Analysis of Factors Affecting Potato Farmers' Gross Margin in Central Ethiopia: The Case of Holeta District

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ABSTRACT

Markets are important for economic growth 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. The title of the study is Analysis of Factors Affecting Potato Farmers' Marketing Gross Margin in Central Ethiopia: the case of Holeta District. Therefore, the general objective of this study was to examine factors affecting potato farmers' gross margin in the Holeta district and specifically to examine the effects of farmers demographic characteristics, factors of production, institutional factors, production cost and livestock ownership on the potato producing farmers' gross margin. The research was bound to the production area which is 35 hectares of potato in Welmera, Goro and Arebot Kebeles of Holeta district. 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. Moreover, the result from the OLS (Ordinary Least square) regression showed that 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. The study imply the introduction of modern technologies for the efficient use of the irrigation water, controlling disease and pest practices should be promoted to increase production;

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.

Key word: Potato farmers, Gross margin, Holeta District

1. INTRODUCTION

1.1. Background of the Study

Markets are important for economic growth 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). Market-oriented farmers play a significant role in the rural agricultural sector in Ethiopia. However, these trader-farmers are often disadvantaged by limited access to information, services, appropriate technology and capital. These factors restrict their capacity to effectively participate in the marketing of their produce. In many instances farmers, including those in the potato innovation platforms (IPs) of in Western Shoa of Ethiopia are relegated to the lower end of value chains where they are price takers with little bargaining power. Therefore they end up earning little margins while giant chain actors along the chain like middlemen have the power to determine prices paid by the final consumer and thus extract huge marketing margins.

Potatoes are considered a source of both food and income, thus development of the potato sector can improve livelihoods of rural dwellers in Ethiopia in the context of urbanization and market integration (Horton, 2008). Urbanization, increasing incomes, market liberalization and direct foreign investment are causing changes in the food marketing systems (Kennedy et al., 2004). In addition, increased participation of women in the labor force has led to transition from traditional staple foods to convenience foods. The changes in the marketing of food products have thus led to a shift from informal to formal market channels.

Formal marketing channels are characterized by standardized branded products, use of efficient, integrated marketing, logistical, and financing processes. In addition, the terms of production,

processing, procurement, payment and product type are set by buyers and not producers. This is due to the demand by urban consumers who require high quality products at consistent prices throughout the year. Supermarkets are becoming significant players in vertically integrated food marketing systems. Other market players include hotels and fast-food outlets. These trends confront smallholder farmers with market challenges and opportunities. As a result of such trends, the livelihoods of smallholder farmers are being influenced by the demands of urban consumers, market intermediaries, and agricultural (food) industries (Horton, 2008). Often smallholder farmers have limited access to marketing information, services, technology and capital.

Production of potatoes in Ethiopia is basically for subsistence use (mainly household consumption) with limited surplus for sale in order to earn income despite enormous opportunities for national, regional and global trade. There is no cross-border trade with Ethiopia, but this only occurs to meet the very short term potato supply shortages (Okoboi, 2001; Ferris et al., 2002). The potato value chain is not well organized or integrated because producers, transporters, marketers, wholesalers and retailers are fragmented. This lack of organization is one factor that isolates the potato sub-sector from regional and global markets. There are few initiatives for collective action in potato production and marketing and those existing are in their infancy and widely scattered (Ferris et al., 2002) leading to limited or no integration of stakeholders along the potato value chain.

With increasing population and urbanization and thus growing demand coupled with the increase in fast food restaurants and supermarkets, the potato sub-sector in Ethiopia is bound to expand. This was noted by Ferris et al. (2002) who estimated the demand for potatoes to be approximately 850,000 to 1,200,000MT per year by 2015. Production volumes increased from 478,000MT in 2000 to 695,000MT in 2010 (FAO, 2012). This is an opportunity for potato farmers to increase farmers' gross margin and productivity of improved and suitable potato varieties, which will in turn increase their income and improve food security and livelihood. Given the challenges and opportunities that smallholder farmers face in Ethiopia, it is important to identify factors affecting farmers' gross margin in the area of Holeta, Western Shoa.

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 (Goletti, 2000). 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 respectively. The other products such as cabbage, beetroot, 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. Therefore, the purpose of this study is to determine factors affecting potato farmers' gross margin in the Holeta district

1.2. Statement of the Problem

Consumers need standardized products, yet these farmers have little knowledge of consumers demand and hence cannot produce what the market needs. Even if they produce what the market

needs, they may have little information of reliable and profitable markets. In such circumstances, there is potential exploitation of farmers by the middlemen and wholesalers in the chain because the market value of the potatoes is subject to very limited negotiation, given that almost all farmers sell to middlemen at the farm gate. The exploitation is further exacerbated by absence of standardized packing and weighing scales (Hoffler and Maingi, 2005). The growing demand for potatoes in urban areas could therefore contribute positively to the development of the rural areas and the overall economy of Ethiopia if there is 2 way efficient flow of market information.

High marketing margins exist either because of monopolistic elements in the marketing chain or because the real costs of marketing are high. High marketing costs may be due to poor marketing services and infrastructure. Thus, improving the marketing services such as storage, transportation, and processing can lead to improvement of rural income by reducing marketing costs (Fuglie, 1993). Farmer collective action has also been proposed as a way of improving the welfare of smallholder farmers in the emerging high-value agricultural markets (Horton, 2008) as it can improve the bargaining power.

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 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 (Haji, 2008). 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 (Goletti, 2000).

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 (Lumpkin et al., 2005).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 (Haji, 2008). This study has the purpose of investigating the vegetable specifically factors affecting potato farmers' gross margin in Holeta district.

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' to get gross margin in the vegetables market (Mari, 2009).

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 and transportation (Andargachew, 1990). Thus, reducing the information gap on the subject by contributing to better understanding of improved strategies for reorienting marketing system for the benefit of small farmer development is found to be vital. Therefore this study aim to determine factors affecting potato farmers' gross margin in the Holeta district.

1.3. Research Questions

This study tried to answer the following research questions:

RQ1: How ispotato gross margin affectedby factor of production?

RQ2: How ispotato gross marginaffectedbyinstitutional factors?

RQ3: How ispotato gross margin affectedby production cost?

RQ4: How ispotato gross margin affectedby livestock owner ship?

1.4. Objectives of the Study

1.4.1 General Objectives

The general aim of this study is to determine factors affecting potato farmers' gross margin in the Holeta district.

1.4.2 Specific Objectives

(i) To assess the influencing factors of production on gross margin.

(ii) To identify the effects of institutional factors on gross margin.

(iii) To examine production cost influence on gross margin.

(iv)To determine the effects of livestock ownership on the potato producing farmers' gross margin.

1.5. Scope or Delimitations of the Study

This study were assessed on the factors affecting potato farmers gross margin in central Ethiopia in the case of Holeta district, Attempting to analyze the entire potato markets were impossible action given the limited resources and time that student researcher had, so that the research was narrowed on potato production around three kebeles in Holeta district. Specifically, Wolmera, Goro and Arebot are the main areas this study focused. In addition to geographical delimitation student researcher delimited this study by specific production period of 2016/17.

1.6. Limitations of the Study

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.

1.7. 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 factors responsible for farmers' gross margin clearly 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. Moreover, it can contribute to the existing body of literature in the study subject. Conducting such kind of researcher help student researcher to practice what has been learned in theory and also this study will use as a blue print for other student researchers who like to conduct their study in similar topic.

2. REVIEW OF RELATED LITERATURE

2.1. Concepts and Definitions

2.1.1 Farm Gross Margins:

Farm Gross Margins provide a simple method for comparing the performance of enterprises that have similar requirements for capital and labor. A gross margin refers to the total income derived from an enterprise less the variable costs incurred in the enterprise. Generally the gross margins for any agricultural crop are determined by deducting variable costs from the gross farm income of a given crop for a given period of time (usually per year or per cropping season). They are not a measure of farm profit as they do not include capital (land, buildings, machinery, irrigation equipment etc.) or fixed costs (building and machinery depreciation, administration, insurance, rates, taxes etc.). However, they do provide a useful tool in terms of farm management, budgeting and estimating the likely returns or losses of a particular crop (Mendoza, 1995).

2.1.2 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.

2.1.3 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).

2.1.4 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).

2.2 Literature Review on Factors Affecting Potato Farmers Gross Margin

Different studies   on the area of potato gross margin were done by using different approaches and these are presented as follows:

2.2.1 Empirical Literature from Other Countries

According to Sarhad, (2011) study which aims to calculate the cost and revenue of Potato farms by using descriptive statistics and gross margin technique provided a more solid and concrete base of the economic aspects to the small scale potato farms in the study area. Some relevant studies mentioned in the succeeding lines to provide a conceptual and methodological framework to the present study.

Ali et al. (2014) studied cost efficiency of open shed potato farmers in Pakistan by using maximum likelihood estimation revealed that cost efficiency ranges from 0.425 to 0.972 with mean efficiency of 0.741 implies that on average farmer was 74 percent efficient in cost saving. Whereas, Fawwaz et al., (2013) studied resource use efficiency in potato farming in Kenya by using ratios of marginal value product (MVP) to marginal factor cost (MPC) were less than unity for labor cost, cost of feed and cost of equipment which indicated that these inputs were over utilized. Results of the study showed greater than unity value for potato, cost of machineries, drugs and vaccines, and also indicated that these inputs were underutilized during the production process in the study area. Imtiaz, (2012) study to analyze potato farming enterprises in Peshawar District of Pakistan revealed that the commission agent supply 79 percent of one hectare of land while the remaining 21 percent is obtained from wholesale market. On credit, 74 percent of procurement of one kg of potato was made, out of which 63 percent was from the commission agent and the remaining 11 percent was from the wholesale market.

Bano et al., (2011) study by using descriptive analysis along with cost and return analysis on socioeconomic characteristics of the sample potato farmers in Rawalpindi District showed that capital turnover of 1.32 with a rate of return on fixed cost 424 percent and on variable cost 135 percent. Study conducted by Sheikh and Zala, (2011) on the production performance and economics appraisal of potato farms in India, Anand District of Gujarat by using benefit cost ratio, net present value, break even analysis and gross margin found that as the farm-size increases, the net return as well as per kg live weight basis also increases.

In the Punjab state of India, Singh et al. (2010) carried out the gross margin and return analysis of different sizes of potato farms. Total variable cost per hectare was Rs.77.37%, Rs. 68.18% and Rs. 62.51% on small, medium and large farms respectively. Variable cost per potato, chemical cost per hectare, interest on working capital and labor cost etc were highest on small farms followed by medium and large farms. The study suggested that higher weight mean higher feeding cost per kg output.

2.2.2 Empirical Literature from Ethiopia

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

12

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 coast 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 filed 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.

3. RESEARCH DESIGN AND METHOD

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 average 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 HoletaGennet of 25,593, of whom 12,605 were men and 12,988 were women. The majority of the inhabitants said they practices 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.

3.2. 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 and primary data were collect for the purpose of this study where gathered from local farmers by distributing questionnaire and also kebele agricultural officers were other source of primary data student research use structured interview.

3.3 Population, sample technique and sample size

Secondary data provided a general overview about farmer's earnings by marketing crops. However, there was inadequate analysis of who gets what and what are the crops factors leading to that difference. In collecting primary data a from target population of 120 farmers 68 farmers were selected as sample size by using purposive 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 51% (68 households) of potato farmers' were selected by using purposive sampling technique in the three kebeles for gathering primary data by distributing questionnaires.

The questionnaire was developed by open ended and close ended questions to get both quantitative and qualitative data. 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 gross margin 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 1st December 2016 to 30th January 2017. The quantitative data that gathered from close ended questions were analyzed using STATA and has been presented in tables and figures and qualitative data that comes from open ended question and interview were described by using narration.

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.

3.4. Methods of Data Analysis

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

3.4.1. Descriptive 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' gross margin OLS model was used.

To determine farmers' 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:

$Y = \alpha 0 + \alpha 1X1 + \alpha 2X2 + \alpha 3X3 + ... + \alpha 11X11 + \varepsilon$

Where:

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

α0 = The intercept of regression equation

α (1-11) = Coefficient of parameter estimates

X1 = Sex;

18

X2 = Age;

X3= Education level (in years);

X4 = Household size (in numbers of members);

X5 = Potato cultivated Land size;

X6 = Production cost;

X7= Access to extension service;

X8= Access to irrigation;

X9= Access to credit service;

X10= Access to market information;

X11 =Livestock owned

ε = Error term

Then the parameters can consistently be estimated by OLS over n observations reporting values for Yi by including an estimate of the inverse Mill's Ratio, denoting i, as an additional regressor. An econometric Software known as "STATA" was employed to run the model. Before fitting important variables in the models it was necessary to test multicolinearity problem among continuous variables and check associations among discrete variables, which seriously affects the parameter estimates. As Gujarati, (2003) indicates, multicolliniarity 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, multicolliniarity is a situation where explanatory variables are highly correlated. There are two measures that are often suggested to test the existence of multicolliniarity. 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 multicolliniarity of continuous variables. As R^2 increase towards 1, it shows high multicolliniarity 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).

Multicolliniarity 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 multicolliniarity associated with the VIF is defined as Contingency coefficient which is used to check multicolliniarity 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.

4. 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 male and female, 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 11and 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

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

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

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.

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.

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 was19.66.

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

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%									

(Table header title: Descriptive Analysis for Institutional Factors)

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

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. 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
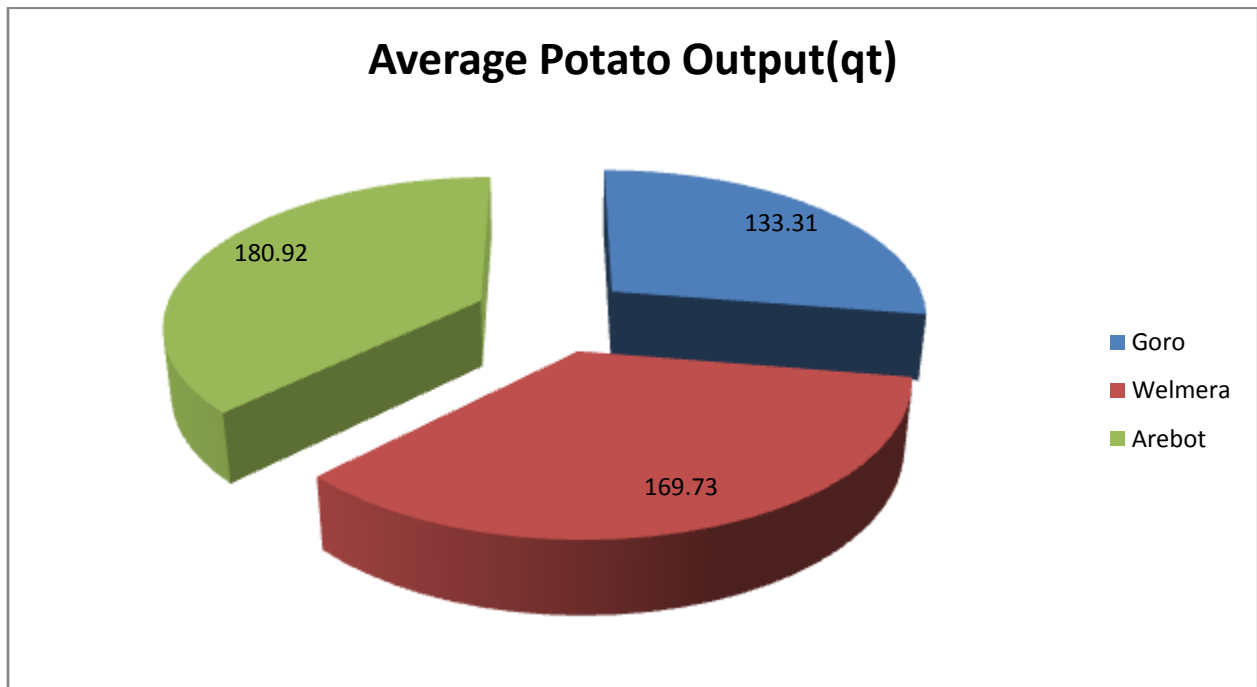
The average revenue generated from potato production by sampled kebele of Welmera, Arebot and Goro were about ETB. Birr 76,379.41; 81,414.59 and 59,986.61 respectively.

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

Average Potato Sales Revenue

81414.59

59986.61

76379.41

- ■ Goro
- ■ Welmera
- ■ Arebot
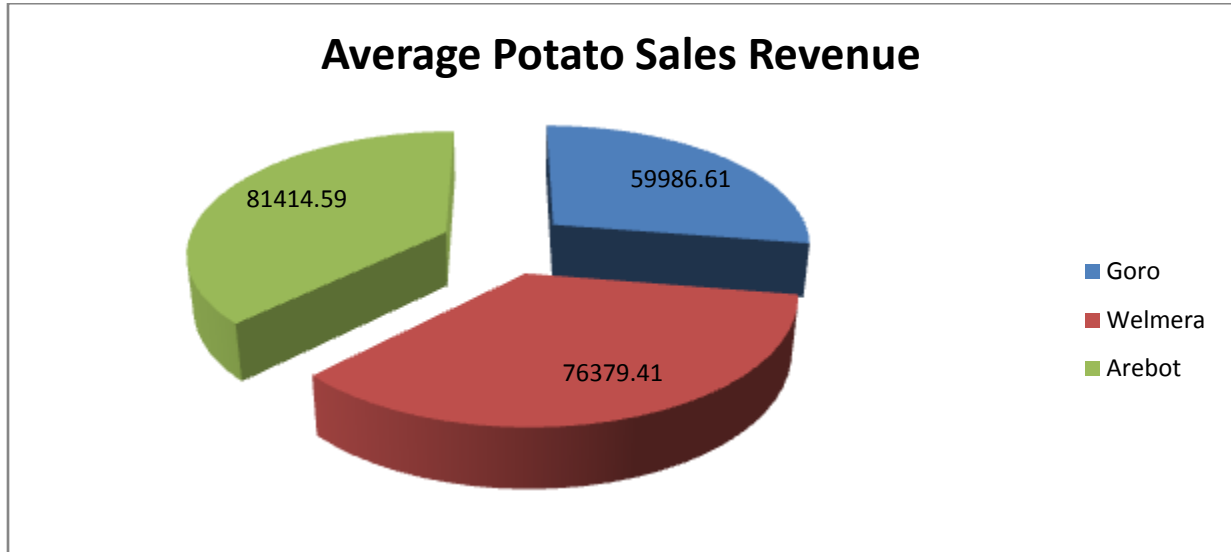
The average gross margin generated from potato production by sampled kebele of Welmera, Arebot and Goro were about ETB. Birr 71,584.54, 67,157.31 and 52,743.78 respectively.

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

Average Farmers' Gross Margin for Potato

0

71584.54

52743.78

67157.31

- ■ Goro
- ■ Welmera
- ■ Arebot
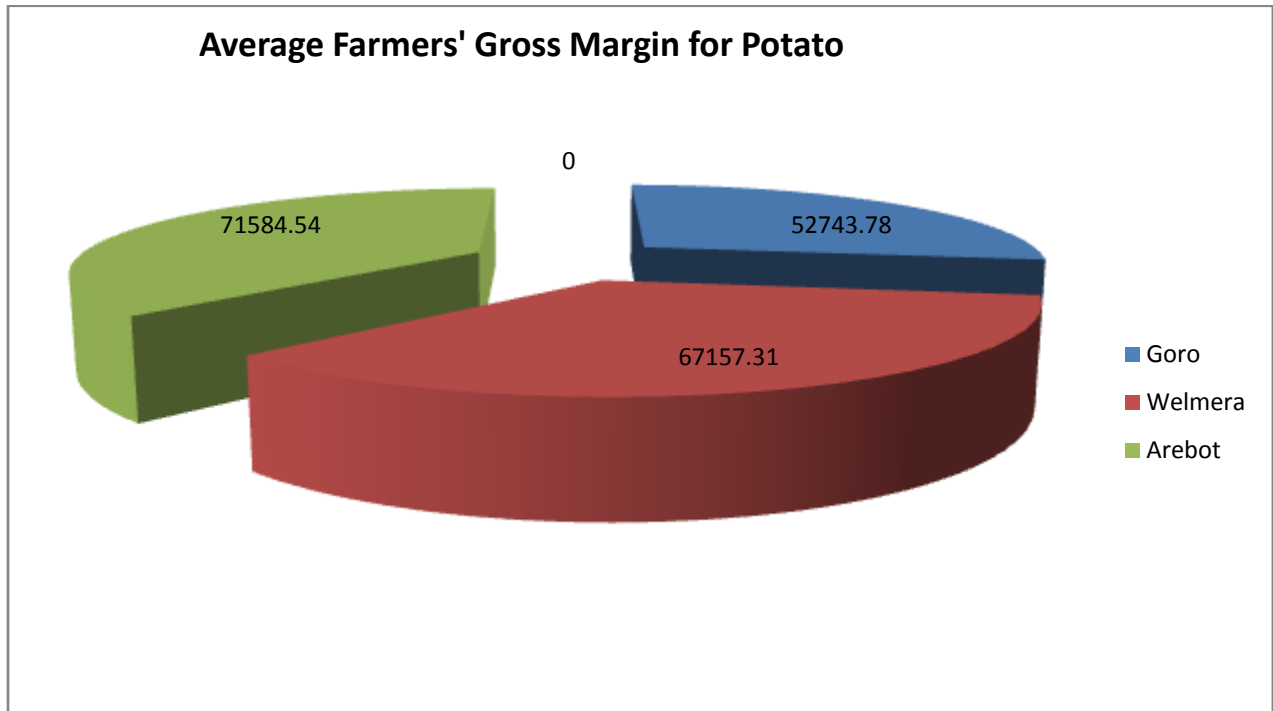
4.2 OLS Estimation Result for Factors Affecting Farmers' Marketing Gross Margin

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 multicolliniarity 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-Value	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 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 with the 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 contrary to our finding, Gizachew, (2006) found that household size affect gross margin 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., 2015study indicated that farming experience affect channel choice decisions in one way or another.

Contrary to our finding, Abay (2007) study found out that marketable supply of vegetables was 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 by0.27, 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 was 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 decrease 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.

5. SUMMARY, AND RECOMMENDATIONS

5.1 Summary

The general objective of this study was to examine factors affecting potato farmers' gross margin in the Holeta district and specifically to examine the effects of farmers demographic characteristics, factors of production, institutional factors, production cost and livestock ownership on the potato producing farmers' gross margin. The research was bound to the

production area which is 35 hectares of potato in Welmera, Goro and Arebot Kebeles of Holeta district.

The study imply the introduction of modern technologies for the efficient use of the irrigation water, controlling disease and pest practices should be promoted to increase production; 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.

5.2 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. 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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List of Abbreviations and Acronyms

- **GM** :Gross Margin
- **GMAT** : Gross Margin Analysis Tools
- **ETB**: Ethiopian Birr
- **OLS** : Ordinary Least Square
- **MoA:** Ministry of Agriculture
- **BoARD** : Bureau of Agriculture and Rural Development
- **FAO:** Food and Agriculture Organization
- **HH Head**: House Hold Head
- **HH Size** : House Hold Size
- **Conf.** Coefficient
- **Std. Err.** Standard Error
- **Prob.** Probability
- **Hec.** Hectare
- **KG:** Kilogram
- **VAT:** Value added tax