors affecting their productivity is also expected to be similar).

$$n=\frac{24941}{(1+24941(0.1)^2}=\frac{24941}{250.41}=99.6\approx100$$

The number of sample households chosen from each village was proportional based on the total number of households in each village with.

Table 3.1.Sample Kebeles and Sample Size in Study Area

	Number of HHs in sample Kebeles villages			
Code	**Kebeles and Villages**	**HHs**	**%**	**Sample size**
1	SelamAbebe	5000	20.04	21
2	Fikrleagear	4950	19.85	18
3	Tegebahr	4980	19.97	19

4	Debre birhan	4991	20.01	20
5	Ineget	5020	20.13	22
	Total	24941	100	100

* Percentage= (Total HHs in individual Kebele Villages/Total HHs of all sample Kebeles) X 100 **Sample size= (PercentageX101/ 100)

Source: Gindawoyin woreda Agricultural office and own computation.

3.4. Methods of Data Analysis

After the collection of important primary and secondary data through household survey, the data processing and analysis took place. The data processing started with the editing, coding, classifying and tabulation of the collected data on the bases of homogenous groups or common characteristics. Then by using descriptive analysis method and econometric technique the collected data was processed and analyzed exhaustively.

3.4.1. Descriptive Analysis of Data

Descriptive statistics such as percentage, frequency, minimum, maximum, mean, range, standard deviation, and different graphs were used. Status of smallholder farmers' wheat production measured in terms of farmer produce productivity of wheat per hectare. This is classified as high, medium and low based on productivity per hectare of land.

3.4.2. Econometric Analysis and Model Specification

To examine the influence of different proposed factors on wheat productivity of farm household, econometric model was used. Multiple Linear Regression model was used to identify the factors affecting the productivity of wheat in the study area. The rationale behind this is selecting Multiple Linear Regression Model is due to the continuous nature of the dependent variable, quantity of wheat output. Besides, different researchers like Babatunde&Qaim (2009), Berihun (June 2014), and Niranjan

(April 2015), were used the multiple linear regressions technique in addressing similar issues.

Hence, its specification is given as:

$Q = \beta_0 + \sum \beta_i X_i + U_i$

$Q = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots + \beta_n X_n + U_i \quad i=1, 2 \ldots, n$

Where Q is dependent variable (Quantity of wheat Output per hectare of land)

X_i = i^{th} explanatory variables (regresses),

i = number of observations of explanatory variables

β_i = a vector of estimated coefficient of the explanatory variables (parameters),

U_i = the stochastic disturbance term that is assumed to satisfy all the assumptions.

Where independent variable of the study are:

Q = Quantity of wheat Output per hectare of land,

GENDR= Sex of the household head

AGE = Age of farm respondents,

EDUC = Educational Level of the Household head

FAMSZ = Family size per household

LANDSZ = Wheat farm land size,

IRRIG = Availability and use of Irrigation Technology for Wheat production

FERTILIZER = Use of Chemical Fertilizer

IMPSEED=Use of Improved Wheat Seed

CREDIT = Credit Access of HH

IOH = Income of Households

Status of smallholder farmers' wheat production measured in terms of farmer produce productivity of wheat per hectare.

3.5. Description of Variables and Hypothesized Effect on Wheat Production

The concept of dependent and independent variables were defined, unit of measurements, in addition the analysis of relationship that how the independent variables influence the dependent variable and the expected signs were described below:

Dependent Variable

The Wheat Productivity (Q): is the dependent variable of the multiple regressions which refers the quantity of wheat output obtained per hectare of land within a given period of time by a single farmer. It has a continuous nature measured in number of quintals of wheat produced.

Independent variables

Gender of HH Head: It is a dummy variable represented as 1 if the HH head is male and 0 otherwise. Male-headed HHs are physically strong and capable than female headed HHs and then the former would have better opportunities for enhancing their farm income (Tesfaye, 2021); as a result it was hypothesized that the male headed households is expected to be more productive than Female headed households .as a result for male a positive sign was expected.

Age of the HH Head: It is continuous variable, and measured in years. The age of the household head can also indicates farm experience and proper time allocation for farm activities until a certain age limit and thereafter their farm income would decrease (Shumet, 2011). Hence, it is hypothesized that old aged farmers are expected to be more productive than the young farmers due to their experience on the farm.

Educational Status of the Household Head: Education status of the households head is measured in terms of dummy variables which take 1 if the head is literate and 0 otherwise. Where, the educated farmers acquire, analyze and evaluate information on different agricultural inputs, market opportunities that potentially could increase farm income than illiterate farmers (Simotaw*et al.*, 2011). Positive coefficient expected from the regression result.

Family Size: This is a continuous variable measured in numbers. Large and productive family size could increase crop production through proper labor division, on time weeding and harvest. Besides, small and efficient family size could increase crop production by devoting all their time for farm activities as well as by employing agricultural inputs (Rahman and Zerina, 2013). Hence, it is hypothesized that it expected positive effect on wheat production.

Farm Size: It is a continuous variable referring to the hectares of land owned by the households. Those with larger farm size could produce a lot wheat yield that could potentially increase farm income (Mohammed, 2017). Hence, positive sign was proposed.

Income of the Households: It is a continuous variable measured in capital. Those with larger capital accumulation could produce a lot wheat yield that could potentially increase farm income (Sosina et al,.2014). Hence, it hypothesized that positive effect on wheat production.

Improved Variety Seed: It is a dummy variable representing 1 if the farmer uses HYV seed and 0 otherwise. Farmers who adopt are more probable to produce higher wheat product that increases farm income and further adoption of different agricultural inputs (Bishaw et al., 2010); as a result, it is hypothesized that positive effect on wheat production.

Irrigation: This is a dummy variable representing 1 if the HH used irrigation for cultivated land and 0 otherwise. HHs who has irrigated land and use irrigation expected to have a much better farm income than non-users (Laduber et al,. 2014). Therefore, it was hypothesized that positive effect on wheat productivity.

Access to Credit: It is a dummy variable; 1 represents if the HH has had credit access and 0 otherwise. Credit access reduces liquidity problems that HHs could face while intending to purchase agricultural inputs; and hence paves the way for timely application of inputs thereby increase the wheat productivity of farm households (Mohammed, 2017). Hence, It is hypothesized that it will have positive effect on wheat productivity.

Fertilizer use: This is a dummy variable representing 1 if the farmer uses fertilizer and 0 otherwise. As per the conclusion of Samuel (2006), farmers those who use chemical fertilizer not properly or inappropriately were expected in the long-run to have lesser wheat yield and because of deterioration of soil fertility, thereby farm income decreases. Hence, negative coefficient expected from the regression result

Possession of Oxen for Plough: This is a continuous variable measured in numbers. Where, those with a flock of livestock like oxen believed to have higher wheat production that would potentially increase the resultant farm income (Rios et al., 2008 and Kaija, 2007). Hence, positive sign was expected.

3.6. The Null Hypothesis of Research

Hypothesis– The amount of wheat productivity fluctuates with HHs behavioral characteristics, socioeconomic, technological and institutional as well as natural factors that influence from cultivation to harvesting period. Because, peasant households wheat productivity was dependent on limited fluctuating rainfall and moderate temperature, so mostly plants in summer and harvest in autumn season in the year.

4 RESULTS AND DISCUSSION

4.1. DESCRIPTIVE DATA ANALYSIS

The data was collected from 100 smallholder farmers selected in Goncha siso enesie Woreda and descriptive analysis results were discussed below.

Table: 1 Households demography-Sex of respondents

Sex	No respondant	Percentage %
Male	68	68.00
Female	32	32.00
Total	100	100.00

Source: - From the own survey

table: 1 represents the information about the number of male and female respondents who From participated in the survey. Out of 100, the male is 68, and female respondents are 32, 68%, and 32%. It implies that the male respondents' participation is more than the female in Goncha siso enese.

Tabel 2 the household educational status

Educational status	No respondent	Percentage %
Literate	56	56.00
Illiterate	44	44.00
Total	100	100.00

Source: From the own survey

Table:2 refers total respondents, illiterate are 44 (44%),and 56% are literate. The analysis of the data implies that most of the respondents are literate 56%. It is a posetiveimpact on wheat production.

Table: 3 Size and age of family households

Family size	Frequency	Percentage %	Age of household head	frequency	Percentage %
Low	44	44.00	Youth	52	52.00
Middle	47	47.00	Adult	31	31.00
Large	9	9.00	Old	17	17.00
total	100	100.00	Total	100	100.00

Source: From own the survey

Table:3 reveals the size and age of family households in Goncha Siso Enesie Woreda. It observed that 47% of household family size in middle members.The age of the respondents' youngest household age was 25 and the oldest age 65. The difference between the age group is 40It showed 52% of respondents' age group youth. Adult age group were accounted 31%and 17%of age groups from the total age groups were old.

Table 4. Household productivity used in wheat production

Variables	Frequency	Percentage %
Use of improved seed	64	64.00
Otherwise	36	36.00
Use of irrigation	3	3.00
Otherwise	97	97.00
Access to credit	66	66.00
Otherwise	34	34.00
use of chemical fertilizer	75	75.00
Otherwise	25	25.00

Source: From the survey

Table: 4 use of impruved seed, fertlizer, irregation, , and credit access are using by all respondents in the wheatproduction. However, only 64% respondents use the improved seed to produce wheat production. 36% farmers are not using quality seed and use a local variety of wheat. As the above table 4 states, 3% of sample HHs had used irrigation practice from any source of water to produce more wheat.Besides, from the sample HHs a 25% of total of peasant households more or less used chemical fertilizer in their wheat plantation and earned 42.1% of the wheat yield. Households who have used fertilizer earn the maximum wheat yield. The remaining 75% sample households were produced 57.9% of the wheat crop yield.Among the credit access, 66% of sample HHs had used credit service from loan and saving institutions such as Amhara bdri ena tekuam, and others addressed to sub district level and attained 97.3% of wheat production. The remaining 34% of sample HHs including not produced (34%) not accessed credit service earned 2.7% of wheat

production.

Table 5,wheat farm land size of householdes

land size	Freq.	Perce
Low	57	57.00
middel	39	39.00
Large	4	4.00
Total	100	100.00

Source: from own servey

The land holding of the sample household varies from 0.25 hectar to 3heactar. The lowest land holding is 57%. The land holding for medium group is 39 % heactar and the large farm land holding corresponding for wheat production is 4%. land size and land productivity are directly and positively related. Taking this into consideration the finding also confirms that size of cultivated land has its own influence on wheat productivity.

Table 6,income of household

income of household	Values of variables	Freq.	Percent %
very low	Below 45000	21	21.00
Low	45000-80000	27	27.00
Medium	80000-115000	39	39.00
large	Above 115000	13	13.00
Total		100	100.00

Source: Own Survey Data Result, 2015

Frome above table 6 Around 21% of the sample households who owned the incomeestimated below 45,000.00ETB Very low attained only 21% share of total wheat crop production in study area. The low level estimated 45,000.00- 80,000.00ETB owner 27% of sample households attained 27% share of total wheat crop production.the middle level of eastimated 80000-115000ETB and shares of 39% wheat production Moreover, the only 13% of the sample households who owned the income estimated above 115,000.00ETB attained 13% share of total wheat crop production in study area. medium very large, when compared with the very lowst, lowest and large level incom owners in proportion with sample household number.

Table 7:No of oxen used for wheat production

No of oxen used	frequince y	Persent %
2	43	43.00
3	21	21.00
4	18	18.00
5	9	9.00
6	7	7.00
7	2	2.00

Source own survey data result 2015

82% sample HHs possesses 2-4 oxen used for plough wheat farm as the main source of draft power were attained for wheat production. In counter side, 18% of sample HHs including low produced have possesses 4-7 oxen used primitive tools with hand and given their farm plot for crop share farmers were attained only for wheat production.

Table: 8 Levels of factors of production and yields of tef

Variables	Min	Max
The out put of wheat per quintal	5	60
Farm land size in hectar	0.25	3
No of oxen	2	7
Income in birr	10000	150000
Family size per household	1	12
Age of household head	25	65

Source: From the survey

From table: 8 represents the maximum level of wheat output was 60 quintals and the minimum 5quintals produced. Using at max level of Oxen of 7, 3 hectares of land, family size 12,age 65 and 150000 birrs of capital.

Merge all descriptive statics result tables into one or into two tables.

Econometric Analysis

For estimate purposes, employed the OLS regression analysis. Before going estimate the specified model, it is significant to undertake different tests on whether the basic assumptions of the method meet or not.

Test for multicollinearity

An indication for a linear relationship between independent variables is called multicollinearity. A decision rule for the multicollinearity test for the model stated is a variable whose VIF values are greater than 10 indicates the existence of severe multicollinearity. As observed from table-9, no mean value of VIF is higher than 10. The researcher concluded that there are no problems of multicollinearity between the explanatory variables.

Table 9: Multicollinearity test (VIF)

```
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
      LANDSZ |      2.48    0.403501
        INOH |      2.45    0.408356
        NOOX |      1.54    0.648260
       FMLSZ |      1.33    0.754501
     IMPSEED |      1.29    0.773834
       EDUCL |      1.27    0.785223
         AGE |      1.26    0.791987
    FERTLIZER |      1.20    0.833746
       IRRIG |      1.20    0.836630
      CREDIT |      1.15    0.868104
      GENDER |      1.12    0.891459
-------------+----------------------
    Mean VIF |      1.48
```

Test for Heteroscedasticity

This type of test is using to examine the pattern of the error terms variance are constant or to test the assumption of homoscedasticity. Heteroscedasticity is present if the variance of the error term is not constant variance for different segments of the population or sample size. Heteroscedasticity is more likely to exist in cross-sectional than time-series data. The decision rule is if the p-value of the Breushpogan test is higher than any of the chosen significance levels 10%, 5%, and 1% indicated no probable, the problem of heteroscedasticity. Thus, the result highlights that chi 2 of 7.33% is higher than any significance levels, and the study concludes these showed the same variance among error terms.

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

Ho: Constant variance

Variables: fitted values of e2

chi2(1) = 3.21

Prob > chi2 = 0.0733

4.2 Results of the regression analysis

This section presents the findings from the econometric results on the determinants of wheat production. The section covers the regression model used in this study and the results of the regression analysis.

Table 12 Results of regression analysis

```
. reg QW GENDER AGE EDUCL FMLSZ LANDSZ NOOX INOH CREDIT FERTLIZER IRRIG IMPSEED

      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F(11, 88)     =   89.83
       Model |  16254.493     11  1477.68118           Prob > F      =  0.0000
    Residual |  1447.50701     88  16.4489433          R-squared     =  0.9182
-------------+------------------------------           Adj R-squared =  0.9080
       Total |     17702      99  178.808081           Root MSE      =  4.0557

------------------------------------------------------------------------------
          QW |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      GENDER |    2.037335   .9208497     2.21   0.030     .2073393    3.86733
         AGE |    .0541807     .04349     1.25   0.216    -.0322465   .1406079
       EDUCL |    .8844691   .9220453     0.96   0.340    -.9479021   2.71684
       FMLSZ |   -.5759735   .2099502    -2.74   0.007    -.9932055   -.1587415
      LANDSZ |    19.05804   1.101113    17.31   0.000     16.86981   21.24627
        NOOX |   -.6719482   .3682033    -1.82   0.071    -1.403675   .0597786
        INOH |    .0000886   .0000195     4.55   0.000       .00005   .0001273
      CREDIT |   -.9734131   .9189075    -1.06   0.292    -2.799549   .8527226
   FERTLIZER |   -.4211263   1.025774    -0.41   0.682    -2.459636   1.617383
       IRRIG |    4.961682   2.599296     1.91   0.060    -.2038724   10.12724
     IMPSEED |    .2252665   .9605143     0.23   0.815    -1.683554   2.134087
       _cons |    .3397646   2.209864     0.15   0.878    -4.051876   4.731405
------------------------------------------------------------------------------
```

Source own data analysis 2015

From table 12 highlights R-square and adjusted R-square values are 0.9182 and 0.9080 respectively. The total variation between the dependent variable and independent variable is 90.80%. It showed from the analysis, GENDER,FMLSZ,LANDSZ,NOOX,INOH and IRRIG variables' p-value is significant.

Table : 16

```
. estimates table, star(.1 .05 .001)

-------------------------
    Variable |    active
-------------+-----------
      GENDER |  2.0373346**
         AGE |   .05418068
       EDUCL |   .88446906
       FMLSZ |  -.57597351**
      LANDSZ |  19.058041***
        NOOX |  -.67194817*
        INOH |   .00008862***
      CREDIT |  -.97341306
   FERTLIZER |  -.42112634
       IRRIG |   4.9616821*
    IMPSEED |   .22526648
       _cons |   .33976465
-------------------------
legend: * p<.1; ** p<.05; *** p<.001
```

Note: ***,** and * are statistically significant at 1%, 5% and 10% respectively.
Source own data analysis result, 2015

4.3 Discussion of Economic Multiple Regression Result

Gender and Wheat Production - As have seen above, as gender 1 increase by one unit, Wheat Production would increase by 20.37%. Although descriptive statistics results reveal Wheat Production increment as male headed household increase. The econometric estimation result confirmed with the prior positive hypothesis, and it is statical significance at 5%.

Family Size and Wheat Production - Family size has a negative effect on wheat production which is statistically significant at 5% level. Large unproductive and small family size could decrease wheat production due to improper labor division, on time weeding and harvest. However, this would not properly perform with large family size and increase in family size diminishes per capita wheat production. And a unit increases in family member decreases the per capita wheat production by 57.59%. The finding is in line with the Mario Villatoro and Michael Langemeier, 2006. Hence, the prior undetermined sign in the null hypothesis found to be negative, the large family size had a negative impact on increment of income from wheat farm.

Farm Land Size and Wheat Production - Arable land size has a strong positive relationship with wheat production; and it is statistically significant at 1% level. As land size increase by one unit the wheat production would increase by 19.08%. It is due to higher wheat crop production and besides, if farm HHs did own large arable land size, it will serve for plough animal feed in such a way for further production. Even though it may have a negative impact on preparing compost for future cropping season, farmers with large farm size would also collect huge crop residues for their animals. Hence, these all opportunities would lead to higher wheat production. The finding is consistent with the finding of Anyanwu (2011; 2009) in Rivers state of Nigeria in which increment in farm production found to be the result of arable land size increment.

Irrigation and wheat production: the coefficient of irrigation use was found to be significant at 10%.as irrigation agriculture improves by 10% the output of wheat increase by 49.7%. an agricultural productivity by using improved irrigation wheat cultivation techniques that increase wheat productivity.

Possession of Oxen for Plough and wheat production: This variable affects the wheat production of household negatively at 10% significant level. The marginal effect result shows that when the number of oxen owned by household increased by one unit, the probability of household in wheat production decreased by 67.19%. This is due to the fact the household increased their grazing land and decreased the amount of land allocated for wheat production and plough by oxen requires large labour force in wheatproduction then wheat production decreased. This result is consistent with the study of Dessie et al. (2018) Oxen production significantly affected the wheat production of the smallholder farmers.

Income of households and Wheat production: As the regression result reveals, by influencing the wheat production, the asset of household found to be statistically significant at 1% level. While keeping other variables constant, the households who had income accumulation had multiple option whereby smallholders could be instigated to use agricultural inputs like fertilizer, improved seed, improved farming tools, and would

not require to take loan from anybody. Those with larger income accumulation could produce a lot of wheat yield and that could potentially increase farm income. Then, HHs who had additional income accumulation utilize would have much better to get 0.088% of wheat yield than HHs had no or low income. The estimated result confirms with the findings of (Mpawenimana, 2005) that the prior positive hypothesis not rejected.

5. SUMMERY, CONCLUSION AND RECOMMENDATION

6.APPENDIXES

6.1. Appendixe review schedule

This questionnaire is prepared in order to conduct scientific research on the " productivity And its determinants among smallholder wheat producers in Gonch siso enesie districts." The purpose of this study is in order to identify productivity and its determinants among smallholder wheat producers in Goncha siso enesie districts. This information is used only for research purpose and highly determining the quality of this research. The secrecy of our information is kept. So, confidentiality for our responses, comments and opinions are ensured.

Instruction:- please use this mark " √" or "x" in the boxes for our closed ended questions and give explanations briefly and precisely for open questions. .

Kebele_____

A, Demographic characteristics of household

1. Sex. A, male ☐ B, female ☐

2. Age of household head..... (In year).

3 Educational level of household head. 0) Illiterate

1) literate

a) Only read and write

b) Grade 1-10

d) Grade 10-12

e) Above grade 12

4 Family size of household……in number?

B, Socioeconomic characteristics of household

5. Total land holding..... in hectare?

6. From the total land holding what amount of land you used for wheat production.....in hectare?

7. How many oxen do you have for plough in 2021 cropping season? .....

8. How many quintal of wheat did you get per hectar ? .....

9. What did you see your wheat production relative to the previous year?

A, Increasing ☐ B, Decreasing.☐ C, constant ☐

10. If your answer in question number "15" is increasing what are the factor for the increment? .....

11. If your answer in question number "15" is decreasing what is your main reason? ……..……..

12.Annual household income of the respondent in2021 in ethiopian birr_____

13. Did you access credit to your wheat production? A,☐ B, ☐

14. did you use Fertilizer properly for your wheat production?A, Yes ☐ B, No☐

C,Technological factors of household

15.Did you use irregation to your wheat production ? A, Yes ☐ B, No ☐

16. Did you use improved seed during production year? A, Yes☐ B, No ☐

17.If your answer in question number "11" is No what is the main reason?

A, Lack of acces☐ B, Lack of awareness. C, price expensiveness D, If others, specify.....

18. If your answer in question number "11" is yes how many kilogram of selected seed did you use per hectare?.....