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Determinants of Barely productivity in case of shashogo woreda, Hadiyya zone, centeral Ethiopia.

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ACRONYMS AND ABBREVIATIONS

CSA	Central Statistical Analysis
ADLI	Agricultural Development Led Introduction
DA	Developmental Agency
FAO	Food Agricultural Organization
GDP	Gross Domestic Product
N	Number of respondents
NGOs	Non-Governmental Organizations

ABSTRACT

Barley is one of the most important cereal crops in Ethiopia, contributing significantly to food security and rural livelihoods. However, its productivity remains low due to various socio-economic, institutional, and agronomic factors. This study examines the determinants of barley productivity in Shashogo Woreda, Hadiyya Zone, Central Ethiopia, using a multiple linear regression model. A sample of 100 barley-producing households was selected through stratified random sampling across three kebeles. Data were collected through structured questionnaires and analyzed using descriptive statistics and econometric modeling. The results indicate that land size, fertilizer use, credit access, education level, and agricultural extension services have a positive and significant impact on barley productivity. Conversely, the age of the household head and distance to farmland negatively influence yield, while livestock ownership and non-farm income were found to be statistically insignificant. The model's R^2 value of 0.78 suggests that 78% of the variation in barley productivity is explained by the included variables, with an F-statistic of 19.82 ($p = 0.000$) confirming the overall significance of the model. The findings emphasize the need for policies that promote access to agricultural inputs, credit facilities, and extension services while addressing challenges related to land accessibility and modern farming adoption among older farmers. Strengthening rural infrastructure and enhancing farmer education are also recommended to improve productivity.

Keywords: Barley productivity, Determinants, Shashogo Woreda, Ethiopia

1. INTRODUCTION

1.1. Background

Most of the world's 2.1 billion people who live on less than 2 dollars a day live in rural areas and depends on agriculture. The number of rural poor has increased in Africa and south Asia and reduced in East Asia and the pacific(WDR,2008).According to Barrios et al, (2008) agriculture is the main engine for economic growth for sub Saharan African countries .However, feeding the increasing population of sub Saharan African has becomes a critical challenge for most of countries in this area (Owusue et al, 2010).

In line with this Diao and Hazel (2010), underscore the existences of two school of thought or debates in African agriculture. These debates focus on potential role of agriculture and industry in improving African development and ability of the agricultural sector to ensure pro-poor growth. Hence the argument that agriculture is a large sector and upgrading it leads to a better aggregate growth (Sadoul et al, 2010). Ethiopia is one of the sub Saharan African countries which liberalize its economy to maintain a sustained economic growth and hence, reduce poverty. Over the last ten years the sustainable economic growth brought with its positive trends in reducing poverty. However, poverty head count is still more prevalent in rural areas (30.4%) than urban areas (25.7%) in Ethiopia (CSA, 2010/11).

In Ethiopia about 83.9% 0f total population is live in rural areas and agriculture is their main source of livelihood. Since 2010, agriculture become the second most dominant next service sector of the country economy by providing employment for 80% of the total labor force and contributes 42.7% to growth of domestic product and 70% of foreign exchange earnings (CSA, 2013).Due to its importance, the government of Ethiopia gives high priorities to the agriculture sector by setting strategy of agricultural development led industrialization (ADLI).

The main goal of agricultural policy is not only achieving sustainable increase in agricultural production and productivity of smallholder farmers, but also accelerates agricultural commercialization and agro-industrial development in the country (PIFW 2010-2020). According to KechaBirraworeda agricultural and rural development bureau report (2016), the

woreda has suitable climatic condition for production of most dominant cereal crops such as barely, Teff, wheat, and maize which are practiced by small scale farmers in this area. Even though the Woreda has suitable climatic condition for production of these major cereal crops, the wanted amount is not produced, so the focus of this study is to know the determinants of those dominant cereal crops in the study area. In Africa, particularly in Ethiopia cereal crop production is dominated by smallholder farmers.The yield of Barely cereal is very low because of low adoption of improved agricultural technologies, weather fluctuation, climatic change, rapid population growth, difference in land size holding and livestock. Due to this reason Barely cereal crop productivity in developing countries has not been able to satisfy the food requirement of the people (Hailu, 2008). In addition to above reasons the productivity of Barely cereal crop in Ethiopia was severely restricted due to many recurrent disasters. These are; flood, lack of diversity of items and due to weak subsistence agriculture economy. According to the most recent report of Ethiopian economic association, gaining in the yield level in the farming areas over the past few years for most Barely cereal crops has not been able to increase average yield for most countriesas a whole (EEA, 2015) .Even though, agriculture is the crucial sector in the national economy, its production and productivity is unsatisfactory. So, an important way to increase Barely cereal crop productivity and agricultural productivity is that reducing constraints of agriculture (natural constraints, economic constraints, social and institutional constraints). These constraints reduced through diffusion of improved seed, land management practice and training farmers (CSA, 2015). In the country level there were a lot of researchers tried to identify the determinants of Barely cereal crop productivity of small holder farmer, like Endale (2011), Olayem (2015), and Van Dusen(2008) ,they have tried to study on the variables such as improved seed, farm size ,education level ,age and sex ,but they did not focused in detail about the effects of credit access on Barely cereal crops productivity.In Ethiopia Barely cereal crop production is dominated by rural smallholder farm households. The yield of Barely cereal is very low because of low adoption of improved agricultural technologies, weather fluctuation, climatic change, rapid population growth, difference in land size holding and livestock. Due to this reason Barely cereal crop productivity in Ethiopia has not been able to satisfy the food requirement of the people [Hailu, B. (2008).]. In addition, the productivity of Bately cereal crop in Ethiopia was severely restricted due to many recurrent disasters: these are; flood, lack of diversity of items and

due to weak subsistence agriculture economy. According to the most recent report of Ethiopian economic association, gaining in the yield level in the rural farm areas over the past few years for most Barely cereal crops has not been able to increase average yield for most countries as a whole [EEA. (2009).]. Even though, agriculture is the crucial sector in the national economy, its production and productivity is unsatisfactory. So, an important way to increase Barely cereal crop productivity is that reducing constraints of agriculture. These constraints reduced through diffusion of improved seed, land management practice and training farmers [CSA. (2000)].

However, a few studies have been conducted focusing on the different dimensions of rural smallholder farm households in Ethiopia, particularly, in Hadiyya Zone. However, most of these studies have focused on marketing and were limited to a specific area and production aspects. Systematic and adequate information on the determinants of cereal crop productivity were not well identified. Further, in the study area there is no empirical study conducted on the determinants of Barely cereal crop productivity of rural smallholder farm households. Therefore, this study was conducted to assess determinants of Barely cereal crop productivity of rural smallholder farm households. Specifically, this study was conducted to identify rural household crop yield and indicators in Smallholder rural areas of the Hadiyya Zone, to identify the key determinants of Barely cereal crop productivity among rural smallholder farm households along with other socio-economic factors in increasing smallholder rural farm household Barely cereal crop productivity.Several determinants of cereal crop productivity study findings have pointed to the fact that the agricultural Barely cereal crop productivity can be influenced by different factors. Several productivity research findings have pointed to the fact that[10] in Nigeria using the ordinary least square method (OLS) who found that farm size, fertilizer and hired labor were significantly influence Barely cereal crop productivity of rural smallholder farm households. The study conducted by [Belay K. 2003] in Ethiopia showed that the Barely cereal crop productivity by applying the ordinary least square method (OLS), cereal crop productivity significantly influenced by improved seed and fertilizer. A study conducted by [Rebecca. 2011] reveals that Barely cereal crop productivity of rural smallholder farm households significantly influenced by fertilizer and farm size using multiple linear regression method. By using the ordinary least square method Barely cereal crop productivity significantly influenced improved seed, farm size, educational level and age of households [AsfawA&Admassie A. 2004.].

1.2. Statements of the Problem

Barely cereal crop Productivity is essentially regarded as technological problem since the technology required for enhancing productivity is internationally available, what remains to be done is too widely to diffuse this technology to areas with low productivity. Since the technologies are not available for free and not cheap, it requires some kind of resource transfer from the rich countries to the poor one's (in the short and medium term to enable developing countries to acquire both the technology and technical knowhowthat goeswith-it). It also requires poor countries to reallocate their own resource from less productive endeavors to world's activity that could help in increasing productivity of agricultural sector (EEA, 2003).

Many empirical evidences indicate that Ethiopia and most sub-Saharan nations are poor and their economy is based on agriculture. About 85 percent of population in the country engaged in agricultural sector, it shows agriculture is the backbone of the countries economy. But the sector is based on the traditional farming methods and most of rural peoples used to their own consumption. As a result product efficiency and its contribution to economic development are very low. To narrow down the gap, a decisive agricultural policy measures were employed by traditional government of Ethiopia in the early period (knife Abraham, 2002).

Even though the government has set strategy at the country level to fight wide spread of poverty and to improve food security through agricultural sectors, it is known that the crop productivity remain very low especially, when it is compared to the rapid population growth (EEA, 1995).

It is obvious that, in less developed nations the crop production depend on traditional and backward farming methods. And it is the same for shashogoworeda. Therefore, the researcher is try to examine the factor that influence return from ceral crop production and other related problems. Studying this problem can be taken as solving socioeconomic problems. Because improving productivity means improving the society's income and increasing the levels of living standards. This gives its own contribution to employment creation.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this study was to analyze Determinant of Barely cereal crop productivity in case of shashogoworeda, Hadiyya zone in central Ethiopia.

1.3.2 Specific Objective

- To describe the level Barely productivity
- To identify determinants of Barely productivity

1.4. Research Questions

From the above specific objectives, the following research questions are addressed

- What are factors which affect Barely cereal crop productivity in the study area?

1.5. Significance of the Study

The study Determinant of Barely cereal crop productivity was important because it may provide a short term cost effective option to enhance productivity when adoption of improve technologies are costy.in the district where technology adoption and increasing inputs are hardly possible to enhance productivity due to financial constraint, costly and demanding new set of knowledge and skill, the determination of the extent of input use efficiency in cereal productivity given the existing technology and input levels are vital and important policy issues. one of the most important factors behind the limited adoption of technological packages is the in efficiency in the use of inputs, which implies that improving technical efficiency is important to promote more efficient use of agricultural technology. An empirical analysis of farmer's technical efficiency helps to determine the level to which farmers are using the existing technologies and factors

affecting their level of efficiency. In addition, knowing the efficiency level of small holder farmer is important for policy makers in order to design appropriate development strategies, hence the result of the study helps farmers, agricultural extension agents, researchers and policy makers in assisting their efforts of increasing cereal crop productivity in the district and help consumers by making cereal crop more readily available.

1.6 .Scope of the Study

Farmers in shashogo district cultivate different types of crops and cereals are the dominant crops. The study focused on the determinants of Barely productivity during meher season in shashogo district and used a cross sectional data of 2023/24 production year the study does not show inter temporal differences of barely producer farmers. In addition, the study is limited to the determinants of Barely cereal crop productivity without regard to other crops. Moreover, the study is limited to only shashogo district Hadiyya zone in central Ethiopia.

1.7. Organization of the study

This study was I organize in to four chapters, chapter one will about introduction which contains back ground of the study, statement of the problem, objectives of the study, significance of the study, research question, and organization of the study and limitation of the study. Chapter two contains literature review (theoretical and empirical review). Chapter three deals with methodology of the study which consists, description of the study area, data type and source, sampling techniques and sample size and data processing and analysis, Chapter four will the last chapter Work Plan and Budget break down .

2. LITERATURE REVIEW

2.1 Concepts and definition

Agriculture is the science of art of cultivation of soil and rearing of livestock. Agriculture as the primary economic activity is the major economic activity of the world's population .More than 60% of people of the world depend on agriculture for its livelihood. This means agriculture is the main economic and social development background for almost all countries the world. Agricultural products is used for daily food consumption, source of raw materials for industrial input, contribute to countries economic growth, source of income for individual farmers. Being a major determinants of life of the people in the world due attention should be given to agricultural sector especially to improve the lives of majority engaged its activity (Gosaye, 2008).The term agriculture has different meaning by different individuals, some side it is farming and animals husbanding some may them thing of agribusiness firms. Some agricultural economists have referred to food and fiber industry when describing the agricultural science. They also devised rules for decision in an ever changing uncertain economic and agricultural environment. This rule can be used to make production, consumption, marketing and financial decision. By studying the logic of these managerial rules, we can learn how to adjust managerial decision to the changing environment in which economic and agricultural activity occurs (Dawit et al., 2012). General overview of cereal crop production The small holder farmers use subsistence farming system and most of outputs produced are for family consumption (although, some may be sold or trade in local markets and few staple food crops usually including Barley, Wheat, Sorghum, Teff) are chief source of food intake. Output and productivity are low and only the simplest traditional methods and tools are used. Capital investment is minimal, and land and labor are the principal factors of production. (Addissie, 2008). Subsistence agriculture is highly risk and uncertain in the region where forms are extensively small and cultivation is dependent on uncertainties of variables such as rain fall. Average output will be low and the peasants will be exposed to very real danger of starvation. According when risky and certainty are high, small holder farmers may be very reluctant to shift from traditional technology and crop pattern to a new one that provides higher yields, but entail greater risk of crop failure (Muuz, 2006).

A cereal crop is generally defined as a grass grown for its small edible seed. It has been the most important source of the world is seed. Cereals as grouped are the most widely adapted crop species. They can be grown under adverse condition with a least some yield. These broad ranges of adaption the efficiency of production the ease with which cereal can be stored make them dependable source of food. Small holder farmers Small holder farmers are farmers which derives their livelihood main from agriculture utilize family labor in farm production most output is produced for family consumption and they are characterized by practical engagement in input and output market which are perfect market. Subsistence farming on small plot of land it is way of life for the vast majority of Ethiopia people and its productivity is low. Inspire of the existence of some unused land and potentially cultivable land only small areas can plant and weeded by farm family at the time when it uses only traditional tools. In some areas traditional farming practices must rely piney on the application of human labor of small pare parcel land. The given limited area of that a farm family can cultivate in the context of a traditional technology and the use of primitive tools. This small area tends to be intensively cultivated as the result they are subject to rapidly diminishing return to increase labor input. In such condition shifting cultivating is the most economic method of using limited suppliers of labor on extensive tracts of land (Tadero, 2008).Determinants of Barely cereal crop productivity In developed country, productivity agriculture has significantly increased while per portion of the population in the sector declines. On other hand the economies of low income consequently, it is better to outline factorseffecting agricultural output specially, cereal crop output by using some method of arrangement. Different authors used deferent classification schemes of agricultural output growth determinants. Wiebe et al., (2011) divides agricultural output growth determinants in to conventional (land, labor physical capital and fertilizer) and nonconventional factors of production which include private and public agriculture research education infrastructure government program and policies and environmental degradation (Senai, 2006). Millikan and hap well divided the determinant of agricultural output into many categories. These are physical input factors economic, factors, organizational factors, cultural and motivation factors and knowledge factors.

2.2 Factors that determine Barely cereal crop productivity

According to (J.pender, 2007) production pressure small and holding access to roads and irrigation, extension and credit programs are found to be have direct impact on crop production. As Haile Hagos, 2009 description the major factors that determine agriculture productivity of the country includes:

1. Population growth pressure: it creates inappropriate land i.e. over sloughing and over grazing. Which again creates irrational forest resource use by deforestation create massive soil erosion, aired climate ,migration of wild life , land fragmentation , degradation and lack of effective land property right.
2. Technological factors: Ethiopian peasants depend on traditional tools, low application of modern technologies and institutional facilities are inadequate in peasant farming. There is no access to credit facilities. Because farmers income is low, they face problems of low level of technological development which include lack of fertilizer, improved seeds appropriate livestock breeding, tools and agricultural machines.
3. Infrastructure: peasants face the problems of inadequate road, irrigation, marketing, ware house transportation and communications. Some of the reason for the inadequacy of the above infrastrure are lack of capital formation, topographical variation like rugged terrain and dispersed population settlement which makes it difficult to construct roads, school, healthy centers etc. to sum up the road density truck fleet and the capacity of the models of transport have limiting factors for agricultural development.
4. Rural credit: rural financial methods are under developed in Ethiopia. There are may be need to design rural credit policy that is acceptable to both lender and borrowers. The financial sector must be regulated to provide credit at

reasonable interest rates. Micro finance institutions must be functional in rural areas.

According to central agricultural census commission , 2002 description factors that increase crop productivities are favorable weather condition, use of improved seeds and proper wedding, application of fertilizer and pouching, and the fourth. On the other hand factors that decrease crop productivities are too much rain fall and lodging of the crop, shortage of rain fall, insect(locust) disease and other pests, wild animal and domestic animal and domestic animal damage, shortage of seed, depletion of the soil fertility etc.

Reardon et.al 1996 indicate that determinants of crop productivity according to their evidence are fertilizer, seed, animal traction , organic inputs and conservation investments, farm size and land tenure , non cropping income (including credit), and preparation efforts, and well-functioning input and output markets. Moreover, they indicate that policy reform (exchange rate, interest rate and market liberalization) is necessary but not a sufficient condition to advocate productivities.

2.3 Agriculture in Ethiopia

Ethiopian Agriculture is an ancient and primary economic activity to its people. Due to diversified; topography soil, weather and climatic condition that favors various agricultural activities, majority of the country's people have been engaged in and generate their income from the sector. This sector is major food supplier, main source of export or foreign currency earnings and capital accumulation for the process of future industrialization to the country. Even though agriculture in Ethiopia is primary sector, its performance is mainly characterized by backward and traditional farm implements and by rain feed agricultural production that resulted to low and declining productivity of the sector (central agricultural census commission, 2002).

The great majority of the Ethiopian population resides in rural area engaged in some form of agriculture activities. It is also in this sector that the over whelming majority of the poor reside. A close look at the performance of Ethiopian macro economy also reveals its close correlation with the performance of agricultural sector. The Ethiopian development strategy is planned to resolve around productivity improvement of the small holder agriculture based on utilization of domestic raw materials and labor intensive technology. In raise productivity and production of

farmer by designing incentive packages such as access to fertile land, provision of inputs, credit and tax incentives, improvement in budgetary allocation, man power development in agriculture, development of infrastructure, and other supports(knife a.2001).

2.3.1 Use of Modern Inputs in Cereal Production

Little information is available on modern inputs in the peasant farm sector in Ethiopia apart from fertilizer use. This is partly because farmers do not usually use such inputs. The majority of farmers still rely on traditional farming practices. Fertilizers, chemicals and improved seeds have become available in the 1980s. However, it is reported that improved seeds are only available to a limited number of households. In 1987, for example, only 1 per cent of total seed requirement by the peasant farmers was improved seeds (Workneh, 1992). Owing to the lack of detailed data on the use of improved seeds at the regional level and by crop, it is not possible to include this variable in our regression analysis although it might have had a powerful effect on crop productivity. Irrigation is not available for peasant farm production, although the country has very good river networks and water resources. Poor farming practices and deforestation have led to severe soil erosion and land degradation. Lack of irrigation and soil erosion have been and will continue to be the major threats on improvement of land productivity for peasant farms.

2.3.2 Farming system in Ethiopia

Various attempts have been made to classify the difference farming system in Ethiopia. The following are the classification of the major farming system in Ethiopia.

A. low land mixed agriculture

Low land agriculture is common in the rift valley and north areas of the Awash River. Drought tolerant varieties of sorghum, wheat, maize, and teff are grown. A number of oil crops and lowland pulses are also grown. Livestock is raised on common grazing lands and crop residues. The land is ploughed with a pair of oxen as the highland mixed agriculture system. In response to shortage and variability of rainfall in the lowland areas often diversified their cropping patterns by growing several types of crops and varieties. At times of drought, the farmers in the central rift valley shift to early maturing crop varieties and short cycle crops such as drought tolerant crops of teff as an alternative to long maturity crops such as sorghum and maize. High seed rate,

more than double the recommended rate, is used to get animal feed through thinning (tilahun, 19950).

B.Shifting cultivation

There is very little information in shifting cultivation of Ethiopia. According to westphal (1995), shifting is practiced by some ethnic groups living in southern and south western fingers of the Ethiopian highlands and in the lowlands (among the gumuze, Berta, kaffa, the gimiramaji groups). Farm plots are cultivated for one or two years and left idle for several years to be covered with woodland.

C. commercial agriculture

commercial agriculture was introduced in 1960`s when the Haileselase government decides to enhance the role of commercial farming farms to meet the growing demand for food in the urban areas and agricultural inputs for industry. The size and role of state farms diminished sharply after1992 as the new government decide to hand over some of the state to nearby farmers and privatize some of them. At present there is only 13 state farm enterprises producing mainly wheat, maize, cotton, coffee, and tea on an area of only 156040 hectares. The main problem faces the investor in agriculture is access to land. Conflict with local in habitants is not a conductive environment for investment. Existing regulations prescribe that land be free of other users to be leased to an investors by a regional government (EEA, 2001).

2.3.3 Major crops

Crops can be classified into different categories based on their type and use. Crop production can be divided into two major crops; staple crops and cash crops (knife A, 2001).

A. major staple crops

Ethiopia’s major staple crops include a variety of cereals, pulses, oilseeds, and others. Grains are the most important type of cereal and the chief element in the diet of most Ethiopians. The principal grains are , barely, teff, sorghum, maize millet are the most known among others. The

first three types of cereals are primarily cool weather crops, cultivated at altitudes generally about 2000 meters above sea level. Teff is endemic grain for Ethiopia, furnishes the flour for enjera and unleavened bread that is the principal form in which grains consumed in the highlands and in the urban canters through the country. Major subsistence crop barely is used as food and production of tella and also used to produce local beer production. Maize constitutes the largest crop output in the country in the volume terms producing over 30 percent more than its closest rival teff (IBIDI, 2001).

Sorghum, millet and teff are cultivated mostly in warm and temperate areas at lower altitude along the countries western, south eastern and eastern regions. Sorghum and millet both are drought resistance; grow well at low elevations when rainfall is less available. Corn is grown chiefly between elevation of 1900 to 2600 meters above sea level and it need large amount of rainfall to ensure good harvest. These three grains constitutes the staple food part of the population and are major food items in diet of nomads (IBID, 2001).

B. major cash crops

The most important cash crop in Ethiopia was coffee during the 1970`s, coffee export accounted for 50 to 60 percent of the total value of the all exports, although coffee share dropped in to 25 percent as a result of economic depression in the dergue regime following the 1974 revolution. By 1976 coffee export had recovered and five year ending in 1989 coffee export accounted for about 60 percent (IBID, 2001).

Use of modern agricultural input and improved seeds

Improved crop varieties are crucial to increase agricultural productivities. Government believe that improved seeds are the nucleus of all improvements where the potential impact of other farm inputs depends on. While the use of good quality seeds of adopted and improved varieties is widely recognized as fund a mental to ensure increase crop production and productivity for centuries. The Ethiopian farmers largely use land races for agricultural production. Even today, some 85 percent of Ethiopian farmers are believed to depend up on those seeds. The problem in Ethiopia is not only the production of high quality improved seeds but also marketing needs. Seeds marketing are the weakest link in the seed production marketing chain. The formal seed sector in Ethiopia does not have small to medium size enterprises that can produce and distribute seeds of improved varieties and guarantee supply of all types of crop seeds for the farmers (kebede, 1997).

2.4. Empirical review

2.4.1 Barely cereal Production and yield of crop

Small holder farmers are vital for Ethiopia`s agriculture and rural economy. Small holder farmers defined as those marginal and sub marginal farm households that own and land cultivated less than 2 hectares of land cultivated about 78% of the countries farmers. These small holders owned only 23% of the total cultivated land. Their contribution to national grain production was nonetheless 41%. Their contribution to household food security and poverty alleviation is thus disproportionately high and is increasing. Moreover, as the national production increases, so does the number of small holding (FAO, 1990). Since 1995/96-cropping season when participatory agricultural demonstration extension of technology (PADETS) become operational, fertilizer and improved seeds have witnessed widespread with increasing rates of adoption, despite the removal of all input subsidy since 1997/98. Between 1995 and 1999, the consumption of fertilizer increased from 35272 to 2168756 quintals. In the same period, improved seed application rose from 11043 to 177783 quintals. The number of participating farmers leaped from 31256 to 3731217 covering nearly 40% of the farming population. The value of credit, which began at 8.1 million, has reached 150.2 million (tenkir, et.al. 2004). Yield reflects the amount of grain harvest per unit of area. Its sustained growth is essential to agriculture to contribute to overall economic growth rural poverty reduction recent official statistics shows improvement in grain yield. The report indicates that yield of cereals per unit of cultivated land has increased by 5.7 percent in 2006 to 2007. Most observer of Ethiopian agriculture would easily explain the sharp drop in cereal output in 1998 compared to the previous two years as a natural result of the negative weather out-turn surely, unfavorable weather has something do with the decline in the particular year(tewdros,2006)

2.4.2. Overall performance of crop subsector

Agricultural production in Ethiopia is characterized by severe fluctuations in the rains. The overall performance of the economy is highly correlated to the performance of agriculture. This is not surprising since agricultures share in GDP is quite high averaging about 53% during the

dergue and 51.2% under EPRDF. The highest rate of growth in agriculture during the period under consideration was achieved in 1987 when it grew by 18.8% while the lowest was achieved during the drought year 1985 where it decline by 21% the average growth rate in agriculture during the last ten years of the dergue period was a mere 2% which Is significantly lower than the rate of growth of population. The food deficit in the country increases during this period (EEA, 2000).

The agricultural sector has been said that time and again that agriculture is the backbone of the Ethiopian economy not just because it constitutes almost half of the GDP but also because more than 85% of the population still depends on it for their livelihood. As a result the government has given more attention to the development of agriculture. So that they would increasingly benefit from the small plot of land, and surplus labor could increasingly move to industrial sector. However, the attempt to increase productivity has not yield the expected outcome (EEA,2007/2008).

In addition to the above empirical findings, the following are another empirical frame work related to this study. Dayal E. (1984) under took a research titled agricultural productivity in India. In his study three indexes of agricultural performance measurement such that land productivity, labor productivity and aggregate productivity has been estimated to measure productivity pattern in India. The study employed regression analysis to see the significance of these variable in agricultural productivity. By using regression analysis the study found out that labor productivity is positively related with agricultural workers in survey area. The land productivity analysis`s was positively related with fertilizer, irrigation and urban industrial development and negatively related with population density and agricultural workers. In his study the significant explanatory variable in the regression analysis explained that 61% of land productivity, 57% of land productivity and 42% of aggregate productivity were observed.

2.4.3. Productivity of cereal crops in Ethiopia

Two sets of data,CSA and FAO, were used to analyses the structure and trends in the production of cereals, pulses and oilseeds in Ethiopia for the period 1980 and 1996. Area and production figures of cereals are quite different for the two sets, FAO data being up to 28-31% higher in some years. However, the direction of change are similar for the most part. FAO`s estimates

appear more consistent with the largest estimates of area under cultivation given by other sources. Cereal production averaged 6.6 million tons during the period under consideration. On the average, 5.4 million ha of land was cultivated to grow cereals, giving a yield level of 12.2 quintals or 1.2 tons per ha. Annual pulse production amounted to 807168 tons, compared to 55226 tons in the case of oilseeds. Only 930560 and 145930 ha of land was allocated to the production pulse and oilseeds. Yield levels were also low, averaging 8.7 quintals for pulses and 3.8 quintals for oilseeds (CSA/FAO, 2001).

Cereals productivity increased by 1.4 %(significant at less that 1 percent) per annum during the period 1980-1996. On the other hand, no significant growth rates were recorded for pulses and oilseeds respectively. Overall, the productivity of food crops remained very poor, especially when compared to rapid population growth. In particular production stagnated during the seventeen years tenure of dergue. Cereal production, for instance, fluctuates between 62 and 65 million quintals during the period 1986 to 1991(immediately after the drought year of 1983-85). Area under cereal crop production also stayed at round 5.2 million hectares over the same period. Annual production of pulses and oilseeds in 1986-91 was lower than the level attained in 1980. The productivity of field crops improved after 1991 owing to improved policy environment, increase availability inputs such as fertilizer the relatively good weather. The period from 1994 until 1997 has been particularly favorable: cereal production rose to 110.6 million quintals, while area harvested jumped to 8.8 million hectares in 1996. While a similar positive was observed with repeated to pulses the performance of oilseeds remained poor even after 1994(IBID, 2001).

2.5 Conceptual framework

The conceptual framework forming the basis for the empirical analysis is summarized in Figure Smallholder farmers are supposed to produce crops for two main purposes which are consumption and marketing purposes. They could entirely consume their output, entirely market, consume a part of it and market the remaining depending on the commodity. If the farmers entirely consume their products, it means that they are not market-oriented and they can be said to be autarchic. It implies that they produce just to meet what they need throughout the production season and do not need to depend on the market (Benjamin, 2013).

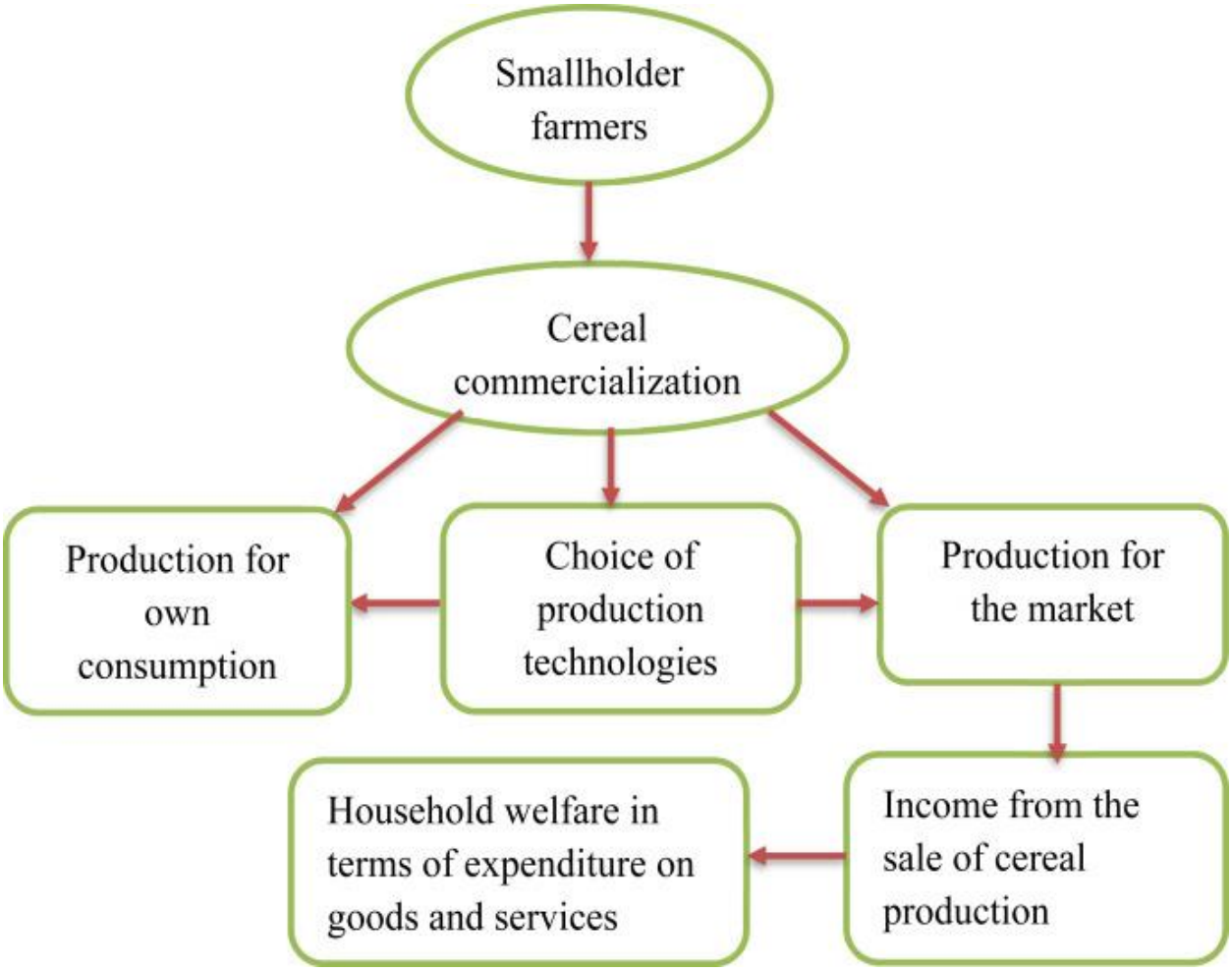

Figure 1 Cereal commercialization and household

3.RESEARCH METHODOLOGY

3.1.Description of the study area

Shashogo is one of the Woredas in the centeral Ethiopia, partofthe Hadiya zone,Shashogo is bordered on south the Kambat zone, on the west by Limo, on the northwest by Ana Lemo, on the northeast by Silt'e'Zone, and on the southeast by the Alaba Zone. Based on the CSA, this woreda has a total populatono n of 103722, of 52,435 are men and 51,287 women, 7.92% of its population are urban dwellers .The longitude and latutide of this woreda are approximately 7.9367.

3.2 Data type

In this study the qualitative and quantitative types of data are used. The qualitative data are non numeric variables such as the status of delivering quality service of shashogoworeda`s agricultural and rural development office on providing selected seed and fertilizer which can not be measured numerically. Whereas quantitative data are numeric variables that can be measured and express the situation by numerically.

3.2 Source of data

In this research, two sources of data are used for quantitative and qualitative of data deliverance. These sources are primary and secondary. For primary data source the researcher used mainly cross sectional data. These primary data source is collected directly from selected sample of farm households. Whereas secondary source of data is gathered and compiled from different published and unpublished materials like books and annual report of woreda's agricultural and rural development office by critically observing the reliability and application of the data.

3.4 Data collection method

The study was utilizing both primary and secondary data. The primary data will collect from households who are engaged in agricultural activities particularly in barely production and farmers and agricultural office workers through schedule (the questionnaire filled by the enumerator) method of data collection. The secondary data is taken from the woreda`s and shashogo agricultural and rural development office.

3.5 Sampling techniques and sample size determination

In order to select sample households, two-stage sampling technique where combinations of purposive and simple random sampling techniques were used to select the district and sample household heads shashogoworeda, Hadiyya zone in centeralEthiopia.was purposively selected due to near our campus and extent ofbareiy cereal production in hadiyya zone. This information is obtained from shashogo district Agricultural Office. In the first stage, out of the total 35 rural and 4 urban kebeles, two kebele were selected by simple random sampling. In the two stage, 80 sample barely cereal producing farmers were selected using simple random sampling technique from each selected kebele based on probability proportion to size sampling technique. The sample size for the study was determined based on Yamane (1967) since the population is homogeneous in agri-ecology and production system. The simplified formula provided by Yamane is used to determine the required sample size at 90 % confidence level and 10 % level of precision.

. The simplified formula used to determine the sample size of the study was specified as follows.

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

Where: n=statistically acceptable sample size

N=Total size of target population

e=level of precision(error level) at 90 % confidence level (0.1).

Table 1. Sample distribution in selected kebele

No of kebele	Name of Kebele	Total population	Household	Sample size
1	Bachagolla	2600	220	44
2	Bonoshawanchokota	2144	180	36
3	Hulegutacho	1000	100	20

Total	48441	500	100

Source: own survey and district agricultural office 2024

3.6 Method of data analysis

For data analysis the researcher was used both the descriptive and the econometrics model of data analysis. For the descriptive methods of data analysis the researcher will use percentage, table, graphs, and charts.

3.7 Model specification

To examine the factor that determines the barely cereal crop productivity the econometrics model are used.

Multiple linear regression model (MLRM)

In addition to its wider application multiple linear regression model analysis is a general technique which can be fitted to all kinds of variables. The method of OLS is used popularly not only because it is not easy to use but also because it has some strong theoretical properties, which are the best linear unbiased estimators. Due to this reasons the researcher used the multiple linear regression model in order to test the major factors that determine the productivity of Barely cereal crop production. The multiple regression models specified as follows;

$Yi=\beta + \sum \beta jxji + ui$

Where i=1, 2 … (Sample size)

β=intercept

j=1, 2… (Number of explanatory variables)

Yi=yield

Ui=unobserved error or disturbance term

Xj=land size, family labor, age of household head, distance of farm land from their residence, amount of fertilizer used, access to credit ,education status and extension service.

Table 3.1 description of variables

Variables	Description	Type	Measurement	
Sex	sex of household head	Dummy	1=male, 0=female	+ve
livestock ownership		Dummy	1=own 0=others	+ve
non-farm income		Continuous	Birr	-ve
Yield	Yield per hectar (in quintal)	Continuous	Quintal	+ve
Lan_size	Amount of farm land covered by ceral crop(in hectare)	Continuous	Hectare	+ve
Fam_lab	Member of household between 15-65 years old.	Continuous	Number	+ve
Age	Age of household head	Continuous	Year	-ve
Dis_farm	Distance of farm land from	Continuous	Hour	-ve

	household resident			
Fer_used	Amount of fertilizer used	Continuous	Quintal	+ve
Cred_acc	Credit access of respondent	Dummy	1=Yes, 0=No	+ve
Edu_stat	Education status	Continuous	Number of year	+ve
Ext_ser	Extension service	Continuous	1=Yes, 0=No	+ve

Definition and expectation of variables

Based on the literature reviewed and farmer specific characteristics of respondents in the study area, the explanatory variables selected for the study were presented as follows.

Dependent variable

- Yield: in this paper the data is collected from the various major crops output per quintal in the year 2023/24 cropping season. According to shashogo agricultural office report, the cereal crop production covers the highest farm area of land. Therefore for simplicity of the analysis only the wheat production yields taken as a dependent variable.

Independent variables

- Credit access: it is a dummy variable which takes a value 1 if the household had credit access and o otherwise. Accessing credit by the household means having a potential of purchasing the inputs in cash. Having sufficient input at required time in turn make a production in a better way. Therefore credit access helps households to finance required capital to buy the input that are used in the production process and expected to have positive impact.

- Family labor: it represents a number of productive age group; those living within the household. Marshall has stated the law of diminishing returns in agriculture as such:"as increase in capital and labor applied to the cultivation of land causes in general a less than proportionate increase in the amount of the produce raised, unless it happens to coincide with the improvement in the act of agriculture"(. In contrast to this law of diminishing returns, the larger the family members, the more the labor force available for production purpose. This initiate production Due to such contradict concepts its sign is indeterminate a prior.
- Extension service: this is a dummy variable which takes a value 1 if the household had contract with extension workers and received services, and 0 otherwise. The respondent having a frequent contact with the extension workers are close to information and expect to acquire the more know how of the production techniques. Therefore, this variable is expected to have positive impact on the crop productivity.
- Age of household head; as the age of farmers increase, it indicates they have more experience to the production process and take the advantage of well management and marketing process compared to the young age farmers. In other sides, the young farmers are close to information and easily adopt the new technology. Since both young and old age groups have important contribution on its own side to the cereal crop productivity its sign is indeterminate a prior.
- Artificial fertilizer used: the presence of di-Ammonium phosphate (DAP) and Ammonium Nitrate (UREA) in the soil can increase the soil fertility. This in turn expected to increase the productivity of crop that is cultivated from this land. Therefore, the use of artificial fertilizers in the production process is expected to have positive influence on productivities.
- Education status: it is dummy variable which takes a value 1 if literate, other wise o. The educated (literate) farmers are able to adopt technologies, and understand and gather information easily than that of the illiterate. In addition the educated farmers can improve the know how of the production process. Therefore education has expected to be a positive impact to productivity.

Distance of farm land from household resident: the respondent those far from their farm land may face difficulties of securing their field crop from different external attackers like animals and conserving their crop frequency. Therefore the household having a less distance to travel to their field areas (farm land) are expected to be more productive than those who travel long distance.

4 DATA ANALYSIS AND RESULTS

4.1 Method of Data Analysis

All the completed questionnaires from the respondents, total responses for each item were gathered and tabulated. Then used the likert- scale for interpretation, weighted mean andstandard deviation were computed. The weighted mean and standard deviation were calculated using the SPSS statistical software and tested with Chi square wherever appropriate Under this section,the results of the research are presented as per the objectives one by one

4.1.1 Demographics character

Table1:Basic Information about the respondents

Items	**Name of the district**						**Total**		F-Static	P- value
	Bacha golla		Bonoshawancho kota		Hulegutacho					
	Mean	Std	Mean	Std	Mean	Std	Mean	Std		
Age of household head in years	45.23	13.38	44.43	12.54	37.38	7.31	45.40	11.84	5.45	0.006
Family size	7.80	3.23	7.63	3.08	10.53	3.79	8.66	3.60	6.21	0.003
No of family members in productive age	4.00	2.08	4.10	2.92	4.33	2.32	4.14	2.44	0.57	0.568

Source Own survey result 2025

Table 1 presents the basic demographic characteristics of the respondents across the three districts: Bacha Golla, Bonoshawancho Kota, and Hulegutacho. The results highlight significant

differences in household head age and family size, while the number of productive-age family members remains relatively similar across the districts.

The average age of household heads is estimated at 45.40 years, but with a significant difference among the districts ($F = 5.45$, $p = 0.006$). Bacha Golla and Bonoshawancho Kota have similar average ages of 45.23 years and 44.43 years, respectively, while Hulegutacho has a much younger average of 37.38 years. This indicates that household heads in Hulegutacho tend to be younger than those in the other two districts, which could be due to differences in generational transitions, migration, or early household formation patterns. The average family size is 8.66 members, with significant variation across districts ($F = 6.21$, $p = 0.003$). Households in Hulegutacho have the largest family sizes, averaging 10.53 members, whereas Bacha Golla and Bonoshawancho Kota report smaller household sizes of 7.80 and 7.63 members, respectively. This suggests that larger families are more common in Hulegutacho, potentially due to higher birth rates, cultural practices favoring extended family living, or economic factors influencing household composition.

In contrast, the number of family members in the productive age group shows no statistically significant difference among the districts ($F = 0.57$, $p = 0.568$), with an overall average of 4.14 members. Hulegutacho has the highest average productive-age members (4.33), followed by Bonoshawancho Kota (4.10), and Bacha Golla (4.00). Despite slight differences, the similarity in productive-age members across districts suggests a consistent pattern of workforce availability. However, factors such as labor force participation rates, employment opportunities, and economic incentives may still influence how these individuals contribute to household productivity. the results indicate that while Hulegutacho has younger household heads and larger family sizes, the number of productive-age family members remains relatively uniform across all three districts. These demographic variations may have implications for labor availability, dependency ratios, and household economic sustainability in each district.

4.2 barely production and consumption

Table2. barley production ans consumption by farmers.

Items	District						**Total**	
	Banchagolla		Bonoshawancho kota		Hulegutacho			
	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Total produced barley(qt)	15.00	8.98	17.93	14.86	16.17	11.47	16.37	11.94
Allocated for domestic consumption(qt)	4.38	3.98	4.29	6.00	3.13	2.37	3.94	4.36
Proportion for home consumption(%)	30.12	29.08	29.29	30.30	21.70	12.69	27.04	25.33
Allocated for sale(qt)	7.57	7.45	10.80	13.88	10.05	9.56	9.47	10.61
Proportion for market(%)	47.91	28.33	54.30	28.61	59.24	16.47	53.82	25.26
Reserved for seed(qt)	2.57	1.59	2.67	2.18	2.00	1.31	2.41	1.74
Proportion for feed(%)	18.43	7.49	15.35	7.35	13.31	5.85	15.70	9.18
Reserved for other purpose like gift(qt)	0.48	0.52	0.17	0.53	1.12	1.30	0.59	0.94
Proportion for other purposes(%)	3.53	4.35	1.06	3.92	7.11	8.40	3.90	6.36

Source Own survey result 2025

Table 2 presents the production and allocation of barley across the three districts: Bacha Golla, Bonoshawancho Kota, and Hulegutacho. The findings indicate differences in production levels

and the proportions allocated for various uses, including home consumption, market sales, seed, feed, and other purposes.

The total barley production per household averages 16.37 quintals, with notable variation across districts. Bonoshawancho Kota has the highest average production (17.93 quintals), followed by Hulegutacho (16.17 quintals) and Bacha Golla (15.00 quintals). The higher production in Bonoshawancho Kota may be due to better agricultural practices, access to inputs, or more favorable climatic conditions.

The amount allocated for domestic consumption is relatively consistent across districts, averaging 3.94 quintals. Bacha Golla (4.38 quintals) and Bonoshawancho Kota (4.29 quintals) have slightly higher allocations than Hulegutacho (3.13 quintals). In terms of proportion allocated for home consumption, Bacha Golla and Bonoshawancho Kota allocate around 30%, whereas Hulegutacho households allocate only 21.70%. This suggests that Hulegutacho farmers may rely more on market sales or alternative food sources for household consumption. The amount of barley allocated for sale averages 9.47 quintals per household. Bonoshawancho Kota reports the highest market allocation (10.80 quintals), followed by Hulegutacho (10.05 quintals) and Bacha Golla (7.57 quintals). The proportion allocated to the market is highest in Hulegutacho (59.24%), followed by Bonoshawancho Kota (54.30%) and Bacha Golla (47.91%). These results indicate that Hulegutacho farmers are more market-oriented, possibly due to greater access to buyers or economic necessity. The amount reserved for seed is relatively small, averaging 2.41 quintals across districts, with minor variation between them. Similarly, the proportion allocated for feed is around 15.70%, with Bacha Golla allocating the highest percentage (18.43%) and Hulegutacho the lowest (13.31%). This suggests that farmers in Bacha Golla might prioritize livestock feed more than the other districts. Barley reserved for other purposes like gifts or social obligations varies significantly. Hulegutacho allocates the highest amount (1.12 quintals), whereas Bonoshawancho Kota allocates the least (0.17 quintals). The proportion for other purposes is highest in Hulegutacho (7.11%) and lowest in Bonoshawancho Kota (1.06%). This indicates that cultural and social practices in Hulegutacho may involve greater sharing of barley as gifts or contributions to communal activities.

Bonoshawancho Kota has the highest barley production, market sales, and total allocation for different uses Hulegutacho farmers sell the highest proportion of their barley, consume the least at home, and allocate more for social purposes. Bacha Golla farmers allocate the highest proportion of their barley for feed and home consumption but sell less compared to the other districts. The differences in allocation suggest that economic priorities, market access, and household needs vary significantly among the three districts.

4.3 Gross income generating from barley

Table 3. Gross income generating for barely

Scale	Gross income generated from barley	Bachagolla		Bonoshawancho kota		Hulegutacho		Total	
		No	%	No	%	No	%	No	%
5	Verygood(greater than40% from othercrop)	17	45.94	13	36.11	19	51.35	49	44.54
4	Good(between 30-40%from other crop)	7	18.91	11	30.55	10	27	28	25.45
3	Medium (between 20-30% from othercrop)	7	18.91	6	16.66	5	13.51	18	16.36
2	Faire(between10-20%from other crop)	3	8.1	4	11.11	3	8.1	10	9.09
1	Poor(less than10%from other crop)	3	8.1	2	5.55	0	0	5	4.54

Source Own survey result 2025

Table 3 presents the distribution of farmers based on the proportion of their gross income generated from barley in the three districts: Bacha Golla, Bonoshawancho Kota, and Hulegutacho. The results indicate variations in the significance of barley as a source of income across districts.

The majority of farmers (44.54%) fall into the "Very Good" category, meaning they generate more than 40% of their income from barley. This proportion is highest in Hulegutacho (51.35%), followed by Bacha Golla (45.94%), and lowest in Bonoshawancho Kota (36.11%). This suggests that barley plays a more dominant role in farmers' income in Hulegutacho compared to the other districts, potentially due to market access, productivity, or crop diversification levels.

The "Good" category (30–40% income from barley) accounts for 25.45% of farmers overall. Bonoshawancho Kota has the highest proportion in this category (30.55%), followed by Hulegutacho (27%) and Bacha Golla (18.91%). This indicates that in Bonoshawancho Kota, a considerable number of farmers depend on barley for a significant portion of their income, but they may also rely on other crops more than in the other two districts.

The "Medium" category (20–30% income from barley) includes 16.36% of farmers. Bacha Golla has the highest percentage (18.91%), while Bonoshawancho Kota (16.66%) and Hulegutacho (13.51%) have slightly lower proportions. Farmers in this group likely have a more diversified income, balancing barley production with other crops.

The "Fair" category (10–20% income from barley) represents 9.09% of farmers. There is little variation across districts, with Bonoshawancho Kota having the highest proportion (11.11%), while both Bacha Golla and Hulegutacho have the same percentage (8.1%). This suggests that for these farmers, barley is a secondary income source, contributing only a small portion of their earnings.The "Poor" category (less than 10% income from barley) accounts for only 4.54% of farmers, indicating that most farmers rely on barley as a substantial source of income. Interestingly, no farmers in Hulegutacho fall into this category, while Bacha Golla and Bonoshawancho Kota have small proportions (8.1% and 5.55%, respectively). This further

supports the idea that barley is a more critical income source in Hulegutacho compared to the other two districts.

4.4 Use of improved seeds and fertilizers in three district

Table 4.4 use of improved seeds and fertilizers

Input type	User's (Yes)	Non users (No)
Improved barely seeds	64%	36%
DAP fertilizer	78%	22%
Urea fertilizer	71%	29%

Source Own survey result 2025

Table 4.4 presents the adoption rates of improved barley seeds and fertilizers across the three districts. The results indicate that while a significant proportion of farmers use these inputs, there is still a notable percentage of non-users.

The use of improved barley seeds is recorded at 64%, meaning that nearly two-thirds of the farmers have adopted improved seed varieties, while 36% still rely on traditional seeds. This suggests that while improved seeds are widely adopted, some farmers may face barriers such as limited access, high costs, lack of awareness, or skepticism about their benefits.

The use of DAP fertilizer is the highest among the inputs, with 78% of farmers applying it to their barley fields, while 22% do not use it. This indicates that the majority of farmers recognize the importance of DAP fertilizer in enhancing soil fertility and improving barley yields. However, the remaining non-users may be constrained by factors such as affordability, availability, or traditional farming practices.

Similarly, Urea fertilizer is used by 71% of farmers, while 29% do not use it. Although the adoption rate is relatively high, it is slightly lower than DAP fertilizer usage. This could be due

to differences in farmers' perceptions of its necessity, cost-related challenges, or soil fertility management practices that reduce the need for additional nitrogen application.

4.5 agricultural practices and major constraint

Table 4.5 major constraint of barely production

Constraints	Frequency	Percentage
Lack of improved seeds	35	35%
Poor soil fertility	28	28%
Pest and disease	22	22%
Shortage of fertilizer	40	40%
Limited access to credit	30	30%
Climate change effect	50	50%
Lack of market information	25	25%

Source Own survey result 2025

Table 4.5 presents the key challenges faced by barley farmers, highlighting multiple constraints that impact production and productivity. The results indicate that farmers face a combination of input-related, environmental, and market-related challenges.

The most commonly reported constraint is the effect of climate change, affecting 50% of farmers. This suggests that unpredictable rainfall, drought, temperature fluctuations, and other

climate-related factors are significantly impacting barley production. Climate variability likely affects yields, planting schedules, and overall productivity, making it a critical issue for farmers.

The shortage of fertilizers is another major challenge, reported by 40% of farmers. This suggests that either the availability or affordability of fertilizers, such as DAP and Urea, remains a concern, potentially limiting farmers' ability to enhance soil fertility and improve yields.The lack of improved seeds is cited by 35% of farmers, indicating that despite a 64% adoption rate of improved seeds (as seen in Table 4.4), a significant proportion of farmers still struggle with accessing or affording them. This may result in lower productivity compared to those using improved seed varieties.

Limited access to credit is a constraint for 30% of farmers, suggesting that financial limitations prevent some from purchasing essential inputs like improved seeds and fertilizers. This highlights the need for better financial support systems, such as agricultural loans or cooperatives, to assist farmers in investing in their production.

Poor soil fertility is reported by 28% of farmers, indicating that declining land productivity is a concern. This may be linked to inadequate fertilizer use, land degradation, or unsustainable farming practices. Without proper soil management, barley yields may continue to decline over time.

Pests and diseases affect 22% of farmers, showing that plant health issues are a notable but relatively smaller challenge compared to other constraints. This suggests that while pest and disease outbreaks occur, they may be somewhat manageable or less frequent than other production challenges.

Lack of market information is an issue for 25% of farmers, meaning that a portion of farmers struggle to access timely and reliable data on barley prices, demand, and selling opportunities. This could result in poor marketing decisions, lower bargaining power, or financial losses.Climate change is the most significant constraint, affecting half of the farmers, emphasizing the need for climate adaptation strategies such as drought-resistant varieties and water conservation methods.

4.6 Econometric Model Results

To identify the key determinants of barley productivity in Shashogo Woreda, a Multiple Linear Regression Model (MLRM) was estimated using the Ordinary Least Squares (OLS) method. The dependent variable was barley yield per hectare (in quintals), while the explanatory variables included land size, family labor, age of the household head, distance of farmland from residence, fertilizer usage, credit access, education status, extension service, livestock ownership, and non-farm income.

4.6.1 Model Estimation Results

Table 4.6: Results of the Multiple Linear Regression Model (MLRM)

Variable	Coefficient(Bj)	Std.Error	t-Statistic	
Constant (B)	3.24	1.15	2.82***	
Land size	0.78	0.12	6.50***	
Family labor	0.34	0.09	3.78***	
Age	-0.02	0.01	-2.00**	
Distance to farm	-0.41	0.14	-2.93***	
Fertilizer used	0.55	0.10	5.50***	
Credit access	0.64	0.22	2.91***	

Education	0.29	0.08	3.63***	
Extension service	0.48	0.13	3.69***	
Livestock ownership	0.21	0.17	1.24	
Non farm income	0.08	0.05	1.60	
R^2.	0.78			
Adjusted R^2.	0.74			
F-Static	19.82(p=0.000)			

(Significance levels: *** p<0.01, ** p<0.05, * p<0.1

The findings of this study on the determinants of barley productivity in Shashogo Woreda align with several previous studies while also highlighting some differences. The comparison provides insights into the broader trends and regional variations affecting cereal crop productivity in Ethiopia.

The coefficient of Age is -0.02, and it is statistically significant at the 5% level (p = 0.048). This means that, holding all other factors constant, as the age of the farmer increases by one year, the barley productivity decreases by 0.02 units (for example, quintals per hectare, if that's your unit of measurement). In simple terms, older farmers tend to produce slightly less barley compared to younger farmers. This negative relationship may be because older farmers might be less energetic, slower to adopt new technologies, or less able to manage the physical demands of farming activities.

This finding is consistent with a study by Gebre et al. (2021) on wheat productivity in Ethiopia, which reported that older farmers were less likely to adopt improved inputs, leading to lower yields. However, Bekele & Tadesse (2019), in their study on cereal crops in Oromia, found that older farmers achieved higher productivity due to their farming experience. This contrast

suggests that while experience can be beneficial, adaptability to new agricultural practices is crucial for sustained productivity.

The coefficient of Distance to Farm is -0.41, and it is statistically significant at the 1% level (p = 0.004). This means that, holding all other variables constant, as the distance from the farmer's home to the farm increases by one unit (likely in kilometers), barley productivity decreases by 0.41 units. In simple terms, the farther the farmland is from the farmer's residence, the lower the barley productivity.

This negative relationship could be because longer distances increase travel time and reduce the farmer's ability to monitor and manage the farm efficiently, leading to lower productivity. This result is supported by Asfaw et al. (2020), who found that farmers in Southern Ethiopia with distant farmlands faced logistical challenges that reduced productivity. However, Desta (2018), in a study conducted in Tigray, reported that distance had a less significant effect because some farmers had access to mechanized transport, mitigating its impact. This indicates that infrastructure improvements, such as rural roads and transportation access, can reduce the negative effects of distance on productivity.

The study confirmed a positive and significant relationship between fertilizer use and barley productivity (p = 0.000), with a one-quintal increase in fertilizer use leading to a 0.55-quintal increase in yield. This aligns with Teshome et al. (2022), who found that fertilizer application significantly increased maize and barley productivity in Ethiopia. Similarly, Alemu & Berhanu (2020) observed that farmers who applied higher fertilizer rates achieved better yields. These findings reinforce the importance of fertilizer availability and proper application techniques in improving barley productivity.

Credit Access (Coefficient = 0.64) Positive and significant (p = 0.005).Farmers with access to credit achieve 0.64 units higher productivity compared to those without. Credit helps farmers purchase better inputs like seeds and fertilizersThis finding is in line with Haile & Mekonnen (2019), who reported that access to credit enabled smallholder farmers in Ethiopia to invest in better seeds, fertilizers, and other inputs, ultimately increasing their agricultural output. However, some studies, such as Kassa (2017), found that credit access had a limited impact in

certain areas due to misuse of loans for non-agricultural purposes. This suggests that while credit can enhance productivity, its effectiveness depends on proper utilization and financial literacy among farmers.

A one-year increase in education level increases productivity by 0.29 units. The education level of farmers ($p = 0.001$) was positively associated with barley productivity, as higher education levels improve farmers' ability to adopt modern agricultural techniques. This finding is consistent with Demeke et al. (2021), who found that educated farmers were more likely to implement improved farming practices, leading to higher productivity. Similarly, the role of agricultural extension services ($p = 0.000$) was found to be highly significant, as farmers who received frequent extension visits achieved better yields. This aligns with Worku & Tadesse (2020), who reported that regular extension support improved farmers' knowledge and adoption of best practices, ultimately enhancing productivity.

A one-unit increase in fertilizer use increases productivity by 0.55 units. Positive and highly significant ($p = 0.000$). Farmers who receive more extension services experience a 0.48 unit increase in productivity. Extension services provide farmers with updated farming techniques and practices. Positive but statistically insignificant ($p = 0.112$). Non-farm income has a small positive effect, but it is not strong enough to conclude it significantly influences barley productivity. livestock ownership ($p = 0.217$) and non-farm income ($p = 0.112$) were found to be statistically insignificant in determining barley productivity in Shashogo Woreda. While some studies, such as Ayalew (2018), found that livestock ownership indirectly supported crop production by providing manure and draft power, the impact was not significant in this study. Similarly, Ebrahim & Getachew (2019) noted that non-farm income had mixed effects, with some farmers using additional income to invest in farming, while others diverted their focus away from agriculture.

The R^2 value of 0.78 indicates that 78% of the variation in barley productivity is explained by the included independent variables, such as land size, fertilizer use, credit access, education level, and extension services. This suggests that the model provides a strong explanatory power for understanding the key determinants of barley productivity in Shashogo Woreda. The remaining

22% of the variation may be attributed to other unobserved factors, such as climate variability, pest infestations, and soil quality, which were not included in the model.

The F-statistic of 19.82 ($p = 0.000$) confirms the overall significance of the model, meaning that the combined effect of the independent variables is statistically significant in explaining variations in barley productivity. This finding aligns with previous studies, such as Gebremedhin & Tesfaye (2020), who found an R^2 value of 0.75 in a similar study on wheat productivity in Ethiopia. Their results also emphasized the importance of input availability and technical support in improving crop yields.

Compared to studies on other cereal crops, the R^2 value in this research is relatively high. For example, Teshome et al. (2022) reported an R^2 of 0.69 in their study on maize productivity, while Alemu & Berhanu (2021) found an R^2 of 0.72 in their analysis of sorghum production. The slightly higher explanatory power in the current study suggests that barley productivity in Shashogo Woreda is strongly influenced by measurable factors such as input usage, education, and credit access, making it possible to design effective interventions to enhance productivity.

5. CONCLUSSION AND RECOMMENDATIONS

5.1. Conclusion

In conclusion, the productivity of barley cereal crops in Shashogo Woreda, Hadiyya Zone, Central Ethiopia, is influenced by a complex interplay of various determinants. Our research highlights key factors such as soil fertility, access to water, agricultural practices, and socio-economic conditions that significantly affect yield outcomes. The findings indicate that improved soil management and sustainable agricultural practices can enhance productivity levels. Furthermore, access to extension services and education plays a crucial role in equipping farmers with the necessary knowledge and skills to optimize their production methods.The study also underscores the importance of addressing infrastructural challenges, such as transportation and market access, which hinder farmers from realizing the full potential of their barley crops. Additionally, the impact of climate variability on crop yields cannot be overlooked, emphasizing the need for adaptive strategies to mitigate these effects.

Overall, enhancing barley productivity in Shashogo Woreda requires a multi-faceted approach that combines agronomic improvements, policy interventions, and community engagement. By focusing on these determinants, stakeholders can contribute to food security and economic development in the region, ultimately leading to a more resilient agricultural sector. Future research should continue to explore innovative solutions and best practices tailored to the local context to further support barley farmers in achieving sustainable productivity gains.

5.2 Recommendations

Based on the findings of the study on the determinants of barley productivity in Shashogo Woreda, the following recommendations are proposed:

- Enhance Access to Credit Facilities: Since credit access significantly improves barley productivity, local governments and financial institutions should work to expand affordable and farmer-friendly credit services. Additionally, training programs on proper credit utilization should be provided to ensure loans are invested in productive agricultural activities.
- Promote Educational Opportunities for Farmers Given the positive impact of education on productivity, efforts should be made to enhance farmers' education levels. Adult education programs, functional literacy training, and agricultural workshops should be organized to help farmers better understand and adopt improved farming technologies.
- Strengthen Agricultural Extension Services As extension services were found to significantly influence productivity, the government and NGOs should increase the frequency and quality of extension support. This includes providing technical advice, demonstrating modern farming practices, and facilitating farmer-to-farmer learning experiences.
- Support Fertilizer Usage and Improve Input Supply Systems Fertilizer use was a strong determinant of productivity. Therefore, improving the availability, affordability, and timely delivery of quality fertilizers is crucial. In addition, training farmers on the proper application of fertilizers should be emphasized to maximize yields.
- Facilitate Land Access and Land Management Practices Since land size positively affects productivity, policies that promote land consolidation or efficient land use should be encouraged. Training on sustainable land management practices should also be provided to ensure optimal utilization of available farmland.
- Address Challenges Related to Farm Distance As greater distance from farms negatively impacts productivity, initiatives such as promoting the establishment of farmers'residences closer to their farmland or improving rural transportation

infrastructure (e.g., farm roads) would help reduce travel time and enhance farm management.

- Target Youth in Farming Programs The negative impact of age suggests that younger farmers might be more productive. Therefore, programs that encourage youth engagement in agriculture, such as providing incentives and start-up packages, should be prioritized to sustain and enhance agricultural productivity..
- Diversify Income Sources Cautiously Although non-farm income and livestock ownership were found insignificant in this study, farmers should still be supported to diversify their income sources carefully, ensuring that such activities complement rather than substitute agricultural production.

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