

WOLKITE UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

SENIOR ESSAY ON; FACTORS AFFECTING BEAN PRODUCTIVITY OF SMALLHOLDER FARMERS IN (CASE OF BEREHET WOREDA, NORTH SHOA OF ETHIOPIA)

SENIOR ESSAY Submitted to the Department of Economics, In Partial Fulfillment of the Requirement of Ba Degree in Economics

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June, 2019

Wolkite,Ethiopia

DECLARATION

I, declare that this senior essay entitled: "FACTORS AFFECTINGBEAN PRODUCTIVITY OF SMALLHOLDER FARMERS IN **(CASE OF BEREHET WOREDA, NORTH SHOA OF ETHIOPIA)**

"is outcome of my own effort and study and that all sources of materials used for the study have been appropriately acknowledged.

To the best of my knowledge, this study has not been submitted for any degree in this University or any other University. It is offered for the partial fulfillment of the Bachelor degree in economics.

By: Abdurazik Muhamed.

Signature----------

Date----------

ADVISORS' APPROVAL SHEET

This is to certify that the thesis entitled "FACTORS AFFECTINGBEAN PRODUCTIVITY OF SMALLHOLDER FARMERS IN **(CASE OF BEREHET WOREDA, NORTH SHOA OF ETHIOPIA).** submitted in partial fulfillment of the requirements for the Bachelor degree in Economics, of the Department of Economics, and has been carried out by **Abdurazik Muhamed. ID No BER 020/09,** under my/our supervision. To the best of my knowledge, is an original work and not submitted earlier for any degree either at this University or any other University.

Therefore I recommend that the student has fulfilled the requirements and hence here by can submit senior essay to the department.

Advisor: lemma Sh. (Msc).

Signature:_____

Date: _____

ACKNOWLODGEMENT

First of all, I would like to express my deepest gratitude (endless thanks) to almighty Allah.(Al-hemdulillah).

Next, I would like to express my deepest gratitude thanks to my advisor lemma Sha. (MSc). For his advice, follow up, constructive comments and positive attitudes, when I prepare this research paper.

My deepest gratitude thanks also to my families for their constituent and reliable financial and moral support that enables me to complete this study and I would like to express my heartful thanks, deepest gratitude and appreciation to my friends ayenewteshome and others for his charming cooperation in writing and editing this research paper, being together with me and

Again, I would like to say thanks to Berehet agricultural office (BAO) by giving necessary information during preparation of this research paper.

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List of Acronym

BLUE……Best, Linear, Unbiased and Estimator

CLRM……..Classical Linear Regression Model

CSA…….Central Statistical Authority

FAO……Food and Agricultural Organization

MLRM……Multiple Linear Regression Model

OLS……Ordinary Least Squar

ABSTRACT

Agriculture is the main economic activity in developing countries like Ethiopia. Even though agriculture is the backbone of the economy; it has not been able to satisfy the food requirement of their people owing to lower productivity. Hence it is very important to understand the factor of agricultural productivity. In line with this, the objective of this study is to examine the factor affecting Bean productivity ofsmalholder farmers in Amhara regional states in the case of BerehetWoreda.Todo so, purposive sampling technique was employed to select two Keble(shega and sede'as) from Berehetworeda and respondent households were randomly selected from two kebeles. Hence, 114 households were selected randomly for the study from these sample kebeles, both male and female headed household were included. The necessary data were generated from both primary and secondary sources to answer the research questions. Hence, in trying to examine the problem cross-sectional data collected through questionnaires was the principal means of generating primary data while secondary data were obtained from reviewing various academic research papers, internets and from Agricultural bureau of Berehetwordea and rural development office of Berehetworeda .The paper has employed both descriptive and econometric statistics to analyze the stated objectives. The study founded that educational level, farm size,number oxen, level of income, manure, and credit accesses has positive and significant effects and age of household has a negative and significant effect on Bean productivity of smallholder farmers in the study area. Therefore, the researcher comes up with some possible recommendation for concerned bodies and policy makers. Accesses of credit has more positive impact on the productivity of bean, farmers should be encouraged in order to use it and government should provide service of credit, education and facilitate it for farmers to faster Bean productivity of smallholder farmers in the study area.

CHAPTER ONE

1. Introduction

1.1 Background of the study

Agriculture is the important sector in the world. It provides for food consumption and row material for most of agro based industries and also creates employment opportunities for the large population of developing countries. For poorest countries it provides as leading source of employment and contribute to the large fraction of their national income (WB,2011).it is also the predetermining economic activity in developing countries and contributes half of the total national income .According to the united nation development program , 2010/11 two third of the total population in developing countries leave in rural areas particularly in Africa. Especially in sub-Saharan African countries economy highly depend on agriculture. It contribute 85% of labour force employment , 50% of GDP, 95%totalexport and 70% of supply to countries agro industry sector and main principal source of food production (ayele,2010). As one of the poorest countries in the world Ethiopia's agriculture accounts for about 40% of gross domestic product,90% of exports and 85% of total employment (CSA,2009).

In Ethiopia agriculture is suffer from low productivity and increasing high man to land ratio. It is dominantly under taken by small holder farmers who are characterized by use of family labour, low productivity, low income, low degree of specialization and subsistence of farming is dominant. In Ethiopia an estimation of 20% of the small holder farmers agricultural output goes to the market (Michel, 2002). Ethiopia has a great potential in agricultural production, because of its vast area of fertile land, diverse climate, adequate rainfall and large labour force. Despite these potential, however, Ethiopian agriculture has remained under developed. To use the potential and transfer agriculture in to industry, adopts agricultural development leads to industrialization strategy since 1994/1995 (Ayele, 2006).

Bean is the most widely grown pulse, secondly to maize as food crop and major source of food security in Ethiopia (Mauyoet,al, 2007). It is readily available and popular food to both the urban and rural population in Ethiopia. In addition it is consumed by people from all income level and

service as primary source of dietary protein for people in the lower income level (Kara et, al, 2009).

The Amhara region agriculture is depends on timely and distribution of rainfall. The agriculture situation especially the productivity of Bean very low due to low soil fertility, presence of low rainfall, degradation and moisture definiteness and other factors (Anmut, 2017).

The major agricultural productions in the Berehetworeda are Bean, Teff, Maize, Barley mung bean sorghum, chickpea and Wheat (gezahagn, 2018). The researcher was motivated to deal in factor affecting bean productivity of smallholder farmers in case ofberehetwereda, since the supply of bean in the market was not efficiently exist. All of the societies also not engaged in bean production, because their motivation was constrained by low bean productivity due to different factor of bean productivity.

1.2 Statement of the problem

Bean is an important legume grown in virtually in Ethiopia. It has been considered as low status food or the" meat of the poor" due to its low cost relative to animal products. Bean provides a rich combination of carbohydrates (60-65%),protein (21-25%),fats (less than 2%),vitamin and mineral (Ensminger et,al,2011).In fact with increasing health concerns, most people especially the urban population are reducing consumption of animal protein and instead they are turning to pulse such as Bean due to its low cost.

In Ethiopia improvement in agricultural sector requires a more efficient use of natural resources such as land, labour and capital. Since these resources are major of production, a better performance of a agriculture will therefore depends on considerable constraints hindering the proper functioning of those activities. Among the major factor behind are decline in farm size and subsistence farming, land degradation, variability of rainfall, extension service and inadequate transport network are the major factor that affect agricultural output (Birhanu et,al,2011).

There are many problems in the productivity of Bean of small holder farmers like decline in farm size, subsistence farming, land degradation and inadequate information are the major factor that hinder the productivity of Bean. In addition to these problem there are also particular factor that affect the productivity of Bean such as educational level of households, non-farming

activities of households, the seeds that the household uses and that the number of oxen do have the households in east Gojjam zone, (Anmut, 2017). Raised that fertilizer, educational level, irrigation, number of oxen-per day, have the positive relationship with productivity of Bean while family size and market distance have negative relationship with productivity of Bean (Tekleab ,2013). Thus, this study woud be examined factor that affect the productivity of Bean in Berehetworeda north shoa, Ethiopia. Based on Berehetwereda agricultural office and the researcher observed on this area the productivity of bean in smallholder farmers exist and has factor that hinder the productivity. This study woud be done also based on the previous works of those researchers, which means those previous studies use as a source of reference to this study. This study is differing from the previous studies based on first; this study would be some recent data up to 2018/19. Second adding variables that will be expected factors that affect bean productivity which use of pesticide and manure. Thirdly there is no previous study on the study area.

1.3. Research questions

The following is the major questions that the research addressed:

What are the socioeconomics, institutional, demographic and environmental factors that affect productivity of bean in the study area?

1.4. Objective of the study

1.4.1. General objective of the study

The general objective of the study was to examined factor that affect the productivity of Bean of small holder farmers in Berehetworeda.

1.4.2. Specific objective of the study

The specific objectives of the study were described as follows:

- To identify and analysis the socioeconomics, institutional, demographic and environmental factors that affect productivity of bean in the study area

1.5. Significance of the study

This study would be basically to provideadditional literatures towards the factors that affect Bean productivity in smallholder farmers at the study area. Also it wouldgiven prior information for

government policy maker to design good agricultural policy in BerehetWoreda. Finally the study would be significant to other research to give hint use for the base line for further research onfactors that affect Bean productivity in smallholder farmers in this area.

1.6. Scope of the study

The study was limit on the factor affecting Bean(Viciafaba) productivity of smallholder farmers in Berehetworeda, North shoa zone, 2018/19. The study is focus on assessing bean productivity and factors that determined it. It is only focus on Bean productivity of smallholder farmers out of the crop available and besides it targets only smallholder farmers from the study area.

1.7 limitation of the study

In conducted this study the researcher would be faced the following short coming or limitation these are:-

- Lack of budget for different expenditure.
- Absence of previews study on this study area.
- Lack of sufficient available material and reference related with topics.
- Lack of sufficient computer to regress the model on STATA
- Inadequately prepare for the questionnaires due lack of sufficient time
- Lack of experience on research study

1.8 Organization of the paper

The paper was composed of five chapters. It starts with an introduction, encompassed the background, statement of the problem, objective, study scope and limitation and significance of the study. Chapter 2 provided an overview of the literature review on the subject matter and explained empirical studies. Chapters 3 provided a description of the study area and the methodology approach used in the study. Chapter 4 presented results and discussed of the study and finally last chapter(5) present summary, conclusion and recommendations.

CHAPTER TWO

2 LITERATURE REVIEW

2.1. Theoretical Literature Review

2.1.1. Concepts and Historical background of bean

Bean also known in the culinary sense as the broad been, fava bean, or faba been the term "fava bean" (from Italian: fava for the bean) is used in some English-speaking countries such as the US, but "broad bean" is the most common name in the UK and Australia and New Zealand. Broadbeans have a long tradition of cultivation in Old World agriculture, being among the most ancient plants in cultivation and also among the easiest to grow. Along with lentils , peas , and chickpeas, they are believed to have become part of the eastern Mediterranean diet around 6000 BCE or earlier. Beans are the largest edible seed of plant of several general of fabaceae. It is the most important food legumes for direct consumption in the world. Small holder farmers grow beans which are consumed as dry bean and snap bean (the green pods are consumed as a vegetable).

Bean demand is increasing in the world because about 2/3rd of the world population relies on a largely vegetarian diet. Furthermore, production and export of bean are increasing due to new market created in the developed world, by the increasing number of vegetarian consumer (Ferris, 2008).. Beans are related to soybean (that originates in China) having a diverged some 18 million years ago but they diverged more recently from the cowpea (southern pea).Phaseolus vulgaris is recognized by member of common names that include all dry edible bean seeds type- pino, kidney, Navy bean and different names for garden bean such as runner bean, string bean, half runners, snap bean, French and haricot bean. The bean is the member of the genus phsseolus for which there are five cultivated species but the bean is the most widely grown and the most economically important worldwide. The other four types: the scarlet runner bean (p.coccineus, known for its red/scarlet flower color); year bean (p.dumosus,akap.polyanthus,just named a species in 1995);tepary bean(p.acutifolius);and Lima bean (p.lunatus).They are listed in order of genetic similarities of the bean.in Ethiopia Broad beans(Amharic : baqella) are one of the most popular legumes in Ethiopia . They are tightly coupled with every aspect of Ethiopian life. They

are mainly used as an alternative to peas to prepare a flour called shiro, which is used to make shiro wot (a stew almost ubiquitous in Ethiopian dishes). During the fasting period in the Ethiopian Orthodox Church tradition called TsomeFilliseta, Tsomearbeå, TsomeTahsas, and TsomeHawaria (which are in August, end of February–April, mid-November–beginning of January and June–July), two uncooked spicy vegetable dishes are made using broad beans. The first is Hilibet , a thin, white paste of broad bean flour mixed with pieces of onion, green pepper, garlic, and other spices based on personal taste. The second is siljo , a fermented, sour, spicy thin yellow paste of broad bean flour. Both are served with other stews and injera(a pancake-like bread) during lunch and dinner. Baqellanifro (boiled broad beans) are eaten as a snack during some holidays and during a time of mourning. This tradition goes well into religious holidays, too. On the Thursday before Good Friday, in the Ethiopian Orthodox Church tradition tselotehamus (the Prayer of Thursday), people eat a different kind of nifro called gulban .Gulban is made of peeled, half beans collected and well cooked with other grains such as wheat, peas and chickpeas . This is done to mourn the crucifixion of Jesus Christ. Boq'ullit (boiled salted broad beans embryo) is one of the most favorite snacks in the evening, the common story-telling time in north and central Ethiopia. It is particularly favorite for the story-teller (usually a society elder), as it is delicious, and easy to chew and swallow. Ripe broad beans are eaten by passers-by. Besides that, they are one of the gift items from a countryside relative in a period close to the Ethiopian Epiphany (org/wiki/vicia_ faba).

2.1.2 Meaning of productivity

Productivity is commonly defined as a ratio between the output volume and the volume of inputs. In other words, it measures how efficiently production inputs, such as labor and capital, are being used in an economy to produce a given level of output. Productivity is considered a key source of economic growth and competitiveness and, as such, is basic statistical information for many international comparisons and country performance assessments (Paul Krugman, 1994).

Productivity is a measure of the rate at which outputs of goods and services are produced per unit of input (labor, capital, raw materials, etc.). It is calculated as the ratio of the amount of outputs produced to some measure of the amount of inputs used. Productivity measures are used at the level of firms, industries and entire economies. Depending on the context and the selection of input and output measures, productivity calculations can have different interpretations.

Improving productivity can have connotations of economizing on the use of inputs. for example, adopting efficient production processes that minimize waste. Equally, improving productivity can have connotations of yielding more output For example, using resources in activities or with technologies that generate more output. Conceptually, productivity is a „supply-side" measure, capturing technical production relationships between inputs and outputs. But, implicitly, it is also about the production of goods and services that are desired, valued and in demand. Productivity can be expressed as a physical measure (for example, number of cars produced per employee), a monetary measure (for example, thousands of dollars of output per hour worked), or an index (Paul Krugman, 1994).

2.1.3Agricultural productivity

The livelihood of a major proportion of population in the developing world is directly or indirectly connected with agriculture. World Bank reports that 2.5 billion people depend on agriculture as their main sources of livelihood and among them 1.3 billion people are small farmers and landless workers. About 75% of all world poor people live in rural areas and 86% of them work in agricultural sector for their livelihood (ECG, 2011).

Agricultural productivity growth has mired in recent era. The growth of the yield of major food grains throughout the world is about 1% per year (FAO, 2009a), whereas the recent world population growth rate is about 1.2%. Land is a scarce resource; expansion of the cultivated area is not possible in many developing countries (ECG, 2011). Accordingly, the only solution may be to increase agricultural productivity to meet the future demand for food for the growing population. Due to the limitation of cultivable fertile land and related inputs, new approach to increase future productivity growth in agriculture in most parts of the world may be intensive agricultural growth rather than extensive growth. Therefore, intensification of production and upgrading the inputs or resources use efficiency are significant key strategies along with diversification (Dixon *et al*. 2001).

The deviation between exactly possible and actual yields for most crops indicates an immense potential for increasing food as well as agricultural production by improving productivity (Zepeda, 2001). FAO expects that in the developing world about 80% increase in food production will need to come from the increase in yields as well as cropping intensity and only

20% will be obtained from the extension of arable land (FAO, 2009c). Hence, Intensification is fundamental not only to meet up the ever-increasing demand for food grains but also to condense deforestation, ecological destruction, and global warming. Agricultural productivity can play a vital role in economic growth by linking the supply and demand side (Johnston and Mellor, 1961).

For example, the agricultural sector supplies raw materials for industrial or other non-agricultural sectors and demands inputs from the modern sectors like science and information technology. In the demand side, increased agricultural productivity can raise the earnings of the rural population and thereby it may create more demand for local industrial products (Dethier and Effenberger, 2011).

2.1.4 Productivity measures in agriculture

Agricultural productivity is the measurement of the quantity of agricultural output produced for a given quantity of input or a set of inputs. There are different ways of defining and measuring productivity. For instances, the amount of output per unit of input (such as tons of soya bean per acre of land), or an index of numerous outputs divided by an index of numerous inputs (Wiebe, 2003). The quantities of output relative to the quantity of inputs are the conventional measures of productivity. If output increases at the same rate as inputs, then productivity is unchanged. On the other hand if the output growth rate exceeds the growth rate in the use of inputs, then productivity is positive. Two measures are often used. First, partial factor productivity measure, state the amount of output per unit of a particular input like land or labor, and the second total factor productivity measure. Most commonly used partial measures are land productivity, i.e., yield or output per unit of land, and labor productivity i.e., output per economically active person (EAP) or per agricultural person-hour (Zepeda, 2001).

Sometimes the indication from partial measures of productivity is not clear enough to show why production is changing. This is because different factors are responsible for changing the productivity, for example, land or labor productivity can increase due to better and more use of fertilizer, power tillers, the use of high yielding variety (HYV) and etc. To avoid such kinds of problems it is better to measure total factor productivity (TFP) to account for the accurate agricultural productivity. Hence, the measure of multifactor or total factor productivity indicates total output relative to a more comprehensive metric of all measurable inputs including land,

labor, capital, livestock, chemical fertilizers, pesticides and other purchased inputs (Alston *et al*., 2009).

It is worthwhile to note that different productivity measures are used for different purposes. For example, yield or land productivity is usually used to evaluate the success of new technology. It is also useful to determine what amount of land is required to meet the future demands of world food (Wiebe, 2003). Labor productivity is usually used for comparing productivity among sectors within or across economies (Block, 1994). It also facilitates to determine the incomes and wellbeing of people engaged in agriculture (Wiebe, 2003). The growth in TFP is usually a measure of technological advancement that can be ascribed by the development of scientific agricultural research, enhancing extension services, Agricultural Productivity and Food Security in the Developing world human capital developments such as education and the development of infrastructure and government policies (Ahearn *et al*., 1998).

2.1.5. Beans Production and Marketing in the World

In 2011, the annual production of bean was 23.3 million MT and the area devoted to the crops was 29.2 million hectare (FAO, 2013).Following the increased in demand for bean its production and area allocation is increasing in the world. The world major bean producers are India, Brazil, Myanmar and China. In 2010, China was the leading exporter of bean followed by Myanmar. In Africa, Kenya, Ethiopia, Uganda and Cameron are the largest producer of bean in their respective order and Ethiopia is the leading exporter in Africa (FAO, 2013).

2.1.6. Beans Production and Marketing in Ethiopia

Globally, in 2010 Ethiopia ranked the eleventh producer of beans and eighth in amount exported in the world. The country is the third largest producer and leading exporter of bean in Africa (FAO, 2013). Bean is one of the crops whose production and marketing could be a potential pathway for improving rural livelihoods.

Ethiopia produced 0.7 million MT of bean in 2004 and in 2010 the country's average production increased to 0.36 million MT annually. The bean is used as a source of foreign currency, food crop, means of employment, source of cash, and balance of payment and plays great role in the country farming system. An increasing trend of bean production has been observed since 2006.This could probably be attributed to a number of reason including increased use of bean as a substitute for long manufacturing crop and poor distribution and unreliability of

rainfall. Moreover, bean is important crops in various inter cropping systems in Ethiopia (Birachi et al, 2011).

Consistent production and statistics for bean are unavailable because its production is often lumped together with those of other phaseolus species. In Ethiopia, bean production is exclusively undertaken by small holder farmers using minimal purchased inputs in an area of up to 1.5 hectare per household in season (Biddchop and Dijk,2007).

2.1.7. Economic Importance of beans

The common bean is a major staple food throughout Southern Africa. It is the second most important source of human dietary protein and the third most important source of calories (Wortman et al., 1998). The crop is considered diverse in terms of its uses, ability to adapt to different environments, viability in terms of morphology and cultivation methods. Common beans can be cultivated in a monoculture, mixed stands or rotation. The crop is consumed in different forms and at different stages. The mature dry bean is consumed as a pulse and the leaf, immature pods & seeds, as vegetables hence it is an important crop for food security. It is also an important crop for food diversification as well as adding flavor to carbohydrate rich meals, like maize, etc. As a major source of protein to most Malawians, the common bean is referred to as "the meat of the poor" even though wealthy people also prefer it. The residues of the crop are often used as fodder; hence it is a very economical crop (Wortmann, 2006). Other authors also agree that beans are economical crops due to their low input requirement demands. Beans fix nitrogen in the soil and this reduces the demand for nitrogen fertilizer to be used, hence cutting down input costs (Snapp et al., 1998).

Common beans are an important cash crop as they provide a good source of income for many Malawians (Chirwa et al., 2007). About 40% of Africa's total production of common beans is marketed at an annual value of US$ 452 million even though the production is largely for subsistence and mainly grown by women (Hillocks et al., 2006). Generally, legumes are considered profitable compared to other crops since they have a short duration to mature and thus provide quick revenue.

Production of common beans in the country has been improving. For instance, in 2006 the country's production of dried beans was at 117,274 metric tons and in 2009, the production rose

to 171,420 metric tons (FAO, 2011). It is incorrect to assume that the increase in production is equivalent to increase in productivity or yield. The crop's national average yield still remains low, explaining why people are still food insecure and malnourished. Therefore there is still a need to increase production to meet the growing population and to address food security.

2.1.8. Factor affecting bean productivity

In developed countries, agricultural production has significantly increased with the proportion of the population in the sector decline. On the other hand the economy of the low income countries of the world is predominantly agrarian with traditional system in extremely low labor productivity in agricultural sector. Consequently it is better to outline factor affecting agricultural output especially bean production by using the method of arrangement.

2.1.8.1. Demographic characteristics of farm operators

The demographic characteristic consists of many variables that affect agricultural production of farm operators. Some of these variables are: gender, age, educational level and family size of households.

Education and agricultural productivity

Research finding have indicated the importance of education in agricultural production. For example Asfaw and Admassie (2004) reported that the conventional factor of production such as growth of stock of capital and labor were unable to explain fully the growth in national income. The contribution of education to the growth of national income was recognized in the 1960s.To achieve agricultural development the investment in production techniques and technology should be supported by a comparable investment in human capital (Bingen et al, 2003).

Formal education enhance farmers engagement in environmental program and method for the sustainability of agriculture (Burton, 2013).Education is also believed to stimulate economic growth by enhancing the productive capacity of farmers as well as eliminating the customs that are contrary to growth such as traditional world of mouth communication method (Asfaw and Admassie,2004).

Age, family size and agricultural productivity

Agricultural production is influenced by other demographic characteristics such as age and family size. The age of households head is a proxy variable for the farming operator. Younger

farmers are more productive than older farmers that lack the required physical strength on the farm and lower the probability of technology adoption (Mussa et al,2011).

The household with larger families have a large labor force and produce more and the productivity increase.

2.1.8.2 Socioeconomic factors influencing agricultural productivity

Kilanzi(2011) says that socioeconomic factor are the matters arising from an increase in population access to properties such as land, and access to farm inputs. The socioeconomic factor consists of variables that affect agricultural production of bean of operator farmers. These variables are: off farming activity, amount of land holding (land holding size), number of oxen the farmers possess.

Land is the most critical natural resource for countries like Ethiopia where the agricultural sector is the engine of the national economy (Amsalu et al,2006).From operator with larger land holding size would have a better farm income if sufficient family labor was available. This leads to children who can work on the land (Park,2009).it is continuous variable measured by hectare and positive impact on productivity

Number of oxen the farmers possess: historically, for thousands of years oxen have been recognized as the first draft animal to serve human beings to cultivate land and pull heavy loads (Bryant, 2010). The number of oxen possession determines the farming ability of farm operators because if farmers don't have a number of oxen they would be obliged to rent out their land to other farmers (Holden et al, 2004). Numbers of oxen owners can cultivate and sow their land at the right time and it have a positive impact on productivity.

Off farming activities is an opportunity for an alternative source of income strategy because the demand for labor in the agricultural sector varies from peak to off peak seasons (Chaplin et al, 2003). Off farming employment helps farmers to get working capital and secure income to finance inputs in a credit constrained situation (Lopez et al,2009). Off farming activity affects productivity negatively because if the off farming activity income of farmers increase they go into off farming activity rather than farming.

Improved seeds: In combination of fertilizer, improved variety of seeds are critical agricultural inputs that help farmers to obtain improved agricultural yields. The productivity and value of crops is improved through the genetic manipulation of selective breeding (Zimba et al, 2008). Moreover, formal sector supplied improved seeds should fulfill certain quality standard set by

the national regulations (Bishaw et al, 2012).Seeds that fulfill quality requirements have a positive effect on the productivity.

Manure: is organic matter, mostly derived from animal feces except in the case of green manure, which can be used as organic fertilizer in agriculture. Manures contribute to the fertility of the soil by adding organic matter and nutrients, such as nitrogen, that are utilized by bacteria, fungi and other organisms in the soil. Higher organisms then feed on the fungi and bacteria in a chain of life that comprises the soil food web. That expect manure affects bean productivity positively because if small house hold farmers use manure as a fertilizer and also increase production of bean.

A pesticide:is any substance used to kill, repel, or control certain forms of plant that are considered to be pests. Pesticides include herbicides for destroying weeds and other unwanted vegetation, insecticides for controlling a wide variety of insects, fungicides used to prevent the growth of molds and mildew, disinfectants for preventing the spread of bacteria, and compounds used to control mice and rats. So the small holder farmer use of pesticide to improve productivity of bean and expected that it have a positive impact on productivity.

Farmer's health: Good health essentially affects the production of farmers in the agriculture sub-sector. Health enhances work effectiveness and the productivity of an individual by increasing the physical and mental capacity of people (Ulimwengu, 2009). Healthier and better nourished people are more likely to be more productive than unhealthy people (Appleton, 2002). Illness is one of the major problems that hamper the production of agriculture. A mere observation can show that due to poor infrastructure and insufficient health access in most of the rural areas people should travel long distances in order to get a medical care. Besides, the existing services within health institutions are not up to the standard. In the situation where there is poor health, there will be loss of labor hours that lead to low level of productivity in the agricultural production (meseret, 2012) based this expect that it have a positive impact on bean productivity. .

2.1.8.3. Institutional factors that affect agricultural productivity

The institutional facilities that affect agricultural productivity especially bean productivity are: extension service, access of credit, fertilizer adoption and improved seeds.

Extension service: the main task of extension agent is to support and encourage farmers to enhance their productivity (Adesoji, 2009).They are responsible for translating the finding of the research institute to the farmers and sending the agricultural challenges of farmers back to the research institute (Ajani &Onwubuya,2013).The communication approaches and channels used by extension agent influence farmers to adopt new innovations (Akinbile,2008). Therefore, if the farmers get extension service from extension agent, the productivity of the bean will be increase.

Access of credit: agricultural credit is described as a banking finance for primary production, processing and trade of agricultural products, and the production and distribution of inputs (Mamalis et al,2011). Small holder farmers may have access to credit from microcredit institute which do not have the collateral requirements. A farmer who gets access of credit is more productive than a Farmer that does not get access of credit.

2.1.8.4. Environmental factors that affect agricultural productivity

Environmental factors influence agricultural production and therefore the income of farm operators. The environmental factors included rainfall, erosion, vegetation and soil type of the area. The extension and intensification of agriculture has contributed to climate change by accounting for between 25 and 30 percent of global greenhouse gas emissions (Janury,2010).Kintomo et al,(2008) stated that one of the course of the reduction in productivity and environmental quality is the intensive land use of farm operators.

Soil erosion and vegetation: it is one of the challenges of agricultural productivity especially in area where there is poor vegetation cover and the soils are not resilient (Powlson et al,2011). In Ethiopia, soil erosion has contributed to the existing problem of food insecurity and is becoming a real treat to the sustainability of the country's dominantly subsistence agricultural system (Bewket et al,2011). The major causes of soil erosion are water, wind and tillage (Powlson et al,2011). The soil erosion leads to the decreasing of the fertility of the soil and it causes the agricultural productivity.

2.2 Empirical literature

Many finding was undertaken to find out the factor affecting agricultural productivity from them.In Ethiopia different finding takes place on the factor affecting of agricultural productivity. The study done by Belay kejela,(2005) by using multiple linear regression model on the productivity of small holder farmers, according to his study number of oxen, improved seeds and

fertilizer as a factor affecting productivity of small holder farmers. Similarly study taken by Senai Haiku, (2006) finds the determinant of agricultural productivity in Ethiopia. Find out land, labor and fertilizer significant factor determining agricultural productivity.

A study conducted by Kilonzi,(2011) further says that through education one is enabled to get information through reading and listing. The level of education of an individual affects productivity and income.

Berhanu et al,(2009) conducted a study on small holder farmers, institutional service and commercial transformation in Ethiopia based on OLS estimation method. The result shows that the use of improved seeds, fertilizer and households involved in the extension program, literate household and access to credit are positively related with crop productivity.

Tekleab(2013) studied on analysis of the determinants of crop productivity of small holder farmers. The data was collected from both primary and secondary sources and it is analyzed through both descriptive and econometric (multiple linear regression) model.

Nyagaka et al (2009) further found a positive effect between extension service and agricultural productivity. This is consist with findings by Mbanasor and Kalu(2008) implies that the more extension visits a Farmer accessed from the extension workers;the more economic productive they become.

Bravo-ureta and Pinheiro(1997) further found that age of the farmers had a negative effect on productivity. It was found that younger farmers were more productive than older farmers in the study area.

CHAPTER THREE

3 Methodology of the study

3.1. Description of the study area

berehet is one of the woreda in the Amhara region of Ethiopia part of the semien Shewa zone.It is bordered on the south the germamariver,on the west by hageremariamkesem, on the north by asagrt, ,on the east by afar region latitude 90º 19’ 60.00N and longitude 39º 29’ 59.99’’E.the major town in berhet is metitehbila.

This area has sub tropical weather “Weynadega”, high land temperature type “Dega” and low land temperature type “Kola” accounting 17%, 3% and 80% of the climate respectively. The woreda is located at 220 km east of Addis Ababa the capital city of Ethiopia. The mean annual temperatures and rainfall rages between 18 to 33 °C and 750 to 850 mm respectively. The altitude of the area ranges from 1000 to 3200 meter above sea level. Mixed farming is the main economic activities of the woreda 80% common agricultural crops like beans, peas, wheat, barley, sorghum, corn, and teff are cultivated in the area (gezahagn,2018).

Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda has a total population of 34,810, an increase of 13.07% over the 1994 census, of whom 17,669 are men and 17,141 women; 3,978 or 11.43% are urban inhabitants. With an area of 791.44 square kilometers, Berehet has a population density of 43.98, which is less than the Zone average of 115.3 persons per square kilometer. A total of 7,658 households were counted in this woreda, resulting in an average of 4.55 persons to a household, and 7,221 housing units. The majority of the inhabitants practiced Ethiopian Orthodox Christianity, with 79.62% reporting that as their religion, while 20.19% of the population said they were
Muslim.

3.2 Types and sources of data

The data for this study would be gathered from both primary and secondary data.

3.2.1 Primary sources of data

These includes the information would be received from individual directly concerning the problem for the study that would be from the selected sample Keble's of small holder farmers that produce Bean in the study areaand extension workers . The primary source of data would be collected through the interviews if it was necessary used telephone, questionnaires carefully designed for the purpose study and the collected data would be presented by using table, frequency, mean, maximum, minimum, standard deviation and percentages. The respondents in this study would the selected sample two Keble's that produced Bean in the study area.

3.2.2. Secondary sources of data

This type of data source would be gathered from necessary published books, internet, from previous studies on the related topics and from berehetworeda agricultural office. This source of data would be used because to strengthen the information required and proposes necessary suggestions for the problems.

3.3. Sample size and Sampling technique of the study

Two stage sampling techniques were followed with a combination of purposive and simple random sampling techniques used to select the 2 Keble's and the sample household heads. In the first stage purposive sampling technique would be used to select 2 Keble's from the total of 10 Keble's since it would be difficulted to collect information from all the woreda of the study area. In the second stage simple random sampling technique would be used to select sample households from the selected two sample Keble's. Simple random sampling technique would be preferred, because in order to avoid bias and ambiguity with in data collection and to minimize cost. Since the collection of data from the whole Keble's is difficult, costly and time consuming.

The sample size for this study would be determined based on Yamane (1967) since the population is homogeneous in a population system. The simplified formula provided by Yamane was used to determine the required sample size at 10% level of significance. The formula to determine sample size of the study was specified as;

Where, n=sample size

N=total number of Bean producer farmer in the selected 2 Keble's.

e=level of significance (9%).

N=663+821

N=1484

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

$$\boldsymbol{n = \frac{1484}{1 + 1484(0.09^2)}}$$

$$n = \frac{1484}{1 + 12.0204}$$

$$n = 113.97 \qquad n \sim 114$$

Table 1, Distribution of the sample in Keble's and total sample size

Sample Keble's	Total number of Bean producer farmers	Sample size Number
07(sede'as)	663	114
05(shegga)	821	
Total	1484	

Source; -berehetworeda agricultural office.

3.4. Method of data analysis

The collected data using the questionnaires would be entered, organize, summarise and categorically analyse by using both descriptive and econometric analysis. In the descriptive analysis of this study, frequency, standard deviation, minimum, maximum, percentage, mean and table would be used. Descriptive analysis used in this study because it would be important to have a clear picture of the characteristics of the sample units and to compare and contrast different categories of sample units with respective to the desired characteristics.

In econometrics analysis in this study ordinary least square (OLS) would be used to analysis factors affecting productivity because the OLS estimator is known as best, linear, unbiased estimator (BLUE) under the validity of a particular set of assumptions. The underlying OLS assumptions are as follows: (1) the variance of independent variables is the same all over the ranges; (2) the variance of error term value is approximately the same over all ranges of independent variables; (3) the expected value of each disturbance (error term) is equal to zero. However, when these assumptions are violated, this would weaken the validity of the results obtained from the regression (Fred *et al.*, 2012).the ordinary least square (OLS) estimation techniques would be employed in the form of multiple linear regression models. The reason why chose was ordinary least square method of estimation?

The dependent variable in this study was quantitative or continuous variable and bean productivity was determined by more than one variable.

- ✓ , Ordinary Least Squares (OLS) method was widely used to estimate the parameter of a linear regression model. OLS estimators minimize the sum of the squared errors (a difference between observed values and predicted values),
- ✓ OLS regression was particularly power full at it relatively easy to also check the model assumption such as: linearity, constant variance, heteroscedastity, normality, non-stochasticity, no autocorrelation and estimated value of mean zero etc.

3.5. Model Specification

Mentioned earlier the study would be applied econometric tools in order to analyse factor that affect Bean productivity of small holder farmers. To analyse the correlate of Bean productivity the multiple linear regression model would employed with the dependent variable quantitative or continuous variable.

3.5.1 Theoretical framework model

The dependent variable which is the quantity of Bean productivity wasafunction of explanatory

Q=f (age, number of oxen, off farm, access of credit, education, manure, farm size, pesticide, extension service, farmers level of income).

Where Q= output-input ratio of bean productivity

Therefore quantity of Bean productivity was a function of age, number of oxen, off farm, access of credit, education, manure, farm size, pesticide, extension service, and income level of smallholder farmers.

3.5.2. Empirical framework model

The specific econometric model for this study would be;

Yi=f (age, number of oxen, off farm, access of credit, education, manure, farm size, pesticide, extension service, farmers level of income, μi).

For estimation purpose this equation can be expressed in linear form as;

$$Q = B0 + \beta 1age + \beta 2Nox + \beta 3offm + \beta 4acr + \beta 5edu + \beta 6fso + \beta 7ext + \beta 8ma + \beta 9imc + \beta 10pesticide + Ui$$

Where, Q1b=quantity of Bean produced measured in quintal

μ0=is the intercept parameter or constant

(β0, β1.....β10)=are parameters of the model

age=age small household farmers of heads

Nox=small household farmers number of oxen owned

offm=off farm activity of small household farmers

acr=small household farmers access of credit

edu=educational level of small household farmers

fso=small household farmers farm size owned

ext=extension service that the farmers get access from extension workers

ma= small household farmers used of manure

inc=small household farmers amount of income

Pesticide=small household farmers used of pesticide

βi=is the error term

3.6. Description of variables and expected sign

3.6.1 Dependent variable

Dependent variable (Q1b):- **bean productivity**: was the dependent variable that was measured by output input ratio. That means, bean productivity would be obtained by dividing the total bean production in quintal of each household by the cultivated land of each household.It was the dependent variable in the model and the physical yield of Bean production that yield in quintal.

3.6.2 Independent variables

Age of household heads (Age):-It is defined as the number of years of the household since birth until the survey is conducted. It is a continuous variable measured in years that is older farmers are less productive than young farmers. Therefore, the expected effect is negative on productivity.

Number of oxen owned (NOx):-It is a discrete variable represented by the number of oxen owned. Household who used more number of oxen have a better performance in production of Bean. According to Endrias et al (2013) the relationship between oxen holding and productivity of bean was positive. Therefore, it is expected to have a positive effect on Bean productivity of small holder farmers.

Off farm activity (Offm): - It is a dummy variable which take the value 1, if the household head engaged in off farming activity and otherwise 0. It is the activities of Farmer other than farming practice like trade, animal husbandry, bee .....etc. When the off farming activity income of farmers increase the farmers can go in to off farming activity rather than farming then productivity of bean decrease. A study done by Hagos (2014) indicated that off farming activity have a negative on agricultural productivity due to farmers spend more time on non-farm activities relative to farm activities. Therefore, it is expected to have a negative effect on the productivity of bean.

Credit access (Acr):-It is a dummy variable which takes the value 1, if the household head has a credit access and 0, otherwise. Access a credit means having a potential to buy inputs in Cash if the loan is money. Therefore it is expected to have a positive impact in the production of Bean.

Educational level of household heads (Edu):-It refers to the formal schooling of household head during the survey period. Those household heads that had formal education determines the readiness to accept new ideas and innovations. It is a continuous variable measured in years of formal schooling. A study done by Fantu et al (2012) argued education level of household heads and agricultural productivity has a positive relationship. Therefore, this variable assumed to have a positive impact on Bean productivity.

Farm size owned to the farmers (FSO):-This variable corporate the total amount of cultivated land. A Farmer who has larger farm land can get higher products than farmers with small plot of land. Larger farm land is also important tools for farming purpose (Abebe, 2011). Therefore, this variable assumed to have a positive impact on Bean productivity.

Extension service that the farmers get(EXT):-It is dummy variable which takes a value 1,if the household head made contact with the extension workers and receive extension service during 2017 production period and 0,otherwise. Access to extension agent will increase farmer's awareness and information on the importance of mechanized farming. Therefore, this variable assumed to have a positive impact on Bean productivity.

Pesticide:- it is dummy variable which takes a value 1, if the household farmers use pesticide and otherwise 0 that expected hasa positive impact on Bean productivity.

Manure (Ma):- it is animal dung or waste matter from animal that is spread over or mixed with the soil to help plants and crops grow as modern fertiliser .it continuous variable measured in quintal.

Farmers amount of income (inc): Money or other forms of payment (received periodically or regularly) from commerce, employment, endowment, investment, royalties, etc and Consumption that, at the end of a period, will leave an individual with the same amount of goods (and the expectations of future goods) as at the beginning of that period. Therefore, income means the maximum amount an individual can spend during a period without being any worse off.It is continuous variable measured in number and farmers have more income he/she buys more amount of input including ox and then productivity of bean increase but less amount off income buy less input that leads to bean productivity decrease.Therefore, this variable assumed to have a positive impact on Bean productivity.

CHAPETER FOUR

4. DATA ANALYSIS AND DISCUSSION

This chapter presented the result of the descriptive and econometric analysis. The descriptive analysis made use of tools like frequency and percentage employed to compare some explanatory variables. Econometric analysis was carried out to identify the factors that affect productivity of bean by small holder farmers and to measure relative important significance explanatory variables on productivity by small holder farmers.

4.1 Descriptive analysis

4.1.1 Demographic characteristics

Table 1; Distribution of respondents by age

Age	Frequency	Percentage
20-30	41	35.96%
31-40	26	22.8%
41-50	24	21.05%
>50	23	20%
Total	114	100%

Source; own survey, 2019

As it shown in the above table that from the total bean producer small holder farmer's 26 (22.8%) of respondents were found the age between 31-40, 41(35.96%) of respondents were found between the age of 20-30, 24(21.05%) of respondents were found the age between 41-50 and the remaining 23(20%) of respondents were found greater than 50 years. Most of the farmers who are engaged in the production of bean are seem to be adult farmers in the study area, those who are more productive rather than the old ones.

Table 2;Distribution of respondents by educational level

Educational status	Frequency	Percentage
Illiterate	46	40.35%
Primary (1-4)	21	18.4%
Primary (5-8)	21	18.4%

Secondary (9-12)	26	22.8%
Total	114	100%

Source; own survey, 2019

Education has its own impact on productivity, which means that households have no more knowledge to perform agricultural activity ineffective way if they are uneducated. Even it takes a long period of time to adopt and develop new production system. As it was shown in the above table that from the total bean producer small holder farmers about 46(40.35%) of farmers are illiterate followed by 26(22.8%) of farmers are attends secondary school education (9-12) followed by21(18.4%) of farmers attends primary school education (5-8) and 21(18.4%) of farmer attends primary school education (1-4).

4.1.2 Socio-Economic characteristics of households

Table 3; Distribution of respondents by number of oxen owned.

Number of oxen	Frequency	Percentage
1	29	25.43%
2	43	37.71%
>2	42	36.84%
Total	114	100%

Source; own survey, 2019

From the above table 4.1.3 among the total respondents 29(25.43%) of respondents has 1 ox, 43(37.71%) of respondents have 2 oxen and 42(36.84%) of respondents have more than 2 oxen. From this the researcher observed that majority of respondents have 2 oxen.

Table 4: Distribution of respondents by farm size

farm size	Frequency	Percentage
1-2	66	57.89%
3-4	44	38.59%
>4	4	3.5%
Total	114	100%

Source; own survey, 2019

As it was shown in the above table that from the total bean producer small holder farmers about 66(57.89%) of farmers possess 1-2 hectare lands followed by 44(38.59%) of farmers have owned 3-4 hectare lands and the remaining 4(3.5%) of farmers have more than 4 hectare lands.

Table 5; Distribution of respondents by engagement in off farming activity

Did you engaged in off farming activity	Frequency	Percentage
Yes	56	49.12%
No	58	50.87%
Total	114	100%

Source; own survey, 20199

In advance to the study the result of the above table is indicated that from the total sample of bean producer small holder farmers about 49.12% of respondents are participated in off farming activity and the remaining 50.87% of respondents are not participated in off farming activities in 2018 production season.

Table 6: Trend of bean production of respondents in year to year

Bean production	Frequency	Percentage
Increasing	70	63.8%
Decreasing	29	26.6%
Constant	15	9.6%
Total	114	100%

Source; own survey, 2019

As the above table indicates that from the total respondents 60(63.8%) of respondents have increasing trend of Bean production through year to year, 25(26.6%) of respondents have decreasing trend of Bean production through year to year and the remaining 9(9.6%) of respondents have constant trend of Bean production through year to year.This implies that the majority of respondents have increasing trend of Bean production through year to year.

Table 7: Distribution of respondents by use f pesticide

Did you use pesticide	Frequency	Percentage
Yes	59	65.75%
No	55	48.24%
Total	114	100%

Source; own survey, 2019

In advance to the study the result of the above table is indicated that from the total sample of bean producer small holder farmers about 65.75% of respondents are use pesticide and the remaining 48.24% of respondents are not use pesticide 2018 production season.

Table 8: Distribution of respondents by use of manure

Use of manure in quntal	Frequency	Percentage
1-20	73	64.03%
21-30	21	18.42%
31-40	7	6.14%
>40	13	11.4%
Total	114	100%

Source; own survey, 2019

manure has its own impact on productivity, which means that households have no use manure for agricultural production the output also decrease or the farmer incur additional cost for modern fertilizer. As it is shown in the above table that from the total bean producer small holder farmers about 73(64.03%) of farmers are 1-20 quintal use manure followed by 21(18.42%) of farmers are 21-30 quintal use manure followed by 13(11.4%) of farmers >4 quintal use manure and 7(6.14%) of farmer 31-40 quintal use manure .

Table 9: Distribution of respondents by income level

Income level	Frequency	Percentage
3000-10000	48	42.1%
10100-20000	25	21.92%
20100-30000	6	5.26%

>30000	35	30.7%
Total	114	100%

Source; own survey, 2019

Income has its own impact on productivity, which means that households have no more income to buy agricultural input and to employ labour the productivity not enough or the farmers are non-productive or enter into debit. As it is shown in the above table that from the total bean producer small holder farmers about 48(421%) of farmers are between 3000-10000 income level followed by 35(30.7%) of farmers are between >30000 income level followed by25(21.92%) of farmers between 10100-20000 income level and 6(5.26%) of farmer between 20100-30000 income level.

4.1.3 Institutional characteristics

Table 10: Distribution of respondents by extension service

Did you get extension service	Frequency	Percentage
Yes	60	52.63%
No	54	47.36%
Total	114	100%

Source; own survey, 2019

As it shown in the above table that from the total bean producer smallholder farmers around 60(52.163%) of respondents are got enough knowledge about the farming activities from extension service agents, and the remaining 54(47.336%) of farmers does not get extension service about the farming activities from extension service agents.

Table 11: Distribution of respondents by credit access

Did you get access of credit	Frequency	Percentage
Yes	78	68.42%
No	36	31.57%
Total	114	100%

Source; own survey, 2019

As it shown in the above table from the total bean producer small holder farmers around 78(68.42%) of respondents who produce bean are get credit service from different governmental and nongovernmental organization and the remaining 36(31.57%) of respondents who produce bean are not get credit access from those organization. This implies that from the total respondents' majority of respondents got access of credit from different organization.

4.1.4 Environmental characteristics

Table 12: Distribution by the soil fertility status

Soil fertility status	Frequency	Percentage
Fertile	69	73.4%
Non fertile	25	26.6%
Total	94	100%

Source; own survey, 2018

As shown in the above table that from the total sample respondents 73.4% of the respondents respond that as they have fertile soil and the remaining 26.6% of the respondents informed that as they have not fertile soil. Therefore, the result indicates that the soil fertility status of the study area is almost fertile.

Table 13; the distribution of output of bean in 2017 cropping season

Total output in quintal	Frequency	Percentage
2-4	68	59.64%
5-7	22	19.29%
8-12	24	21.05%
Total	114	100%

Source; own survey, 2019

As the survey indicated that the farmer output is depend on some factors as a proposal implies but in this case from the total respondents 68(59.64%) of respondents produce 2-4 quintals, 22(19.29% of respondents produce 5-7 quintals and the remaining 24(21.05%) of the total

respondents produce 8-12 quintal bean. From this majority of respondents produce 2 up to 4 quintals of Bean during 2019 cropping season.

summary statistics to continuous variables and Bean output

```
. sum
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Qb	114	9.990833	4.537384	2.75	19
age	114	37.37719	11.58836	20	65
Nox	114	2.210526	1.100874	0	5
offm	114	.4912281	.5021302	0	1
acr	114	.6754386	.4702779	0	1
fso	114	2.174123	.896064	.5	5
edu	114	4.377193	4.360706	0	12
ext	114	.5350877	.5009694	0	1
pesticide	114	.4912281	.5021302	0	1
Ma	114	16.45614	14.37435	0	50
Inc	114	25047.11	28574.24	3000	160000

The above table shows that age and educational level of household heads are demographic factors number ox owned, farm size owned ,off farming activity ,use of pesticide , use of manure and level of income are socio-economics characteristics and extension service and credit access are institutional characteristics thus affects the productivity of bean.

Age; - the age of the households are 37.37 years on average and standard deviation are 11.58 which shows the variation of households on age. The maximum ages of households in the study area is 65 years and the minimum ages of respondents are 20 years.

Educational level of household heads (edu); -as shown in the above table the average number of years of schooling for the respondent is 4.37 years and the variation of years of schooling between respondents is 4.36 years. The maximum years of schooling (grades) of respondents are grade 12 or 12 years and the minimum years of schooling (grade) is 0 year.

Number of oxen owned(Nox);- From the above table the average number of oxen that the household have almost 2 oxen and the standard deviation were almost 1 which shows the

variation of the number of oxen of the respondents in the study area. The maximum number of oxen owned of house hold farmers in the study area 5 and the minimum 0.

Farm size owned(FSO);-the respondents have 2.17 hectare of total cultivated land on average and the variation of total cultivated lands between respondents are 0.89 hectare land. The maximum total cultivated land size is 5 hectare and the minimum cultivated land is 0.5 hectare.

Productivity of bean(Qb); - The average level of productivity is 9.99 quintal/input bean is produced in 2018 and the productivity variation between the respondent is 4.53. The maximum level productivity of bean is 19 quintal, while the minimum level of productivity bean is 2.5 quintal.

Use of manure(INC); the respondents use manure on average 16.45 quintal and the varetion of between thus 14.37.the maximum manure is 50 quintal and the minimum is 0 use by the small holder farmers .

Income of household;From the above table the average number of level of income that the household have 25047.11 and the standard deviation is28574 which shows the variation of level of income the respondents in the study area. The maximum level of income of households farmers is 160000 in the study area and the minimum is 3000.

4.1.5 Secondary data source of berehetworeda from agricultural bureau and rural development office (2008-2010).

Table 4.1.17: trend of Bean production

Number of years	Cultivated land (hectare)	Production in quintal	Production in quintal per hectare
2010	68.5	729.5	16.92
2009	79.43	1277.5	16.08
2008	88	718	8.1

Source;berehetworeda agricultural bureau and rural development office (2008-2010)

As shown in the above table 4.1.15, productivity of bean and cultivated land increases from time to time even though reduction in total cultivated production of bean from year to year.

4.2 Econometric analysis

This section presented factor affecting Bean productivity of small holder farmers by using ordinary least square (OLS) estimation technique. So as to identify the major factors that affect Bean productivity in the study area, the dependent variable regressed against various explanatory variables.

```
. reg Qb age Nox offm acr fso edu ext pesticide Ma Inc
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Source	SS	df	MS		
Model	1915.14527	10	191.514527	Number of obs =	114
Residual	411.282376	103	3.99303277	F(10, 103) =	47.96
				Prob > F =	0.0000
				R-squared =	0.8232
				Adj R-squared =	0.8060
Total	2326.42765	113	20.5878553	Root MSE =	1.9983

Qb	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
age	-.1467756	.0283683	-5.17	0.000	-.2030375	-.0905137
Nox	.5621438	.2998807	1.87	0.064	-.0325989	1.156886
offm	1.090133	.7571907	1.44	0.153	-.4115762	2.591842
acr	.8069285	.4724825	1.71	0.091	-.1301291	1.743986
fso	.5413664	.2232138	2.43	0.017	.0986746	.9840583
edu	.181073	.07509	2.41	0.018	.0321497	.3299963
ext	-.5509325	.6309115	-0.87	0.385	-1.802197	.7003317
pesticide	.3478677	.5914125	0.59	0.558	-.8250596	1.520795
Ma	.0708015	.0216001	3.28	0.001	.0279628	.1136402
Inc	.0000334	8.68e-06	3.84	0.000	.0000161	.0000506
_cons	9.307254	1.827444	5.09	0.000	5.68295	12.93156

4.2.1 Goodness of Fit of the Model or R^2

The goodness of fit of the model is measured by coefficient of determination, which shows the percentage or power of explained variable to express by the explanatory variables.As the above regression result table shows that $R^2 = 0.823$, which implies 82.3% of productivity function is explained by the selected ten (10) explanatory variables. In other words 82.3% of variation of the dependent variable is due to the variation of the independent variable which are included in the model and the remaining variation 0.177 (17.7%) is explained by the variable which are not included in the model or explained by the error term.

The overall significance of the variable is tested by Prob> F. If Prob> F less than0.05 (5%) then the explanatory variables included in the model are jointly statistically significant and the explained variable. As a result show Prob> F= 0.0000 then, it is statistically significant.

4.2.2 Multicolleanarity test

vif

Variable	VIF	1/VIF
offm	4.09	0.244445
Nox	3.08	0.324229
age	3.06	0.326974
edu	3.03	0.329569
ext	2.83	0.353724
Ma	2.73	0.366553
pesticide	2.50	0.400692
Inc	1.74	0.574462
acr	1.40	0.715721
fso	1.13	0.883292
Mean VIF	2.56	

The existence of multicollinearity might cause the estimated coefficients to have wider confidence interval, higher R^2 with insignificant t-ratios and wrong signs that might lead to wrong conclusion. Accordingly, if multicollinearity exists between variables, it does not give sense in economic meaning in this case dropping one of the variables that has high vifvalue is a remedial option from other different alternatives. Moreover, it is difficult to assess the separate influence of each independent variable with multicollinearity in CLRM. The problem of multicollinearity must be checked, and if it exists, some remedial measures must be taken (Gujrati,2004).

In this estimation the most familiar test of detecting the problem of multicollinearity has been used. Accordingly, the result clearly shows that there is no problem of multicollinearityamong variables since the value of VIF for all variables is below the rule of thumb value (10). If the value of VIF for any variable is greater than 10, then we would say there is a serious problem of multicollinearity. However, the VIF value is far less than 10, implying that no danger or there is no severing multicollinearity. From the result there is no the problem of multicollinearity since vif=2.56<10.

4.2.3 Heteroscedasticity test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Qb

         chi2(1)      =     4.36
         Prob > chi2  =   0.0369
```

One of the important assumptions of the CLRM is that the variance of each disturbance term U_1 conditional on the chosen value of explanatory variables is a constant number equal to δ^2. This is the assumption of homoscedasticity, or equal or homo spread, that is, equal variance. However, if the conditional variables of the explained variables continuously increase or decrease as the value of the explanatory variable change, then the problem of heteroscedasticity is encounter. This is the case, as homoscedasticity is one of the requirements of OLS estimation, estimation of population parameters using CLRM will fail to be acceptable. The estimation of population parameters will not be constant. To test it, the study has taken Breuch Pagan test and robust standard error correction measure (Gujirat,2004).

The result shows that the presence of heteroscedasticity problem since the prob>ch2 is less than 5% (3.69%<5%) So that in order to avoid the problem of heteroscedasticity robust standard error correction measure is made as follows

```
. reg Qb age Nox offm acr fso edu ext pesticide Ma Inc,robust

Linear regression                               Number of obs =     114
                                                F( 10,   103) =   75.14
                                                Prob > F      =  0.0000
                                                R-squared     =  0.8232
                                                Root MSE      =  1.9983
```

Qb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
age	-.1467756	.0353035	-4.16	0.000	-.2167918	-.0767594
Nox	.5621438	.337627	1.66	0.099	-.1074598	1.231747
offm	1.090133	.7177146	1.52	0.132	-.3332847	2.513551
acr	.8069285	.4360074	1.85	0.067	-.0577894	1.671646
fso	.5413664	.2569728	2.11	0.038	.0317214	1.051011
edu	.181073	.0831613	2.18	0.032	.0161421	.346004
ext	-.5509325	.6200176	-0.89	0.376	-1.780591	.6787262
pesticide	.3478677	.7022207	0.50	0.621	-1.044822	1.740557
Ma	.0708015	.0296862	2.39	0.019	.011926	.129677
Inc	.0000334	.0000104	3.19	0.002	.0000126	.0000541
_cons	9.307254	2.171561	4.29	0.000	5.000475	13.61403

The problem of heteroscedasticity is avoided or there is no heteroscedasticity after robust test.

```
. imtest

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	84.03	61	0.0270
Skewness	29.90	10	0.0009
Kurtosis	0.02	1	0.8777
Total	113.96	72	0.0012

Imtest is white's test it the null hypothesis that the variance of the residuals is homogenous

H0; homoscedasticity

H1; heteroscedasticity

Therefore if p-value is very small we would have to reject the null hypothesis and accept the alternative hypothesis that the variance is not homogenous (i.e heteroscedasticity) so as the above result p-value is very low and reject H0 accept H1(heteroscedasticity).

4.2.4 Normality test

```
. predict resid,residual

. swilk resid
```

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
resid	114	0.99183	0.753	-0.635	0.73728

```
. swilk Qb age Nox offm acr fso edu ext pesticide Ma Inc
```

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
Qb	114	0.95206	4.418	3.319	0.00045
age	114	0.94155	5.386	3.762	0.00008
Nox	114	0.98728	1.173	0.356	0.36108
offm	114	0.99916	0.077	-5.729	1.00000
acr	114	0.98965	0.954	-0.105	0.54185
fso	114	0.98360	1.511	0.923	0.17809
edu	114	0.96288	3.421	2.748	0.00300
ext	114	0.99945	0.051	-6.650	1.00000
pesticide	114	0.99916	0.077	-5.729	1.00000
Ma	114	0.94825	4.769	3.490	0.00024
Inc	114	0.72021	25.783	7.261	0.00000

```
. histogram resid
(bin=10, start=-4.7191596, width=1.05741)

. sktest resid
```

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
resid	114	0.9311	0.6497	0.21	0.8986

The model assumes that the random variable u has a normally distributed. Symbolically: $u \sim N(0, \delta^2 U)$, which reads as: u is normally distributed around zero mean and constant variance $\delta^2 u$. This means that small values of u's have a higher probability to observed than large values. This assumption is necessary for constructing confidence intervals. If the assumption of

normality is violated, the estimates of parameters are still unbiased but the statistical reliability by the classical tests of significance of the parameters cannot be assessed because these tests are based on the assumption of normal distribution of the u. The normality test adopted imtest for normal distribution. This test computes the skewness, heteroscedasticity and kurtosis measures of the OLS residuals and it follows the chi square distribution (Gujarati, 2004). From the above stata 12 result Shapiro-Wilk W test for normal data test show that p-value(73.7%)and Skewness/Kurtosis tests for Normality ------- joint ------(89.86%)is >5% so the random variable u has a normally distributed.

4.2.5 Interpretation of the estimated econometric results

The estimated model is specified as follows:

$$Qb = B0 + B1age + B2Nox + B3offm + B4acr + B5fso + B6edu + B7ext + B8pesticide + B9ma + B10InC$$

$$Qb = 9.307 - 0.147age + 0.562Nox + 1.09offm + 0.807acr + 0.541fso + 0.181edu - 0.55ext + 0.348pesticide0.07ma + 0.00033InC + Ui$$

From the above regression result one can observe that educational level of household head, farm size, number of oxen owned, income level of household, manure, age, and access of credit are statistically significant. This implies that these variables play a significant role in determining Bean farm productivity of smallholder farmers in berehetworeda, Amhara region. Educational level of household head, farm size (land size), number of oxen owned, manure, income and access of credit are positively related to Bean productivity of smallholder farmers. This indicates that an increase in these variables increase Bean productivity in the study area whereas age is negatively related to Bean productivity of farmers that decrease Bean productivity when these increases, other thing remain constant. However, the remaining explanatory variables extension service, off farming activity and pesticide affects productivity but not as such significant.From the table those variables are statically insignificant. Because their values are greater than 10% level of significance, so we cannot interpret the result. We would interpret the variable which is statically significant

Age of household: As a result of regression shown, age has a coefficient value of 0.147 which indicates that it has negative relationship with productivity of bean and it is statistically

significantas indicated by the 0.000 probability associated with this coefficient. This implies that when age increase by one year, productivity of Bean decrease by 14.7%. This means that the larger age of small holder farmers the lower ability to engage on farm activity and this leads to decrease the productivity of Bean. This study is consistent with the previous study conducted by Senai Haiku (2006).

Number of oxen owned: The coefficient of the number of oxen is positively influence productivity of bean and it is statistically significant. The more oxen available for the farming purpose, the more amounts of land to be cultivated and the more amount of bean production gained. It means that as the number of oxen owned increased by one ox, the amount of bean production increased by 56.2% this increase is statically significant as indicated by the 0.064probability associated with this coefficient. This study is consistent with the previous studies conducted by Endrias et al (2013) explained that the higher the number oxen owned the increase in productivity.

Land size: This variable is found to be influenced positively and statistically significantas indicated by the 0.017 probability associated with this coefficient. .That the household, who have more farm size, produce more production than those who have less farm size. It implies that, as land size increase by one hectare, the productivity of bean increase by 54.1% . This study is in line with the previous studies conducted by Ayele (2006) and Abebe (2011) had also explained that the farmer with relatively larger farm size tends to increase their productivity.

Educational level of household: From the coefficient of regression which is 0.181 for educational status of household head, it is observed that there is a positive relationship and it is significant. As educational level of household head increase by one grade, the productivity of bean increase by 18.1% quintals. This increase statically significance as indicated by the 0.018 probability associated with this coefficient. This study is consistent with the previous study conducted by Fantu et al (2012) studied that educational (year of schooling) increase the productivity of bean.

Access of credit: It is a dummy variable (where 1 if the household get credit, and 0 for no,access of credit).This variable has a positive impact on bean productivity and it is statistically significant at 10% level of significance.The coefficient is 0.807 and it tells keeping other thing remain constant; This implies that the small household farmers who gets access of credit are 80.7% times more productive than a Farmer that does not get access of credit.

Level of income: The coefficient of the level of incomeis positively influence productivity of bean and it is statistically significant at 1% level of significant. The more income available for buying agricultural inputs including ox and the farmer employ more amount of labour for the farming purpose, the more amounts of land to be cultivated and the more amount of bean production gained. It means that as level of income increased by one unit(birr), the amount of bean productivity increased by 0.16% quintals this increase is statically significant as indicated by the 0.000probability associated with this coefficient.

Manure: This variable is found to be influenced positively and statistically significantas indicated by the 0.001 probability associated with this coefficient.manure affects bean productivity positively because if small house hold farmers use manure as a fertilizer and also increase production of bean and decrease their cost incurred for modern fertilizer this leads to increase the productivity of bean. It implies that, the small household farmers use additional one quintal manure , the productivity of bean increase by 0.7% .

CHAPTER FIVE

5 CONCLUSIONS AND RECOMMENDATIONS

In this chapter the major findings of the study are summarized; conclusions are drawn based on the findings and recommendations are forwarded for the concerned bodies.

5.1. Conclusion

Agriculture is the main economic activity in developing countries like Ethiopia. Even though agriculture is the backbone of their economy; it has not been able to satisfy the food requirements of their people. Hence, it is very important to understand the factor of agricultural productivity. In line with this, the main objective of this study is to examine the factor affecting Bean productivity of smallholder farmers in north shoa in the case of BerehetWoreda. To examine this problem the cross-sectional data is collected from two selected kebele. The paper employed both descriptive and econometric statistics to analyses the stated objectives. For econometric analysis the ordinary least square model was employed so as to identify the factor affecting bean productivity in twopurposively selected kebeles in Berehetworeda. The dependent variable that was the being bean productivity was regressed against the ten explanatory variables. Based on the above descriptive and econometric analysis result the researcher reaches on the following major conclusionsThe study area, Berehetworeda is one of the woreda which is engaged in Bean productivity in Amhara region,there is a variation in Bean productivity across households in the study area, the study area is mainly dominated by illiterate farmers not attended school and the educational status of house hold head is at its infant stagesdue to this, whose usage of improved technologies is not good and in addition to this the smallholder farmers in the study area are mostly males means that there is high male farmers than female farmers.

The study found that land size, number of oxen owned, educational level of household head, accesses of credit, use of manure and income have positive effects and age have a negative and statistically significant effects in Bean productivity whereas extension service, pesticide and off farming activity have statistically insignificant impact on the Bean productivity.finally the above significant variable(independents) are important to improve and growth the productivity of bean in the study area.

5.2 Recommendation

These deals with some recommendation drown based on the results of the study in which the small holder farmers of the Keble should focus on in order to promote Bean productivity.

To increase the productivity of Bean, the following points need attention

- The farmers shall be use more amounts manure rather than modern fertilizer.
- The farmers should perform their farm activity properly on their own land size
- Compensate the smallholder farmers when there is an unexpected environmental problem like soil erosion by credit access.
- To improve land productivity the small holder farmers must use land management practice method like terracing and tree planting.
- To overcome from problem of shortage of land, the farmers should use the existing land effectively and efficiently as much as possible by producing twice in a year by using irrigation activity.
- The educational background of the respondents needs to be further enhanced through provision of accessible formal education.
- Ethiopia has many problems on agricultural productivity, such as lack of income to purchase agricultural inputs, lack of the exception of family labor and seeds. The majority of Ethiopia populations are small holder farmers, who cannot use a technology without external funding or aid from other countries. That is the problem of our countries.

The government can solve this problem by different method, such as to expand microfinance in the countries and also to give information for farmers to use credit in order to increase the productivity.

- These problems can solve by different policy maker and different government organization.
- The government shall be provides credit access to farmers who have poor in order to purchase inputs.
- The best way to improve bean productivity in those kebeles is the farmers shall be used credit properly to buy inputs and substitute the chemical fertilizer by natural

fertilizer(manure) which is prepared from animal dung and it is cheap and more available in the local.

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Appendix A

WOLKITE UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

QUESTIONNAIRES

Dear respondents,my name isAbdurazikMuhamed. I am under graduate student at wolkite University.The objective of this questionnaire is to collect reliable data about ***factor affecting Bean productivity of small holder farmers in Berehetworeda***for the requirement of bachelor art degree in economics. Therefore, you respondent are kindly requested to cooperate for the success of the study by giving the desirable information. Thanks in advance for your coordination and honest.

Instruction:

- ✓ You are kindly request to give exact answer.
- ✓ Indicate your response by putting √ mark in the space provided.
- ✓ No need of writing your name.
- ✓ If the question is opening ended, please write your response on the space provided.

A, Demographic characteristics of household

1. Sex. A, male ☐ B, female ☐
2. Age of household head..... (In year).
3. Educational level of household head..... (In grade).

B, Socioeconomic characteristics of household

6, Do you engage in off-farming activities in 2018 cropping season?

A, yes ☐ b ☐

7. If your answer in question number "6"is yes in what type of off-farm activity do you engaged?
A, Trade ☐ B, weaving. ☐ C, animal husbandry ☐ D, If others (specify) ..….....

8. Total land holding..... in hectare?

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

10. How many oxen do you have for plough in 2018 cropping season? .....

11. Do you use manur during production year? A, Yes B, N ☐ ☐

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

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

13. If your answer in question number "11" is yes how many kuntal did you use per hectare?.....

14. How many quintal of Bean did you get in previous year? .....

15. What did you see your Bean production in 2018 relative to the previous year?

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

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

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

18. If your answer in question number "15" is constant what is the main reason? .....

19. Do you use pesticide? A, Yes ☐ B, No ☐

20.how much your income per year ? Birr**……..**

C, Institutional characteristics

22. Did you get any service from development agricultural workers? A, Yes ☐ B, no ☐

23. If your answer in question number "20" yes what type of service did you get? .....

24. Did you use credit to your Bean production? A, Yes ☐ B, No ☐

D, environmental characteristics

25. What was the nature of the land fertility? A, fertile ☐ B, non fertile ☐

26. If there was any environmental problems during the production season list them.....

Appendix B

summary statistics to continuous variables and Bean output

```
. sum
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Qb	114	9.990833	4.537384	2.75	19
age	114	37.37719	11.58836	20	65
Nox	114	2.210526	1.100874	0	5
offm	114	.4912281	.5021302	0	1
acr	114	.6754386	.4702779	0	1
fso	114	2.174123	.896064	.5	5
edu	114	4.377193	4.360706	0	12
ext	114	.5350877	.5009694	0	1
pesticide	114	.4912281	.5021302	0	1
Ma	114	16.45614	14.37435	0	50
Inc	114	25047.11	28574.24	3000	160000

Econometric analysis

```
. reg Qb age Nox offm acr fso edu ext pesticide Ma Inc
```

Source	SS	df	MS
Model	1915.14527	10	191.514527
Residual	411.282376	103	3.99303277
Total	2326.42765	113	20.5878553

Number of obs	= 114
F(10, 103)	= 47.96
Prob > F	= 0.0000
R-squared	= 0.8232
Adj R-squared	= 0.8060
Root MSE	= 1.9983

Qb	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
age	-.1467756	.0283683	-5.17	0.000	-.2030375	-.0905137
Nox	.5621438	.2998807	1.87	0.064	-.0325989	1.156886
offm	1.090133	.7571907	1.44	0.153	-.4115762	2.591842
acr	.8069285	.4724825	1.71	0.091	-.1301291	1.743986
fso	.5413664	.2232138	2.43	0.017	.0986746	.9840583
edu	.181073	.07509	2.41	0.018	.0321497	.3299963
ext	-.5509325	.6309115	-0.87	0.385	-1.802197	.7003317
pesticide	.3478677	.5914125	0.59	0.558	-.8250596	1.520795
Ma	.0708015	.0216001	3.28	0.001	.0279628	.1136402
Inc	.0000334	8.68e-06	3.84	0.000	.0000161	.0000506
_cons	9.307254	1.827444	5.09	0.000	5.68295	12.93156

4.2.2 Multicolleanarity test

```
vif
```

Variable	VIF	1/VIF
offm	4.09	0.244445
Nox	3.08	0.324229
age	3.06	0.326974
edu	3.03	0.329569
ext	2.83	0.353724
Ma	2.73	0.366553
pesticide	2.50	0.400692
Inc	1.74	0.574462
acr	1.40	0.715721
fso	1.13	0.883292
Mean VIF	2.56	

4.2.3 Heteroscedasticity test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Qb

         chi2(1)      =     4.36
         Prob > chi2  =   0.0369
```

After robust stata result

```
. reg Qb age Nox offm acr fso edu ext pesticide Ma Inc,robust

Linear regression                               Number of obs =     114
                                                F( 10,   103) =   75.14
                                                Prob > F      =  0.0000
                                                R-squared     =  0.8232
                                                Root MSE      =  1.9983
```

Qb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
age	-.1467756	.0353035	-4.16	0.000	-.2167918	-.0767594
Nox	.5621438	.337627	1.66	0.099	-.1074598	1.231747
offm	1.090133	.7177146	1.52	0.132	-.3332847	2.513551
acr	.8069285	.4360074	1.85	0.067	-.0577894	1.671646
fso	.5413664	.2569728	2.11	0.038	.0317214	1.051011
edu	.181073	.0831613	2.18	0.032	.0161421	.346004
ext	-.5509325	.6200176	-0.89	0.376	-1.780591	.6787262
pesticide	.3478677	.7022207	0.50	0.621	-1.044822	1.740557
Ma	.0708015	.0296862	2.39	0.019	.011926	.129677
Inc	.0000334	.0000104	3.19	0.002	.0000126	.0000541
_cons	9.307254	2.171561	4.29	0.000	5.000475	13.61403

4.2.4 Normality test

```
. predict resid,residual

. swilk resid

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W          V          z       Prob>z
-------------+--------------------------------------------------
       resid |   114    0.99183      0.753     -0.635    0.73728
```