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**ANALYSIS OF FACTORS AFFECTING POTATO FARMERS'  
MARKETING GROSS MARGIN IN CENTRAL ETHIOPIA: THE CASE  
OF HOLETA DISTRICT**

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**M.Sc. Thesis**

**By**

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**ST. MARY’S UNIVERSITY**

**ANALYSIS OF FACTORS AFFECTING POTATO FARMERS’  
MARKETING GROSS MARGIN IN CENTRAL ETHIOPIA: THE CASE  
OF HOLETA DISTRICT**

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## **APPROVAL**

This is to approve that student, Mesfin Abebe, has completed writing a master's thesis entitled "ANALYSIS OF FACTORS AFFECTING POTATO FARMERS' MARKETING GROSS MARGIN IN CENTRAL ETHIOPIA: THE CASE OF HOLETA DISTRICT" with my advice and follow up. I also approve that his work is appropriate enough to be submitted as a partial fulfillment of the requirements for the Award of Master of Marketing Management offered by the University.

Name of Your Advisor

## **DECLARATION**

I, Mesfin Abebe, assert that this study entitled “**ANALYSIS OF FACTORS AFFECTING POTATO FARMERS' MARKETING GROSS MARGIN IN CENTRAL ETHIOPIA: THE CASE OF HOLETA DISTRICT**” is my own original work that has not been presented for a Master study in any other University and that all sources of materials used for the study have been **duly** acknowledged.

**Mesfin Abebe**

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# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1. Background of the Study**

Markets are important for economic gross and sustainable development of a given country, but, emphases in development policies in agrarian countries have usually been placed on increasing agricultural production to serve as a base for rural development. In the absence of well-functioning markets, agricultural production can experience several drawbacks (Belay, 2009).

Horticultural crops play a significant role in developing country like Ethiopia, both in income and social spheres for improving income and nutrition status. In addition, it helps in maintaining ecological balance since horticultural crops species are so diverse. Further, it provides employment opportunities as their management being labor intensive, production of these commodities should be encouraged in labor abundant and capital scarce countries like Ethiopia.

For most Ethiopian smallholders, fruit and vegetable cultivation is not the main activity rather it is considered supplementary to the production of main crops and the cultivation is on a very small plot of land and is managed by a household. This low priority for horticultural crops cultivation was mainly due to the traditional food consumption habits that favor grain crops and livestock products in most parts of the country resulting in weak domestic market demand for horticultural products. Horticulture production is an important source of income for smallholder farmers' and demand for the products is raising in both domestic and international markets thus increase smallholder farmers'' participation in the market (Yilma, 2009).

Horticulture production gives an opportunity for intensive production and increases smallholder farmers'' participation in the market (Emana and Gebremedhin, 2007).

Vegetables produced in the eastern part of Ethiopia are supplied to the local markets and to the neighboring countries. Potato and onion/shallot are the most commonly marketed vegetables accounting for about 60% and 20% of the marketed products. The other products such as

cabbage, beetroots, carrot, garlic, green pepper and tomato are marketed at relatively smaller quantities by few farmers' (Bezabih and Hadera, 2007).

Ethiopia has good potential in horticultural crops production for which smallholder farming have diversified from staple food subsistence production into more market oriented and higher value commodities. Despite this production potentials and importance of horticultural crops for the country as well as the study area, there has been limited study with regard to the performance of vegetables market and challenges of the market.

## **1.2. Statement of the Problem**

It is common to see imperfect markets in countries mainly depending on the primary agricultural commodities. The problem is severe for countries like Ethiopia that obtain a big share of their gross domestic product, employment opportunity, etc from a single industry. Diversifying the agricultural products and its market base towards non-traditional high-value horticultural crops could increase the earnings and reduce fluctuations.

Despite this potential, the farmers' in the area rarely utilize the opportunity to improve their livelihoods. The smallholder producers are price takers since they have little participation in the value chain and imperfection of the marketing system. As a result, smallholder farmers' have repeatedly faced risk of unexpected fall in horticultural product prices.

It is well known that different household attributes put households under different production and marketing potentials. The market challenges of that the households face might influence the households/ farmers' participation decision and the extent of participation, the type of vegetable crops they would like to grow and the size of farmland they would like to allocate to a specific crop. This could be due to the fact that production and marketing decisions of households are two sides of a coin. The two decisions go hand in hand as farmers' produce what they could sell at an available market. Knowing the interaction patterns between the two decisions helps to understand what crop is sold at which market and whether the intention of selling at a particular outlet increases or decreases the size of farmland allocated to the specific crop.

Imperfections in markets and asymmetric market price information hinder the potential gain that could have been attained under the existence of markets with complete information. In this regard, marketing vegetable crops at farm-gate is an interesting process that has not been investigated much. Both buyers and sellers usually do not have equal market information on the vegetable prices at the central market. Under such circumstances, farm households selling vegetable crops at farm-gate deal with the trade-off between selling their crop harvests at higher possible prices and avoiding the risk of losing product quality if the transaction fails by holding on to higher prices. An interesting issue in this regard is what factors determine the farmers' gross margin in the vegetables market.

As efficient, integrated, and responsive market mechanism is of critical importance for optimal area of resources in agriculture and in stimulating farmers' to increase their output (Andargachew, 1990). A good marketing system is not limited to stimulation of consumption, but it also increases production by seeking additional output. However, there is a critical problem that stands in the course of formulating appropriate policies and procedures for the purpose of increasing marketing efficiency. This has to do with lack of pertinent marketing information and other marketing facilities, like storage, transportation, etc. Thus, reducing the information gap on the subject by contributing to better understand on improved strategies for reorienting marketing system for the benefit of small farmer development.

The supply from other parts of the country is seasonal; often needed to bridge the gap between demand and supply. The potatoes supplied from the eastern part of the country are considered inferior in terms of quality and sold relatively cheaper.

This study has the purpose of investigating the vegetable specifically potato marketing factors affecting farmers' potato gross margin in Holeta district.

### **1.3. Objective of the Study**

The general aim of this study is to examine factors affecting potato farmers' gross margin in the Holeta district. Specifically to analyze the effects of demographic characteristics, factors of production, institutional factors, and production cost and livestock ownership on the potato producing farmers' gross margin.

#### **1.4. Scope and Limitations of the Study**

Attempting to analyze the entire vegetables and markets were impossible action given the limited resources and human skill. Thus, the research was narrowed down to concentrate on the production area 35 hactar. The types of vegetables were limited to potato for its increasing coverage and the marketing problem it used to face. Moreover; due to shortage of budget, and logistics, the researcher couldn't cover all vegetables and kebeles found in the study areas. And also due to lack of secondary data on all sample markets the study was unable to evaluate the market integration among all markets.

The study encountered a number of limitations. In some occasions respondents were not able to give the correct records of their round potato production, prices and earnings because of lack of record keeping. However, different techniques were used to overcome the problem. This included asking different questions for the same answer. Also information from focus groups including traders and extension workers complemented the information obtained from household survey.

#### **1.5. Significance of the Study**

The primary significance of the study is to all actors in the marketing system. Analysis of the whole system and identifying clearly factors responsible for farmers' gross margin will benefit policy makers and implementers in indicating the area of advantage for what should be done to improve farmers' gross margin through efficient marketing system.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 THEORETICAL LITERATURE REVIEW

##### 2.1.1 Concepts and Definitions

**Market:** The word “market” has many connotations. Bain and Peter (1988), define “markets” as a single arrangement in which one thing is exchanged for another. A market is also thought of as a meeting point of buyers and sellers, a place where sellers and buyers meet and exchange takes place, an area for which there is a demand for goods an area for which price determining forces (demand and supply) operates. For McNair and Hansen (1956), “market is another name for demand”. Others define market as a system or an atmosphere or a mechanism that facilitate price fixation and thereby exchange of goods and services.

**Marketing:** In its simplest form is defined as the process of satisfying human needs by bringing products to people in the proper form, time and place (Branson and Norvel, 1983).

Marketing has an intrinsic productive value, in that it adds time, form, place and possession utilities to products and commodities. Through the technical functions of storage, processing and transportation, and through exchange, marketing increases consumer satisfaction from any given quantity of output Mendoza (1995). Kotler (2003) also stated shortly marketing as the task of creating, promoting, and delivering goods and services to consumers and businesses.

**Agricultural Marketing:** It is defined as agriculturally oriented marketing. It embraces all operations and institutions involved in moving farm products from farm to consumers Pritchard (1969). It covers all the activities associated with the agricultural production and food, feed, and fiber assembly, processing, and distribution to final consumers, including analysis of consumers’ needs, motivations, and purchasing and consumption behavior (Branson and Norvell, 1983).

It is both a physical distribution and an economic bridge designed to facilitate the movement and exchange of commodities from farm to fork. Food marketing (of branded foods) tends to be inter-disciplinary, combining psychology and sociology with economics, whereas agricultural marketing (of unbranded products) is more mono disciplinary, using economics almost exhaustively (Kohls and Uhl, 1985).

**Marketable and marketed surplus:** Marketable surplus is the quantity of produce left out after meeting farmers' consumption and utilization requirements for kind payments and other obligations (gifts, donation, charity, etc). Marketed surplus shows quantity actually sold after accounting for losses and retention by farmers', if any and adding previous stock left out for sales. Thus, marketed surplus may be equal to marketable surplus, it may be less if the entire marketable surplus is not sold out and farmers' retain some stock and if losses are incurred at the farm or during transit (Thakur *et al.*, 1997). The importance of marketed and marketable surplus has greatly increased owing to recent changes in agricultural technology as well as social pattern. In order to maintain balance between demand for and supply of agricultural commodities with rapid increase in demand, accurate knowledge on marketed/marketable surplus is essential in the process of proper planning for procurement, distribution, export and import of agricultural products (Malik *et al.*, 1993).

### **2.1.2. Characteristics of Vegetables and its Marketing**

Being produced both by commercial and smallholder farmers' vegetable production and marketing is influenced by a number of factors that can be attributed to production, product, and market characteristics. Kohls and Uhl (1985) identified the major attributes that inhabit marketing.

**Perishability:** As vegetables are highly perishable, they start to lose their quality right after harvest and continued throughout the process until it is consumed. For this purpose elaborated and extensive marketing channels, facilities and equipments are vital.

This behavior of vegetables exposed the commodity not to be held for long periods and fresh produce from one area is often sent to distant markets without a firm buyer or price. Prices may be negotiated while the commodities are in route, and they are frequently diverted from their original destination if a better price can be found. Sellers might have little market power in determining a price. As a result, a great deal of trust and informal agreements are involved in marketing fresh vegetables. There could not always be time to write everything down and negotiate the fine details of a trade. The urgent, informal marketing processes often leads to disputes between buyers and sellers of fresh fruits and vegetables. Producers are normally price takers and are frequently exposed for cheating by any intermediary. Hence, these marketing challenges are exactly faced by the vegetable producers of farmers' surrounding Kombolcha Woreda.

**Price /Quantity risks:** Due to perishable nature and biological nature of production process there is a difficulty of scheduling the supply of vegetables to market demand. The crops are subjected to high price and quantity risks with changing consumer demands and production conditions. Unusual production or harvesting weather or a major crop disease can influence badly the production and marketing system.

**Seasonality:** Vegetables have seasonal production directly influencing their marketing. Normally they have limited period of harvest and more or less a year round demand. In fact, in some cases the cultural and religious set up of the society also renders demand to be seasonal. This seasonality also worsened by lack of facilities to store.

**Product bulkiness:** Since water is the major components of the product, it makes them bulky and low value per unit that is expensive to transport in fresh form every time. This, therefore, exposed farmers' to lose large amount of product in the farm unsold.

These listed characteristics of the product require a special complex system of supportive inputs. It demands a regular marketing preparation process like washing, cooling, proper management from the time of harvest until the produce is put on display. It is frequently believed a vegetable not only remain attractive to the consumer it must also have a shelf life of few days after having purchased by the consumer (Nonnecke, 1989).

### **2.1.3. Vegetable Production and Marketing in Ethiopia**

Ethiopia has a variety of vegetable crops grown in different agro ecological zones by small farmers', mainly as a source of income as well as food. The production of vegetables varies from cultivating a few plants in the backyards, for home consumption, to large-scale production for the domestic and home markets.

According to CSA (2012) the area under these crops (vegetables and root crops) was estimated to be 359,950.13 hectares with a total production of 24,267,581.58 tons in the year 2011/12. Root and tuber crops are by far the dominant product group. Potatoes (32%) stand out as the important products, followed by taro/Godere (19%), garlic (12%), and onions (nearly 12%). Potatoes are mostly found in the Amhara Regional State (51%) and Oromia (33%). Among small-scale producers of vegetables, Ethiopian cabbage (Kale) takes the higher almost 50%, followed by red pepper with a share of 31%, and green pepper 10%.

Smallholder vegetable farms are based on low input – low output production systems. The use of improved seeds and planting material of high yielding varieties and other inputs such as fertilizer and plant protection materials is not common in the smallholder sector. Technical training and extension services on improved crop husbandry techniques are not available. As a result average productivity levels are low in the small scale farming sector (EHDA, 2011).

The Ethiopian Fruit- and Vegetables Marketing Enterprise (ETFRUIT for short) is a state trading organization established in April, 1980 under the Horticulture Development Corporation (HDC) of the Ministry of State Farm Development. ETFRUIT is a wholesale institution dealing with domestic and export trade of fresh fruits, vegetables, flowers, processed horticultural products and some slice crops. The marketing operation of the enterprise includes the collection of products from production sites, transportation, storage, grading and quality control, packing and distribution of these horticultural, floriculture and spice crops (MSDF, 1984).



#### **2.1.4. Marketing Constraints Facing Smallholder Farmers'**

The aim of this section is to identify key constraints facing smallholder farmers' in the study area, such as lack of physical infrastructure, lack of market, and high transaction costs. Smallholder farmers' find it difficult to compete in the new market environment. They face enormous constraints when it comes to physically accessing markets. They also lack market information, business and negotiating experience, and a collective organization to give them the power they need to interact on equal terms with other generally larger and stronger market intermediaries. The result is poor term of exchange and little influence over what they are offered (Heinemann, 2002). Below follows a discussion of some of the common marketing constraints facing smallholder farmers', as revealed through international experience.

##### **a) Constraints on production**

Producing for the market calls for production resources that include land ,labor force and capital. Poor access to these assets affects the way in which smallholder farmers' can benefit for opportunities in agricultural markets, and especially in terms of the volume of products traded and the quality of those products (Bienabeet *al.*, 2004). Small-scale farmers' lack regularity in terms of producing for the markets due to insufficient access to production resources.

##### **b) High transaction costs**

High transaction costs are caused, inter alia, by poor infrastructure and communication services in remote rural areas (Hease and Kirsten, 2003). Transaction costs also result from information inefficiencies and institutional problems such as the absence of formal markets (Makhura, 2001). Transaction costs include the costs of information, negotiation, monitoring, co-ordination, and enforcement of contracts. Smallholder farmers' are located in remote areas and are geographically dispersed and far away from profitable markets. Distance to the market, together with poor infrastructure and poor access to asset and information results high transaction costs. Since small holders are poor, they find it difficult to compete in profitable markets due to the high transaction costs. Traders with higher social capital are better able to enter more capital-intensive marketing activities such as wholesaling and long-distance transport, whereas traders

with poor social networks face major barriers to entry into the more lucrative market segments (Kherallah and Kirsten, 2000).

Minimizing transaction costs is the key to improving access to high-value markets in developing countries, because high transaction costs will make it difficult for poor smallholder enterprise to market their produce.

**c) Lack of on-farm infrastructure**

Smallholder farmers' do not have access to on-farm infrastructure such as store-rooms and cold-rooms to keep their products in good condition after harvest. Lack of access to facilities such as post-harvest and processing facilities constitutes a barrier to entry into agricultural markets, since the emphasis of buyers is more on quality. Access to storage facilities increase farmers' flexibility in selling their products, as well as their bargaining power (Bienablet *al.*, 2004).

**d) Asymmetry or lack of information on markets**

Rural producers, and especially small farmers', have little information about the market demand and price, which is costly to obtain. They may gather information through contact with other actors in the commodity chain, but the accuracy of this information is not certified, since those actors might to be exhibiting "opportunistic behavior" (Bienabeet *al.*, 2004). Smallholder farmers' lack information about product price and times to sell their products, and about potential buyers. This in turn reduces their ability to trade their products efficiently and to derive the full benefit from the marketable part of their production.

**e) Low quantity and poor quality**

Due to their low endowment in production factors, such as land, water and capital assets, the majority of smallholder farmers' produce low quantities of products that are poor quality, which leads to their products being neglected by output markets. Increasing concentration in the food value chain is a global trend, caused by increasingly demanding consumers and concerns about food safety, which tend to make it very difficult for smallholder farmers' to enter high- value markets in light of the low quantity and poor quality of their products.

#### **f) Transportation problems and Lack of markets in rural areas**

Most small-scale farmers' have no means of transport to carry their produce to markets. Transportation problems result in loose of quality and late delivery, which in turn lead to lower prices, and this regarded as the greatest problem faced by emerging farmers' (Louwet *al.*, 2004).

Most smallholder farmers' are located in rural areas where there are no formal agricultural markets or agro-processing industries. They are compelled to market their produce to local communities in their areas, sometimes at lower prices, or to transport their products to towns at a higher cost.

#### **g) Lack of bargaining power**

The bargaining power of the small producers is especially low since they have poor access to market information and limited access to financial markets, which prevents them from selling their products at the most profitable time. Their lack of bargaining power may lead them to undervalue their production and obtain a smaller share of the added value created in the commodity chain. Small farmers' have particularly low bargaining power when they operate in long supply chain, where the specificity of the product transformation assets leads to the creation of oligopsony (e.g. the oil-palm and cotton sectors in West Africa) (Bienabeet *al.*, 2004).

## **2.2 Empirical Literature Review**

Kumilachew (2016) study by using two limit-Tobit regression models showed that potato production was lucrative and semi-commercialized i.e. about 59.50% of the potato produced was sold. Moreover, by using two limit-Tobit regression model results indicated that off-farm income, access to information, access to improved seed and access to irrigation affect proportion of the value of potato sold positively and significantly while number of plots affects it negatively.

Yassin et al., 2016 findings by using probit model demonstrated that level of education, livestock owned, quantity of potato harvested, potato market price, and access to market

information positively affect farmers' participation decision whereas participation in off/non-farm activities were negatively affect farmers' decision to participate in potato output market.

Sebatta et al., 2014 study using ordered probit model showed that dependency ratio, square of distance from home to the market and a farmer having a transport means positively influenced net selling rather than net buying or net buying rather than autarky among smallholders.

Bezabih et al., 2015 study using multinomial logit model indicated that farming experience, distance to the nearest market, access to market information, amount of potato sold, post-harvest value addition, and bargaining power of farmers' affect channel choice decisions in one way or another.

Godfrey and Agnes (2012) study showed that farmers' earned only 8% of the total gross margin (GM) compared to 30.9% for the wholesalers. The regression analysis revealed that selling volumes and selling price had significant impact on the crop profitability. Although education and land size were not significant, they had positive relationship with GM.

Hirpa et al., 2016 study showed that the informal seed system, seed potato value chains suffered from a poor enabling environment such as a low quality technical support and lack of a seed quality control system; use of sub-optimal storage and transportation technologies, sub-optimal farm management practices; and little use of inputs. In the alternative seed system, main constraints were the lack of a seed potato quality control system, poor farm management practices, little use of inputs by seed potato growers, and a distorted seed potato market that resulted from involvement of institutional buyers. Chains in the formal seed potato system were characterized by little involvement of the private and public sectors in the production and supply of seed potatoes.

Gumataw et al., 2016 study found that several socio economic variables particularly age, education, farm size, wealth and location and social network variables notably ethnic and religious ties have an influence on farmer s' choice of sales arrangement. Regarding income effects, gross profit was 225% higher for farmers' without intermediation. This could be explained by the latter farmers' having access to better quality inputs, better contract specifications and receiving higher prices for their products. Nonetheless, the majority of farmers' continue trading via middlemen. Gumataw et al., 2016 suggested three explanations for this outcome. First, wholesalers seem to prefer to work with middlemen to guarantee minimum

quantity and quality, and to reduce the cost of measuring quality. Second, personalized relationships might lock-in small-holders into trading through middlemen regardless of income losses. Third, trading via middlemen can enhance smallholder commercialization by linking low resource endowed farmers' to traders and final markets. However, direct trading with wholesalers seemed beneficial for relatively better-resource endowed farmers'.

Yassin et al., 2016 study by using truncation regression model indicated that livestock owned and access to market information affect farmers' extent of potato sales positively whereas family size and participation in off/non-farm activity affects the extent of potato sales negatively.

Mahlet et al., 2015 study by using descriptive statistics and OLS showed that there are differences between households in terms of age, dependency ratio, access to market information and quantity produced. The result also reveals that, the amount of potato produced, livestock holding and farming experience are some of the significant variables that affect the households' level of potato supply positively and negatively at different probability levels.

Mudege et al., 2015 study result from the Real Markets Approach demonstrated that agricultural market interventions that do not address underlying social structures such as those related to gender relations and access to key resources will benefit one group of people over another; in this case men over women.

Sebatta et al., 2014 study by using a two-stage Heckman model indicated that proximity to a village market positively and significantly influenced decision to participate in the potato market; the second stage of the model indicated that non-farm income earned negatively and significantly affected the potato farmer's level of market participation.

Sebatta et al., 2015 study using breakeven analysis and bivariate probit model indicated that 23% of all farmers' had added value to seed potato while 88.5% had added value to table (ware potato). Kabale had a significantly higher number of farmers' adding value to seed potato than Mbale while the reverse was true for ware potato. Results of the break even analysis showed that value addition to both ware and seed potato at the farm was profitable with value adding farmers' earning 40% more than those who did not add value. Bivariate probit results indicated that how much a farmer harvested influenced their decision to add value to ware potato while access to extension services significantly and positively influenced value addition to seed potato. Adding

value to potato at the farm is therefore a profitable venture that can be used to increase household incomes according to these results.

Kassa, 2014 study by employing value chain framework showed that multiple actors from public, private, and NGO sectors involved in the potato value chain with diverse roles. However, public sector actors involved in input supply and production stages but private sectors play more in trading and marketing stages. Although favorable land and Climatic condition, moisture retention capacity of the soil, high productivity potential, high demand for ware and seed potatoes and enabling policy environment for agricultural development are some of the opportunities in the study areas, the value chain is constrained by inadequate input supply, high input price, inappropriate delivery system, and poor harvesting technology, limited knowledge about post-harvest handling, lack of support for producers and traders, poor infrastructure facilities, lack of market information, and lack of integration among chain actors. Study conducted by Scott (1995) on potato marketing using marketing margin analysis in Bangladesh indicated that producer's price and margin were 1.27 and 67%, respectively.

The notion of market integration is often associated with the degree of price transmission, which measures the speed of traders' response in moving foods to deficit zones when there is an emergency, or some catastrophe that leads to hunger in deficit zones (WFP, 2007). A number of factors that lead to market integration have been identified (Rapsomanikis *et al.*, 2005; Timmer, 2009).

Among the key factors, weak infrastructure and large market margins that arise due to high transfer costs have been asserted as the main factors that partly insulate domestic market integration. Especially in developing countries, poor infrastructure, transport and communication services gives rise to large marketing margins due to high costs of delivering locally produced commodities to the reference market for consumption. High transfer cost and marketing margins hinder the transmission of price signals, as they may prohibit (Sexton, *et al.*, 1991; Bernstein and Amin, 1995). As a result, change in reference market price is not fully transmitted to local prices, resulting in economics agents adjusting partially to shift in supply and demand.

According to Wolday (1994) market supply refers to the amount actually taken to the markets irrespective of the need for home consumption and other requirements where as the market surplus is the residual with the producer after meeting the requirement of seed, payment in kind and consumption by peasant at source.

Empirical studies of supply relationships for farm products indicate that changes in product prices typically (but not always) explain a relatively small proportion of the total variation in output that has occurred over a period of years. The weather and pest influence short run changes in output, while the long run changes in supply are attributable to factors like improvement in technology, which results in higher yields. The principal causes of shifts in the supply are changes in input prices, and changes in returns from commodities that compete for the same resources. Changes in technology that influence both yields and costs of production /efficiency/, changes in the prices of joint products, changes in the level of price/yield risk faced by producer, and institutional constraints such as acreage control programs also shift supply (Tomek and Robinson, 1990).

A study made by Moraket (2001) indicated households participating in the market for horticultural commodities are considered to be more commercially inclined due to the nature of the product. Horticulture crops are generally perishable and require immediate disposal. As such, farmers' producing horticulture crops do so with intent to sell. In his study it was found that 19% of the sample households are selling all or a proportion of their fruits and vegetable harvest to a range of market outlets varying from informal markets to the large urban based fresh produce markets. Typically, many of the households producing fruits and vegetables also have access to a dry land plot where they commonly produce maize and/or other field crops.

Abay (2007) in his study of vegetable market chain analysis identified variables that affect marketable supply. According to him, quantity production and total area owned were significant for onion supply but the sign for the coefficient for total area of land was negative. For tomato supply, quantity of production, distance from Woreta and labor were significant.

Similarly, Rehima (2007) in her study of pepper marketing chain analysis identified variables that affect marketable supply. According to her, access to market, production level, extension

contact, and access to market information were among the variables that influence surplus. Another study by Gizachew (2006) on dairy marketing also captured some variables that influence dairy supply. The variables were household demographic characteristics like sex and household size, transaction cost, physical and financial wealth, education level, and extension visits. Household size, spouse education, extension contact, and transaction cost affects positively while household education affects negatively.

According to Moti (2007) a farm gate transaction usually happens when crops are scarce in their supply and highly demanded by merchants or when the harvest is bulk in quantity and inconvenient for farmers' to handle and transport to local markets without losing product quality. For crops like tomato, farm gate transactions are important as grading and packing are done on the farm under the supervision of the farmer. Therefore, households are expected to base their crop choice on their production capacity, their ability to transport the harvest themselves and their preferred market outlet. From these little reviews, it is possible for households to decide where to focus to boost production and knowing the determinants for these decisions will help choose measures that can improve the marketing system in sustainable way.

Ayelech, (2011) identified factors affecting the marketable surplus of fruits by using OLS regressions. She found that fruit marketable supply was affected by; education level of household head, quantity of fruit produced, fruit production experience, extension contact, lagged price and distance to market.

Adugna (2009) identified major factors that affect marketable supply of papaya in Alamata District. Adugna's study revealed that papaya quantity produced influenced marketable supply positively.

Abay (2007) applied Heckman two-stage model to analyze the determinants of vegetable market supply. Accordingly, the study found out that marketable supply of vegetables were significantly affected by family size, distance from main road, number of oxen owned, extension service and lagged price.



Bezabih and Hadera (2007) identified pest, drought, shortage of fertilizer, and price of fuel for pumping water as the major constraints of horticulture production in Eastern Ethiopia. Other problems which they reported also include poor know how in product sorting, grading, packing, and traditional transporting affecting quality.

Million and Belay (2004) indicated that, lack of market outlets, storage and processing problems, lack of marketing information, capital constraints, high transportation cost and price variation are some of the important constraints in vegetable production.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1. Description of the Study Area**

Holeta Genet (also transliterated Oletta) is a town and separate woreda in central Ethiopia. Located in the Oromia Special Zone Surrounding Finfinne of the Oromia Region, it has a latitude and longitude of 9°3'N 38°30'E and an altitude of 2391 meters above sea level.

Like much of Ethiopia, the economy is mainly based on agriculture but industry is growing. Habesha Cement has announced that it is constructing a new cement plant within the city limits of Holeta. The town hosts a research station of the Ethiopian Institute of Agricultural Research. Founded in 1963, this station is the national center for research to improve the yield of barley, highland oil crops, potatoes, and dairy products.

The 2007 national census reported a total population for Holeta Gennet of 25,593, of whom 12,605 were men and 12,988 were women. The majority of the inhabitants said they practised Ethiopian Orthodox Christianity, with 73% of the population reporting they observed this belief, while 20.44% of the populations were Protestant, and 5.43% were Muslim.

According to the 1994 national census, this town has a population of 16,800. The 1994 census reported this town had a total population of 16,785 of whom 8,040 were males and 8,745 were females. It is the largest of three towns in Walmara woreda.

#### **3.2. Types, Sources and Methods of Data Collection**

Both secondary and primary data were collected for this study. Secondary data were collected from reports, internet material and other documented materials that were relevant to the study. Secondary information included trends of potato production, access of farm inputs, within kebeles. Farmers' demographic characteristics, factors of productions, institutional factors effect on farmers' gross margin.

Secondary data provided a general overview about farmer's earnings in crop marketing relative to traders. However, there was inadequate analysis of who gets what and what are the factors leading to that difference. In collecting primary data a total of 62 households were selected by using two stage sampling technique from the three kebeles. The choice of the three kebeles was purposive based on the high production of potatoes. Kebele rosters were used as sampling framework. About 5 % (62 households) of potato farmers' were selected randomly in the three kebeles for interview. The study used both open and closed questions, to collect information. Structured questionnaires were used to collect both qualitative and quantitative data from potato farmers'. There was also consultation with officials from the district office; executive officers, and kebele executive officers. They provided insights on the general state of potato marketing in their respective kebeles. The study also consulted agricultural and extension officers at the district and ward levels and conducted interviews with key informants. The interviews were conducted for one month from 1<sup>st</sup> December 2016 to 30th January 2017. The collected data were analyzed using STATA and has been presented in tables and figures.

The study used information on different variables such as data on potato production, marketed, prices, age of the household head, extension service, educational status of the household head, family size, factors of production, input costs, access to market information, credit facility, and access to irrigation.

The secondary data were collected from Bureau of Agriculture and Rural Development (BoARD) and other sources. Primary data were collected using informal surveys from key informants. The formal survey was undertaken through formal interviews with randomly selected farmers' and traders using a pre-tested semi-structured questionnaire for each group.

### **3.3. Sampling Procedure and Sample Size**

For this study, in order to select a representative sample a two-stage sampling technique was implemented. Thus, purposive sampling was used to select potato producer kebeles and the

researcher used systematic random sampling to select farm households.

In the first stage, with the consultation of Woreda agricultural experts and development agents, out of 12 kebele 3 potato producer kebeles were purposively selected based on the potato production. In the second stage, using the household list of the sampled kebeles 62 sample farmers were selected using systematic random sampling.

### **3.4. Methods of Data Analysis**

Descriptive statistics, inferential statistics and econometric analysis were used to analyze the data collected from vegetable producers, traders and consumers.

#### **3.4.1. Descriptive and inferential statistics**

These methods of data analysis used in this study were percentages, means, standard deviations and F-test. Thus; the effects of household characteristics, factors of production, input costs, institutional factors on farmers' gross margin were statistical models to analyze the performance of different household farmers'.

#### **3.4.2. Econometric Model**

To investigate factors affecting potato farmers' marketing gross margin OLS model was used.

##### **Gross margin analysis**

To determine gross margin the following formula was used:

$$GM = TR - TVC$$

Where,

GM = Gross Margin (---); TR = Total Revenue (---);

TVC = Total Variable Costs (----)

A linear regression model was used to identify factors influencing potato farmers' GM was taken as a function of other 6 variables which included the level of education, land size, farming experience, production cost, and household size and selling price. The model for factors affecting farmer income was specified as follows:

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \dots + \alpha_{11} X_{11} + \varepsilon$$

Where:

$Y$  = Gross margin of the farmer (in ETB);

$\alpha_0$  = The intercept of regression equation

$\alpha$  (1-11) = Coefficient of parameter estimates

$X_1$  = Sex;

$X_2$  = Age;

$X_3$  = Education level (in years);

$X_4$  = Household size (in numbers of members);

$X_5$  = Potato cultivated Land size;

$X_6$  = Production cost;

$X_7$  = Access to extension service;

$X_8$  = Access to irrigation;

$X_9$  = Access to credit service;

$X_{10}$  = Access to market information;

$X_{11}$  = Livestock owned

$\varepsilon$  = Error term

Then the parameters can consistently be estimated by OLS over  $n$  observations reporting values for  $Y_i$  by including an estimate of the inverse Mill's Ratio, denoting  $i$ , as an additional regressor. More precisely selection model is specified:

An econometric Software known as “STATA” was employed to run the model. Before fitting important variables in the models it was necessary to test multicollinearity problem among continuous variables and check associations among discrete variables, which seriously affects the parameter estimates. As Gujarati, (2003) indicates, multicollinearity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because existing strong relationship among them. In other words, multicollinearity is a situation where explanatory variables are highly correlated. There are two measures that are often suggested to test the existence of multicollinearity. These are: Variance Inflation Factor (VIF) for association among the continuous explanatory variables and Contingency Coefficients (CC) for dummy variables.

Thus variance inflation factor (VIF) is used to check multicollinearity of continuous variables. As  $R^2$  increase towards 1, it shows high multicollinearity of explanatory variables. The larger the value of VIF, the more troublesome or collinear is the variable  $X_i$ . As a rule of thumb if the VIF greater than 10 (this will happen if  $R^2$  is greater than 0.80) the variable is said to be highly collinear (Gujarati, 2003).

Multicollinearity of continuous variables can also be tested through Tolerance. Tolerance is 1 if  $X_i$  is not correlated with the other explanatory variable, whereas it is zero if it is perfectly related to other explanatory variables. A popular measure of multicollinearity associated with the VIF is defined as: Contingency coefficient is used to check multicollinearity of discrete variable. It measures the relationship between the row and column variables of a cross tabulation. The value ranges between 0 - 1, with 0 indicating no association between the row and column variables and value close to 1 indicating a high degree of association between variables. The decision criterion ( $CC < 0.75$ ) is that a variable with the contingency coefficient is computed as follows: Where, CC contingency coefficient is chi-square test and N is total sample size. As cited in Paulos (2002), if the value of CC is greater than 0.75, the variables are said to be collinear. Statistical package STATA version 12 was used to compute both VIF and CC.

## CHAPTER FOUR

### RESULT AND DISCUSSION

#### 4.1. Descriptive Results

##### 4.1.1. Demographic Characteristics of the Sampled Farm Households

This sub-section presents the demographic features of 62 sampled small holders' farmers'. These features were found to be of great help in terms of clearly depicting the diverse background of the respondents on potato farmers' grows margin and the impact this diversity has had on the descriptive and statistical results.

The survey results showed that 83 % and 17% of the sample farm households were males and females, respectively. The average family size of the sample farmers' was about 5.37 persons. This average makes differences in family size, where the largest family size was 11 and the smallest was 1. Moreover, 74% of the sample farmers' were married while 22% were single and 3% were single and divorced, respectively. A typical household head attained two years of formal schooling; were the maximum school year was 12 and the minimum was 0.

The one way ANOVA result shows that sex and formal education had insignificant outcome on farmers' gross margin; whereas age had significant outcome on farmers' gross margin.

Table 4.1: Demographic Characteristics of the Sampled Farm Households

Descriptive Analysis of Demographic Characteristics of Sampled Farm Households													
SN	Variable		Observation	Percent	Freq.	Mean	Std. Dev.	Min	Max	F-Test		Bartlett's test for equal variances	
										F	Prob > F	chi2(3)	Prob>chi2
1	Sex	Male	23	37%	62.00	0.63	0.49	0.00	1.00	0.60	0.62	3.05	0.38
		Female	39	63%									
2	Age		62.00	100%	62.00	56.85	14.35	15.00	92.00	11.310	0.000	7.171	0.067
3	Family Size		62.00	100%	62.00	5.37	2.56	1.00	11.00	4.860	0.003	19.310	0.000
4	Educational level		62.00	100%	62.00	1.90	2.32	0.00	12.00	0.840	0.476	0.068	0.995

Source: Survey result, 2016/17

### 4.1.2. Factors of Production

The one-way ANOVA summary test result in the table 4.2 showed that respondents total farm land size(owned and contracted), potato farm land size(owned and contracted), input costs (land preparation, chemicals and harvesting ) and livestock ownership tends to have significant effect on sampled farm households potato gross margin. Whereas; input costs for fertilizer and labor tend to have insignificant effect on farm households potato gross margin.

Table 4.2: Factors of Production

Descriptive Analysis for Factors of Production													
SN	Variable		Observation	Percent	Freq.	Mean	Std. Dev.	Min	Max	F-Test		Bartlett's test for equal variances	
										F	Prob > F	chi2(3)	Prob>chi2
1	Total Farm Land Size	Owned	62.00	100%	62.00	1.56	0.82	0.02	4.13	3.460	0.017	2.269	0.519
		Contracted	62.00	100%	62.00	0.52	0.27	0.01	1.38	3.340	0.020	30.207	0.000
	Potato Farm Land Size	Own for Potato	62.00	100%	62.00	0.16	0.09	0.00	0.43	13.170	0.000	27.319	0.000
		Contracted for Potato	62.00	100%	62.00	0.38	0.20	0.01	1.00	3.540	0.015	16.592	0.001
2	Input Cost	Land Preparation Cost	62.00	100%	62.00	1608.22	859.91	24.57	4290.00	3.340	0.020	30.207	0.000
		Fertilizer Cost	62.00	100%	62.00	1152.56	616.27	17.61	3074.50	1.570	0.198	8.737	0.033
		Chemical Cost	62.00	100%	62.00	536.07	286.64	8.19	1430.00	5.750	0.000	23.818	0.000
		Labor Cost	62.00	100%	62.00	1072.15	573.28	16.38	2860.00	2.031	0.158	8.156	0.027
		Harvesting Cost	62.00	100%	62.00	536.07	286.64	8.19	1430.00	3.910	0.080	9.171	0.032
		Total Input Cost	62.00	100%	62.00	4905.08	2622.74	74.94	13084.50	1.470	0.168	4.619	0.057
3	Tropical Livestoke Unit		62.00	100%	62.00	5.76	5.22	0.00	19.66	4.790	0.003	31.607	0.000

Source: Survey result, 2016/17

#### a) Land holding

The average potato cultivated land size owned by the sample respondents were about 1.6 ha, the minimum and the maximum being 0 ha and 0.43 ha, respectively. The average potato cultivated land size contracted by the sample respondents were about 0.38 ha, the minimum and the maximum being 0.01 ha and 1ha, respectively.

#### b) Input Cost

Agricultural input are important for rural farm households level of production and revenue generated from it in Ethiopia. Thus, the survey result showed that the average total input cost incurred by a typical farm household was ETB. Birr 4905. The minimum and the maximum being



74.94 and 13084.5 ETB, respectively. Moreover; mean land preparation, fertilizer, chemicals, labor and harvesting costs were found to be ETB .Birr 1608, 1152, 536, 1072 and 536 respectively.

### c) Livestock owned

Livestock are important assets for rural households in Ethiopia. They are used as sources of food, draft power, income, and energy. Moreover, livestock are indices of wealth and prestige in rural areas. Almost all of the sampled households reared livestock, which constituted cattle, small ruminants, and pack animals. On average, the sample households kept about 5.76 animals (tropical livestock unit). The minimum number of livestock kept was 0.01 whereas the maximum was 19.66.

## 4.1.3. Institutional Factors

The one-way ANOVA summary test result in the table 4.3 showed that sampled farm house hold access to irrigation, credit, extension services tends to have significant effect on sampled farm households potato gross margin.

Table 4.3: Institutional Factors

Descriptive Analysis for Institutional Factors													
SN	Variable		Observation	Percent	Freq.	Mean	Std. Dev.	Min	Max	F-Test		Bartlett's test for equal variances	
										F	Prob > F	chi2(3)	Prob>chi2
1	Access to Irrigation	Yes	6	10%	62	1.903	0.298	1.000	2.000	3.460	0.017	1.969	0.519
		No	56	90%									
2	Access to Credit service	Yes	13	5%	62	1.113	0.319	1.000	2.000	3.340	0.020	30.207	0.000
		No	39	15%									
3	Access to Extension service	Yes	7	11%	62	1.371	0.487	1.000	2.000	13.170	0.000	27.319	0.000
		No	55	89%									
4	Access to Market Info.	Yes	53.94	87%	62	1.567	0.790	1.000	2.000	12.150	0.000	26.264	0.000
		No	8.06	13%									

Source: Survey result, 2016/17

### a) Access to Irrigation

About 10% (6) of the sample respondents reported that they had access to irrigation infrastructure traditional or modern.

#### b) Extension service

Agricultural extension services provided by agricultural development offices are believed to be important sources of information about improved agricultural technologies. About 89% of the sample respondents reported that they had contact with agricultural extension and they had received extension advice on vegetables market.

#### c) Access to credit

The main source of credit in the study area was relatives and friends. From the sample households 5 percent sampled farmers' had received while 95% do not receive credit. The chi-square result shows that there is statistically significant difference at 5% level on credit access.

#### d) Access to market information

Table 4.3 shows that about 82.11% of the sample respondents reported that they had access to information related to potato market and 17.89 of the sample respondents had no access to information. Market Distance

### 4.1.4 Potato Production and Revenue

The one way ANOVA test result showed that potato output and sales revenue had significant effect on farmers' gross margin.

Table 4.4: Potato Production and Revenue

Descriptive Analysis of Potato Production and Revenue												
SN	Variable	Observation	Percent	Freq.	Mean	Std. Dev.	Min	Max	F-Test		Bartlett's test for equal variances	
									F	Prob > F	chi2(3)	Prob>chi2
1	Potato Output in Quintal	62.00	100%	62.00	160.82	85.99	2.46	429.00	13.560	0.000	9.171	0.006
2	Potato Sales Revenue in Birr	62.00	100%	62.00	72370.05	38696.14	1105.65	193050.00	15.210	0.000	12.410	0.001
3	Farmers Gross Margin	62.00	100%	62.00	63632.04	34023.94	972.15	169741.00				

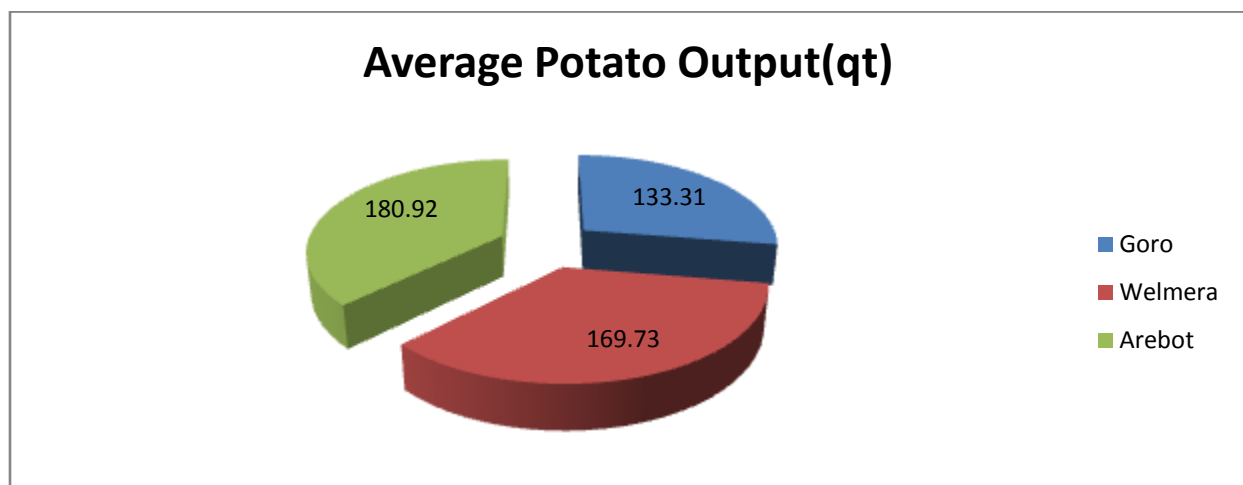
Source: Survey result, 2016/17

The major vegetables grown in the study area are potato and cabbage. The average quantity of potato production by the sample farmers' was about 160.8qt. This average makes differences in

production, where the maximum production was 429 8 qt and the minimum production was 2.46 qt. potato. The average revenue generated from potato production by the sampled farmers' was about ETB. Birr 72,370. This average makes differences in sales revenue, where the maximum production was 193,050 and the minimum production was 1105 birr. The average farmers' gross margin from potato production by the sampled farmers' was about ETB. Birr 63,632. This average makes differences in farmers' gross margin, where the maximum production was 169,741 and the minimum production was 972.15 birr.

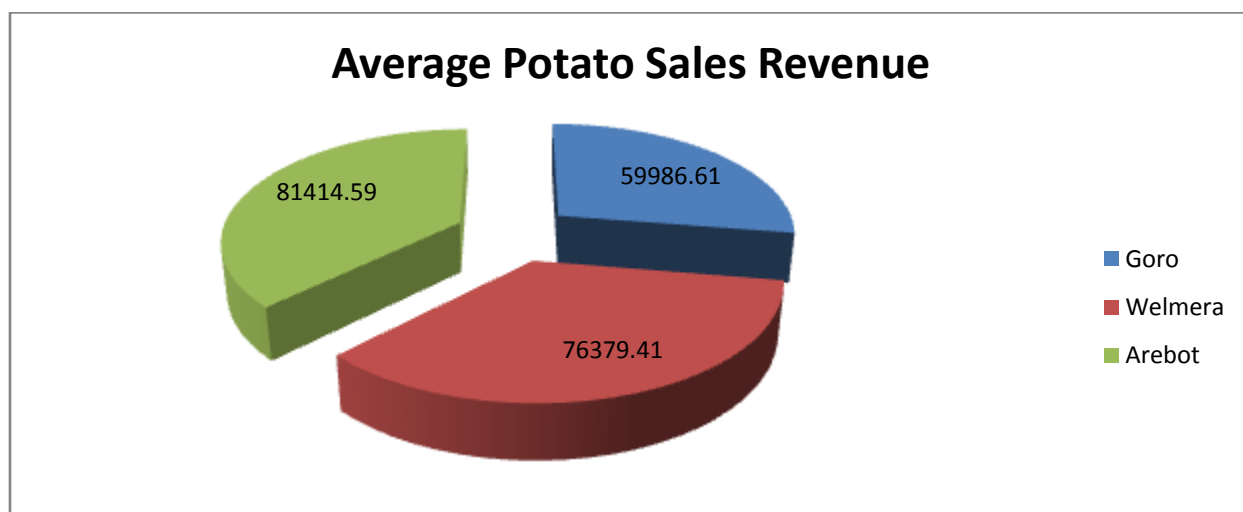
Fig 4.1 depicted that the average quantity of potato produced from Welmera, Arebot and Goro sampled kebeles were found to be 169.73, 180.92 and 133.31 respectively. Moreover, the average potato production in Welmara kebele was found to be the highest.

Fig: 4.1 Average potato output by sampled kebeles



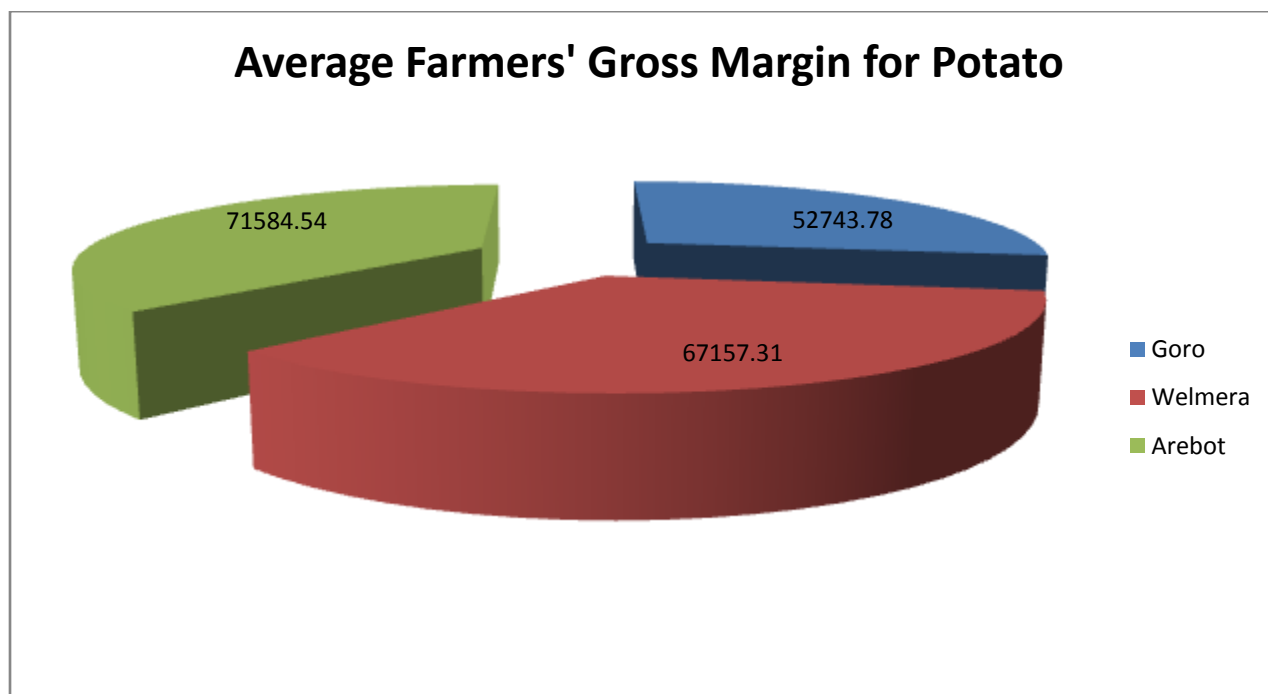
The average revenue generated from potato production by sampled kebele of Welmera, Arebot and Goro were about ETB. Birr 76379.41, 81414.59 and 59986.61 respectively.

Fig: 4.2 Average potato sales revenue by sampled kebeles in ETB



The average gross margin generated from potato production by sampled kebele of Welmera, Arebot and Goro were about ETB. Birr 71584.54, 67157.31 and 52743.78 respectively.

Fig: 4.3 Average potato farmers' Gross Margin in ETB by sampled kebeles



## **4.2 OLS Estimation Result for Factors Affecting Farmers' Marketing Gross Margin**

Table 4.5 summarizes the variables that influence potato farmers' gross margin. Moreover; demographic characteristics, factors of production, input costs and institutional factors influence as independent variables and potato gross margin as dependent variable were exhaustively tested to meet model specification assumptions.

This model helped us to see the hidden characteristics of the data. Thus; validity of the regression model was carefully tested for heteroscedasticity, multicollinearity, autocorrelation, and also for specification errors.

In order to check the existence of multicolliniarity among the continuous variables, Variance Inflation Factor was used and the degree of association among the dummy (discrete) explanatory variables was investigated by using contingency coefficient. The test result indicated that there was no significant multicollinearity or association of variables observed for the test.

Table 4.5: Results of the OLS model

Source	SS	Df	MS	Number of obs = 258		
				F( 11, 246) = 4.37		
Model	53.950	11	4.905	Prob > F = 0.0000		
Residual	276.081	246	1.122	R-squared = 0.635		
				Adj R-squared = 0.6261		
Total	330.031	257	1.284	Root MSE = 6.0594		
Gross Margin	Coef.	Std. Err.	t	P>t	[95% Conf.Interval]	
Age	-0.0374	0.1873	-0.2000	0.8420	-0.4064	0.3316
Education Level of HH Head	0.0324***	0.0083	3.8900	0.0000	0.0160	0.0488
HH Size	-0.5605***	0.1732	-3.2400	0.0010	-0.9016	-0.2194
sex of HH Head	0.0050	0.0520	0.1000	0.9230	-0.0973	0.1074
Total Potato Cultivated Land Size	0.1084***	0.0830	3.3000	0.0030	-0.0552	0.2719
Quantity of Potato Produced	0.0852**	0.1016	2.8400	0.0651	-0.1149	0.2853
Total Input Cost	-0.2141**	0.0958	-2.2400	0.0260	-0.4028	-0.0254
Tropical Livestock Unit	-0.3005***	0.0863	-3.4800	0.0010	-0.4706	-0.1304
Access to Irrigation	0.3465	0.3250	1.1000	0.2750	-0.2901	0.8454
Access to Extension Service	0.0876	0.1247	0.7000	0.4830	-0.1581	0.3332
Access to Credit	-0.1002	0.0941	-1.0600	0.2880	-0.2856	0.0852
Access to Market Info.	0.2775***	0.0871	3.1900	0.0020	0.1059	0.4491
Constant	2.5743	0.7699	1.3400	0.3610	1.0578	4.0908

\*\*\*: significant at 1% level; \*\*: significant at 5% level

The result from the OLS regression showed that most of the variables tested had expected sign. Thus; education level of household head, household size, potato cultivated land size, quantity of potato produced, input cost, livestock ownership and access to market information had expected sign and significantly affect sampled potato farm household gross margin. Whereas; sex of household head, access to irrigation and access extension service had positive sign and statistically insignificantly effect on potato farmers' gross margin. Moreover; age and access to credit had negative sign, but they are statistically insignificant.

Household size of sampled respondents significantly and negatively influenced potato farmers' gross margin. An increase in the household size by one decreases sampled farmers' gross margin

by 0.56, all other factors held constant. This implies that as an increase in household size increases farmers' own consumption.

Education level of the household head significantly and positively affected potato sampled farmers' gross margin. One year increases in household head's education increase sampled potato farmers' gross margin by 0.034, all other factors held constant. This can be explained by the fact that as an individual access more education he/she is empowered with the best skills and knowledge that can effectively used in farming.

Consistent to our finding; Gumataw et al., 2016 study found that age, education, ethnic and religious ties have an influence on farmer s' choice of sales arrangement. Whereas against to our finding; Gizachew, (2006) found that household size affect positively while household education affects negatively.

Consistent to our finding; Yassin et al., 2016 demonstrated that level of education positively affect farmers' participation decision in potato output market. Similarly, Ayelech, (2011) found that fruit marketable supply was affected by education level of household head and fruit production experience. Moreover; Mahlet et al., 2015 study showed that farming experience was one of the significant variable that affect the households' level of potato supply positively at different probability levels. Similarly, Bezabih et al., 2015 study indicated that farming experience affect channel choice decisions in one way or another.

Contrary with our finding; Abay (2007) study found out that marketable supply of vegetables were significantly affected by family size. Similarly, Yassin et al., 2016 study indicated that family size affects the extent of potato sales negatively. In line with our finding; Sebatta et al., 2014 showed that dependency ratio positively influenced net selling rather than net buying or net buying rather than autarky among smallholders.

Mudege et al., 2015 study result from the Real Markets Approach demonstrated that agricultural market interventions that do not address underlying social structures such as those related to gender relations and access to key resources will benefit one group of people over another; in this case men over women.

Total land holding significantly and positively influenced sampled farmers' gross margin. An increase in land holding by one hectare increases sampled farmers' gross margin by 0.1, all other factors held constant. This implies that as the land holding increase the farmer's plant more potato and yield increases, farmers' gross margin also increases. This is in line with Desta (2004) who found that land enables the owner to earn more agricultural output which in turn increases farmers' profitability. Similarly; Godfrey and Agnes (2012) study showed that farmers' earned only 8% of the total gross margin (GM) compared to 30.9% for the wholesalers. The regression analysis revealed that land size was significant and had positive relationship with GM.

Access to market information significantly and positively affected sampled farmers' gross margin. Thus, access to market information increases sampled farmers' gross margin by 0.27, all other factors held constant. In line with our finding; Yassin et al., 2016 and Kumilachew (2016) study indicated that access to information affect proportion of the value of potato sold positively and significantly. Similarly, Rehima (2007) and Bezabih et al., 2015 found that access to market information was among the variable that influence surplus.

Consistent to our finding; Mahlet et al., 2015 and Yassin et al., 2016 study indicated that access to market information affect farmers' extent of potato sales positively. Similarly; Kassa, 2014 and Million and Belay (2004) study showed that lack of market outlets and information as important constraints in vegetable production and marketing.

Livestock ownership significantly and negatively affect sampled farmers' gross margin. A unit increase in tropical livestock unit (livestock owned) decreases sampled farmers' gross margin by 0.30, all other factors held constant. This may be explained by the fact that farmers' who have more livestock do not have the motive to produce more potato which is perishable by nature. Contrary to our finding; Yassin et al., 2016 study demonstrated that livestock owned positively affect farmers' participation decision in potato output market and the extent of potato sales. Similarly; Mahlet et al., 2015 study showed that livestock holding significantly and positively affect the households' level of potato supply at different probability levels.

In line with our finding; Sebatta et al., 2014 study indicated that non-farm income earned affected the potato farmer's level of market participation significantly and negatively. Similarly;



Abay (2007) found out that marketable supply of vegetables were significantly and negatively affected by number of oxen owned.

Quantity of potato produced significantly and positively influenced sampled farmers' gross margin. An increase in potato produced by one increases sampled farmers' gross margin by 0.085 all other factors held constant. Input cost significantly and negatively influenced sampled farmers' gross margin. An increase in potato input cost by one decreases sampled farmers' gross margin by 0.21, all other factors held constant.

In line with our findings; Kumilachew (2016) study indicated that access to improved seed affect proportion of the value of potato sold positively and significantly. Gumataw et al., 2016 study found that gross profit was 225% higher for farmers' without intermediation. This could be explained by the latter farmers' having access to better quality inputs, better contract specifications and receiving higher prices for their products. Nonetheless, the majority of farmers' continue trading via middlemen.

Kassa, 2014 study by employing value chain framework showed that potato value chain is constrained by inadequate input supply, high input price, inappropriate delivery system, and poor harvesting technology, limited knowledge about post-harvest handling, lack of support for producers and traders and poor infrastructure facilities.

Moreover; Bezabih and Hadera (2007) identified pest, drought, shortage of fertilizer, and price of fuel for pumping water as the major constraints of horticulture production in Eastern Ethiopia. Other problems which they reported also include poor know how in product sorting, grading, packing, and traditional transporting affecting quality.

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Conclusion**

The results showed that potato production and marketing in the study area (Holeta District) is very high. The statistical result showed that age, land size (owned and contracted), potato farm land size (owned and contracted), input costs (land preparation, chemicals and harvesting) and livestock ownership, access to irrigation, credit, extension services, potato output and sales revenue had significant outcome on farmers' gross margin. Whereas; sex, formal education, input costs for fertilizer and labor had insignificant outcome on farmers' gross margin.

Moreover; the result from the OLS regression showed that most of the variables tested had expected sign. Thus; education level of household head, household size, potato cultivated land size, quantity of potato produced, input cost, livestock ownership and access to market information had expected sign and significantly affect sampled potato farm household gross margin. Whereas; sex of household head, access to irrigation and extension service had positive sign and statistically insignificantly effect on potato farmers' gross margin. Moreover; age and access to credit had negative sign, but they are statistically insignificant.

#### **5.3. Recommendations**

In view of the above conclusion, this study makes the following recommendations to increase potato farmers' gross margin:

Increasing the production and productivity of potato per unit area of land is better alternative to increase potato farmers' gross margin. Thus, introduction of modern technologies for the efficient use of the irrigation water, controlling disease and pest practices should be promoted to increase production.

Strengthening the supportive activities such as information centers and input supply systems would also boost farmers' gross margin from potato. In addition to that, building the asset base of the farmers' and developing the skills what farmers' have through experience increases potato farmers' gross margin.

Farmers' gross margin is significantly and positively affected by extension service. Therefore, strengthening efficient and area specific extension systems by giving continuous capacity building trainings and separating extension work from other administrative activities increases potato farmers' gross margin.

Finally, further research is needed on determinant of price between different potato markets.

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## Annex- OLS Resgression Diagnostic Tests

### 1) VIF Test

Variance Inflation Factor Test		
Variable	VIF	1/VIF
Age	3.20	0.31
Education Level of HH Head	3.19	0.31
HH Size	3.13	0.32
sex of HH Head	2.77	0.36
Total Potato Cultivated Land Size	2.75	0.36
Quantity of Potato Produced	2.47	0.41
Total Input Cost	2.27	0.44
Tropical Livestoke Unit	2.23	0.45
Access to Irrigation	2.20	0.46
Access to Extention Service	2.18	0.46
Access to Credit	2.11	0.47
Access to Market Info.	2.20	0.46
Mean VIF	2.56	0.40

### 2) Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of gross margin

chi2(1) = 6.84

Prob > chi2 = 0.0057

### 3) Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	62.00	61	0.4402
Skewness	23.05	11	0.0174
Kurtosis	1.77	1	0.1833
Total	86.82	73	0.1286

#### 4) Ramsey RESET test using powers of the fitted values of gross margin

Ho: model has no omitted variables

$$F(3, 47) = 9.60$$

$$\text{Prob} > F = 0.0002$$

#### 5) Correlation Matrix

Correlation

Correlation matrix of coefficients of regress model

	Kebele	educhh~d	age	hhsz	sexhhh~d	tropic~t	landsi~o	totalp~l	totali~t
Extens~E	waterh~g								
Kebele	1.0000								
educhh~d	-0.1410	1.0000							
age	-0.2067	0.3927	1.0000						
hhsz	-0.1301	-0.0114	0.1393	1.0000					
educhh~d	0.0229	-0.0866	-0.0098	-0.1304	1.0000				
landsi~o	0.0230	-0.3625	-0.2209	-0.0267	-0.0677	1.0000			
totalp~l	0.0975	-0.1084	-0.2034	-0.0554	0.1231	0.2304	1.0000		
totali~t									
waterh~g	-0.0993	0.1118	0.2036	0.0527	-0.1225	-0.2382	-0.9999		1.0000
age	-0.0574	0.2308	0.0059	-0.0006	-0.0044	-0.1612	-0.1574		0.1593
hhsz	0.3018	-0.2997	-0.1851	-0.1227	0.0703	0.1539	0.1229		-0.1259
educhh~d	0.1213	-0.2305	-0.0045	-0.1412	0.0865	0.2187	-0.1489		0.1472
landsi~o	0.0740	0.0189	-0.0277	0.1184	0.2808	0.1203	0.1075		-0.1061
totalp~l	-0.2688	-0.0096	-0.3170	-0.0750	-0.2645	-0.0839	0.0751		-0.0754
totali~t	-0.4342	-0.6916							