MARKETING OF KABULI AND DESI CHICKPEAS BY SMALLHOLDER FARMERS IN EASTERN SHEWA ZONE

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By
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STATEMENT OF AUTHOR

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BIOGRAPHY OF THE AUTHOR

I was born in Arsi, Eastern Ethiopia, on October 25, 1974, and began my elementary education in 1978 at Abiot Fire rural elementary school. I received my BSc degree from Alemaya University of Agriculture in 1995. Up on my completion I joined Metu Ministry of Agriculture in the late 1998 to serve as an expert of socio-economic study. After I had served there until mid of 2001, I moved to Alage Agricultural Technical and Vocational Educational Training College where I have been serving as an Agricultural Economics Instructor.

ACRONYMS AND ABBREVIATIONS

DZARC	Debre Zeit Agricultural Research Center
E IAR	Ethiopian Institute of Agricultural Research
FAO	Food and Agricultural Organization
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICARDA	International Center for Agricultural Research in the Dry Areas
IDS	Institute of Development Studies
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Success
MoARD	Ministry of Agricultural and Rural Development
MoFED	Ministry of Finance and Economic Development
NSLTC	National Soil Laboratory Testing Center
PPP	Purchasing Power Parity
QSAE	Quality and Standards Authority of Ethiopia
WHO	World Health Organization

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ABSTRACT

An understanding of the market for smallholder farmers' crops can provide clues to the potential market for their crops. The main objective of this study was thus to analyze the marketing performance of Kabuli and Desi chickpeas in three districts of east Shewa zone. It investigated the socio-economic, demographic, and institutional factors and other marketing attributes that affect farm gate-prices, season price fluctuations and marketable surplus of chickpeas in the study areas. A sample of 700 randomly selected households was interviewed using a structured questionnaire. Secondary data from different sources were also used. Both descriptive and econometric methods were used to analyze the data. The conceptual and empirical evidence suggests that improving smallholder farmers' awareness for the uptake of improved Kabuli varieties for which the marginal values of varieties are considerably high relative to the price of the inputs would improve farm-gate net returns and prices received by small producers. The marketable surplus will also be improved if farmers switch to production of improved varieties of Kabuli chickpeas. Supplementary production relation ship between crop and livestock enterprises was found to be one of the important solutions to alleviation of high price variability that reduces competitiveness of chickpea marketing. In addition to the crop and livestock supplementary enterprise relation ship, moving for off-farm income activities with out affecting negatively the crop and livestock farming was found another alternative to alleviation of the high price variability problems. The study, however, ascertains that smallholder farmers need to know not only how to produce but first need to know and learn how to identify preferable potential buyers that will enhance competitiveness of chickpea market.

1. INTRODUCTION

1.1. Background

The livelihoods of many poor farmers in Ethiopia depend on the sale of their agricultural outputs in the market. Therefore, the price farmers receive for these outputs have major implications for poverty alleviation. Since the fall of the socialist regime in 1991, Ethiopia has successively adopted economic reform programs that aimed to open up the agricultural marketing system for active participation of the private sector. The current policy environment attempts to promote production and marketing of high value agricultural products with a view to increasing competitiveness in domestic and international markets. However, high transaction costs and problems of asymmetric information continue to bedevil smallholder farmers, especially those with poor access to markets for products, inputs and services (Bekele *et.al.,* 2007).

An improvement in the production and marketing performance of high value crops with export potential might bring about an improvement in the livelihood of the most populous smallholder farmers due to the positive relationship between farm productivity, marketing efficiency and economic growth (Hulten, 2000; Easterly and Levine, 2001; Rachel, 2001). Moreover, the production of commercially oriented high value crops has a number of advantages i.e. it improves the performance of markets (Ruben and Pender, 2004), contributes towards new employment opportunities (Oskam et al., 2004) and stabilizes export earnings (Alwage and Seigel, 1994).

One of the main objectives of the recent economic policy of the Ethiopian government under a plan for Accelerated and Sustained Development to End Poverty (PASDEP) is the diversification of production and exports. Chickpea is one of the newly emerging export commodities being promoted for expansion in Ethiopia (Bekele *et.al*., 2007). The crop constituted about 48% of the pulse export volumes in 2002. During this period, the exported volume accounted for about 27% of the total quantity of chickpea production while the balance remained for domestic market (Bekele *et.al*., 2007) However, the chickpea production system is not adequately market oriented and competitiveness of smallholders is limited by low

productivity and poor quality of traditional varieties (Bekele *et al*., 2007). Despite the policy interest to expand chickpea production for exports, farmers can still choose to sell whole; a portion or none of their chickpea at the farm-gate. By examining how smallholder chickpea farmers sell their crop, this study hopes to shed some light on the farmer's ability to develop and maintain successful transactions.

1.2. Statement of the Problem

The structure and functioning of the chickpea marketing system is constrained by several factors (Bekele et al., 2007). First, the supply originates in small quantities from several highly dispersed small producers that supply non-homogeneous Desi types to local markets. Given the low productivity of the crop at present the marketed surplus by individual farmers and the overall traded volume are low, and hence per unit transaction costs for individual farmers and rural traders are high. Second, there is no efficient mechanism for delivering market information to the producers and traders at local markets on issues related to seasonal prices, demand, and quality requirements in different markets across the country. This makes prices to be determined mainly through local supply and demand patterns. This aggravates the seasonal price fluctuations in local markets. Third, there is lack of a well-established system of grades and standards in the chickpea marketing system. This is despite the three grades reorganized by the Ethiopian Grades and Standards Authority (Table 2) and additional quality specification systems required for exports (Table 3). Fourth, the Desi chickpea varieties currently grown by farmers in the country are not able to satisfy the quality attributes required by diverse markets. The low productivity of the crop at present, therefore, indicates that the transaction costs by individual farmers and rural traders are high. Transaction costs are largely fixed costs that can be spread across more production and large area cultivated (Matungul *et al.,* 2001). This shows the limited participation of smallholder farmers in the existing markets as this can lead to the imperfections in farmers' choice of alternative marketing channels and selling time for their produce. According to Bekele et al. (2007), the high transaction costs and inadequate access by market participants to timely and accurate information about prices, quality-price relations and demand patterns in various markets push smallholder farmers to sell their small marketed surplus at the farm gate with lower prices and leads to highly speculative

behavior and extreme uncertainly in chickpea markets respectively. The chickpea marketing system in Ethiopia is also characterized by lack of reliable weights and measures by traders. This shows the sum of market limitations that add up to low level of competitiveness in the chickpea marketing.

1.3. Objectives of the Study

The general objective of this study is to assess the marketing performance of Kabuli and Desi chickpeas in three districts of eastern Shewa zone.

The specific objectives of the study are:

1. Identify the key marketing outlets for chickpea in the study areas.
2. Estimate the marketing margins for different chickpea marketing channels in the study areas.
3. Identify the determinants of chickpea farm-gate prices in the study areas.

1.4. Significance of the Study

Information on the market performance of high value crops, such as chickpea might provide appropriate production and consumption incentives thereby enhancing agricultural productivity and reducing the food insecurity problem in the country.

In a country where livelihood diversification through production of high-value crops were given due emphasis, improvement in chickpea production and marketing can make a significant contribution to the national economy and thus brings growth. To this effect, these goals require appropriate interventions by the government and private institutions with the aim of improving the market structure, information flow and institutional infrastructures, to help the market in achieving the national policy objectives. The means of meeting these needs can be met by evaluating the economic performance of high value crops like chickpea production and marketing.

This study would generate valuable information on chickpea marketing which may help policy makers to take relevant decisions and intervene in the development of chickpea marketing. In general, governmental and nongovernmental organizations who are interested in high value crops marketing may use the result of this study to take appropriate policy measures or can be used as a base line information for further study .

It also provides a clear picture on how chickpeas are marketed (the environment of suppliers, buyers and facilitators that affect the farmers' ability to develop and maintain successful transactions with target customers), so that an understanding of these markets and intervention helps farmers to increase their supply and receive higher prices thereby improving their livelihoods.

1.5. Scope and Limitations of the Study

The study aims at analyzing the marketing performance of Kabuli and Desi chickpeas in three districts of east Shewa zone. It investigated the socio-economic, demographic, and institutional factors that affect farm gate-prices, season price fluctuations and marketable surplus of chickpeas in the study areas. Studies carried out in many developing countries have pointed out that large numbers of sample households were reluctant to give information on financial issues. Moreover, lack of proper documentation on the required information is another limitation. This ultimately reduces the number of valid data case in the analysis. Other limitations of the study are that it does not include informal moneylenders and urban borrowers.

This specific study cannot warrant generalizations and extrapolations to others contextual setting given the diversified rural livelihoods. Moreover, the efforts of getting reliable data might be affected by doubtful respondents and their idiosyncratic behaviors. However, greater efforts were exerted to convince the sample households about the objectives of the study and confidentiality of the given information.

1.6. Organization of the Paper

Following the introduction section the remainder of the paper is organized as follows. Section 2 presents review of relevant literature. Methodology describing the study areas, sampling methods, methods used in data collection and the actual type of data collected and analytical methods adopted follows in section 3. Section 4 presents results and discussion which emphasizes on identification of producers' main reasons for preference of various marketing outlets and estimation of level of profitability across the outlets, analysis of determinants of farm-gate prices and seasonal prices and marketable surplus of chickpea grains. Section 5 presents a summary of the key findings and the policy implications of the study.

2. LITERATURE REVIEW

2.1. Agricultural Markets in Smallholder Farming Systems and Smallholder Market Participation

2.1.1. Agricultural markets in smallholder farming systems

African markets are typically undercapitalized and inefficient (Eleni, 2003, Fafchamps, 2004). Some of the major factors that contribute to less-developed agricultural markets that limit competitiveness and lead to market imperfections are related to high marketing costs resulting from high transaction costs and poor market infrastructure, low marketable surplus and poor quality products that do not meet market preferences (de Janvry *et al*., 1991; Minten 1999; Fafchamps, 2004; Fafchamps and Eleni, 2006).

Ethiopia is one of the sub-Saharan countries which liberalized its economies and developed poverty reduction strategies that underpin market-led strategies for broad-based agricultural development and economic growth. The centralized grain marketing activities of the 1980s where pan-territorial input and output prices were determined by the central government have given way to liberalized agricultural markets. Market liberalization means that input and output prices are determined by market forces. However, due to the weak bargaining power of producers and production fluctuations, price fluctuations in markets have been found to affect producers (EEA, 2004). Due to widespread market failures and imperfections in the marketing chain, donor agencies and government experts have realized that the idea of sole reliance on market forces does not work, and therefore recommended institutional intervention in the price formation of agricultural products (EEA, 2004).

The Ethiopian government's agricultural policy also defines agricultural marketing as a key element of rural growth, poverty reduction, enhanced food security, and addressing the needs of a growing population in both rural and urban areas. However, nearly half of its population is food insecure or live below poverty line (WHO, 2007). The question is; why Ethiopia is unable to feed its citizens, given the huge wealth of productive land, labor, and other natural

resources. According to Mulat (2000), the Ethiopian agricultural output markets are characterized by inadequate transportation network, limited number of traders with inadequate capital and facilities, high handling costs, inadequate market information system, weak bargaining power of farmers, and underdeveloped agro-industrial sectors. The Indian Nobel prize winner Amartya Sen (1999) argued that famine is not an indication of shortage of food, but could be due to the inability of the market to coordinate supply and demand.

2.1.2. Determinants of smallholder market participation

Agricultural produce in Ethiopia are marketed through complex marketing chains that involve a number of intermediaries and marketing agents (Eleni, 2001, MoARD 2005). This increases the transaction costs and lowers the share of the consumer price that is received by the small producer. This indicates that the increased transaction costs underpin the imperfections in grain markets and contribute to the limited participation of smallholders in existing markets.

A household's production technology choices fundamentally affect its productivity and by extension its market participation choices (Barrett, 2007). Households operating undeveloped agricultural productivity technologies may participate in markets, but often only because they must use commodity markets as a way to resolve pent up demand for financial services to which they have no access. This indicates that promoting adoption of improved production technologies is essential to induce broader-based market participation.

2.2. Special Characteristics of Legume Crops Marketing

Grain legumes like chickpea, lentils, peas and beans (of different types) are the third most important export crops in Ethiopia after coffee and oil crops (National Bank of Ethiopia, 2009). Establishing quality-based marketing systems create self incentives for producers to adopt improved technologies (as improved technologies may help to improve quality), adapt and improve product to meet the quality and quantity requirements of consumers. Thus, giving due attention to product quality is paramount in sustaining market performance. This issue can be explored using the case of chickpeas.

Table 1. Ethiopian grades and standards for chickpeas

Quality traits	Maximum allowable limit (%)		
Totally damaged seeds	Grade 1	Grade 2	Grade 3
Broken grains	0.3-1.0	1.0- 1.5	1.5- 2.0
Wrinkled grains	0.5	1.0	1.5
Cracked coat	2.0	4.0	8.0
Foreign matter	3.0	5.0	7.0
	0.2	0.3	0.5

Source: Quality and Standards Authority of Ethiopia (QSAE)

Table 2.Additional preferred chickpea traits and requirements in export markets

Quality traits	Required standards	Remarks
Color	Cream white	Kabuli satisfy this requirement
Weight (100 seeds)	>34g	Markets also require size in mm
Pesticide residue (max mg/kg)	0.05-2	Depends on pesticide used
Moisture content (%)	< 14	Sufficient during needed
Weeds, pests, and disease	Free	Phystosanitary certificate needed

Source: Quality and Standards Authority of Ethiopia (QSAE)

As shown in Tables 1 and 2, the quality requirements and standards for export markets are very stringent and need to be fully complied with if Ethiopian farmers are going to benefit from this market segment and remain competitive in it. The premium quality grades need to have less than 1% damaged seeds, broken grains, or foreign matter or maximum allowable (less than) 2-3% wrinkled grains or cracked coats. In addition to the quality standards on grain size, color, pest attack, foreign matter, pesticide contamination etc., the exporters need to meet phytosanitary requirements (Table 2). In many cases, the product has to be free from any pests or diseases and satisfy very strict food safety requirements in terms of chemical and pesticide residues. The product also needs to be packed in a certain agreeable size (determined by

importer requirements) using acceptable materials and properly labeled (showing name of the product, weight, grain size, origin and address of the exporter). This implies that for many products, including legumes that are traded internationally, they can only be accepted if they meet strict food safety requirements. The certificates of origin that seek to link the product with its original place of production are also essential to raising competitiveness in such a way that the product is easily distinguishable from others having similar characteristics but produced by elsewhere.

Globalization is the term used to describe the recent impact of innovations in communications and transport systems on trade and increasing integration of world markets. This process has encouraged nations to liberalize or open their economies with the aim of increasing their volumes of trade, including the international trade of agricultural products (Kaplinsky, 20001).This implies that international markets demand large quantities of legume products because farmers across the world are now not only competing with their neighbors or their neighboring countries for access to markets but are competing with farmers across the world. According to Kaplinsky (2001), the prices tend to increase in years of poor global production and fall in years of bumper harvests. This indicates that markets are unable to absorb rapid increasing yield from higher input farming systems and thus higher production (excess supply season) is often translated in to reduced farm gate prices.

Competitiveness in global markets would critically depend on improving productivity, grain quality and ability to consistently supply required volumes of market preferred commodities at competitive prices and at the right time (Kaplinisky, 2001).Producers also need to avoid use of certain pesticides that are not approved by FAO and the World Health Organization (WHO). MoARD (2003) provides a list of accepted pesticides for use. This indicates that global markets demand consistent supply of large-seeded Kabuli (higher quality chickpea) in a manner to create time, place and form utility in the product to receive competitive prices and to meet the standards for food quality and safety requirements.

2.3. Production and Marketing of Chickpea in Ethiopia

2.3.1. Production of chickpea in Ethiopia

Ethiopia has suitable agro-climatic conditions for production of both Desi and Kabuli type of chickpeas. But, the country has traditionally grown Desi chickpeas both for consumption and sale. However, some small-seeded Kabuli type varieties have been released for cultivation since 1970s (Table 3). Kabuli types are just beginning to be grown in some areas and are new in domestic markets (Legese *et al*., 2005). Along with the renewed focus on market-led agricultural development and the ongoing effort to increase export of tradable commodities, the better market opportunities and higher prices seem to have increased the much needed policy attention for Kabuli types. The traditional Desi varieties are small-seeded and are mainly traded locally because international markets favor larger-seeded Kabuli varieties. The average yields of Kabuli varieties are low. The average yields for Desi varieties are low but higher than those in the rest of Africa, perhaps due to the good soils and growing conditions for the crop in the highlands of Ethiopia (Bekele *et al*., 2004). This leads to the importance to consider the global price structures in determining whether it would be profitable to produce and export Kabuli chickpeas and whether Ethiopia would be competitive in such markets. However, large- seeded types that are more preferred in international markets have been released for cultivation in Ethiopia only recently and are not relatively well known amongst local farmers and the trading community. This shows information dissemination is very important to create better agronomic practices by cultivator smallholder farmers and to improve other factors that affect the production and marketing of Kabuli chickpeas and the competitiveness of smallholders in domestic and international markets. Farmers would only switch to Kabuli types if the new varieties have got more marginal values than Desi types and find a reliable market outlet for their produce. This implies that individual producers always have an incentive to adopt a cost reducing technology.

Table 3.Chickpea varieties released in Ethiopia

Variety	Year of release	ICRISAT /ICARDA code	On-farm yield potential (t/ha)	Type	Market Traits			Agronomic Traits
					Color	100 seed Weight (g)	Size in mm	(Duration and pest, disease resistance)
DZ-10-04	1974	-	1.4	Kabuli	Cream White	10.2	2-3	Medium duration
DZ- 10-11	1974	-	1.9	Desi	Light brown	13.0	3-4	Medium duration
Dubie	1978	-	1.7	Desi	Grey	22.0	5-6	Early maturing
Marye	1986	K850*F378	2.3	Desi	Brown	25.5	5-6	Early maturing, fusarium resistant
Worku (DZ-10-16-2)	1994	ICCL 82104	2.9	Desi	Golden	33.0	7-8	Medium duration, fusarium resistant
Akaki (DZ-10-9-2)	1995	ICCL82106	2.6	Desi	Brown	21.0	7-8	Short duration, fusarium resistant
Shasho	1999	ICCV 93512	2.0-3.2	Kabuli	Cream White	29.9	6-7	Short duration, fusarium resistant
Arerti	1999	FLIP 89-84C	1.8-3.7	Kabuli	Cream White	25.7	6	Short duration, fusarium resistant
Chefe	2002	ICCV 92318	1.8-3.6	Kabuli	Cream White	27.7-39	6	Short duration, fusarium resistant
Teji	2005	FLIP 97-266C	2.0-3.5	Kabuli	Cream White	38.1	8-9	Short duration, fusarium resistant
Ejeri	2005	FLIP 97-263C	1.5-3.5	Kabuli	Cream White	37.4	8-9	Short duration, fusarium resistant

Sources: Bejiga et al. (1996), ESE (2001) and Legese et al. (2005).

2.3.2. Marketing of chickpea in Ethiopia

Underdeveloped market linkages and problems of low economies of scale and high transaction costs often push smallholder farmers to sell their small marketed surplus at the farm-gate with lower prices (Fafchamps and Hill 2005; Shiferaw *et al,* 2006). This implies that in a developing country like Ethiopia the value of outputs that gained in the market is not substantial to induce producer smallholder farmers to create a good agro-economic potential. Thus, output markets and demand are important determinants to adopting improved technologies that ending in fetching high profit for farmers. Chickpea marketing system in Ethiopia is under- developed and poorly organized. The export market outlet is relatively new and highly variable depending on production conditions in the major importing countries in South and West Asia and competitiveness with strong competitors' exporter countries such are India, Pakistan and Tanzania (based on Birehanu Adnew's National Report, 2009). At present, the growing demand in domestic markets and low incentives for exporters resulting from low volume, poor quality and poor price competitiveness in export markets seem to favor domestic markets. As Desi production has still been dominating, most of what is traded in domestic as well as export markets seem to be the Desi type chickpea. This display there is high expectation from government bodies and farmers to adapt production policy and marketing policy to market demand for the crop to fetch competitive prices for smallholder farmers and exporters and thereby address poverty alleviation plans.

3. METHODOLOGY

3.1. Description of the Study Areas

With recent improvement in the road system, Lome-ejerie and Minjarshenkora districts are going to be linked by asphalt road to the main road running from Addis Ababa to Nazareth. On the other hand, Gimbichu is linked by paved dirty road to Debre-Zeit town which is located along the asphalt road which linked Addis Ababa and Nazareth. Chafe Donsa (capital town of Gimbichu), Ejerie (capital town of Lome-ejerie) and Arerti (capital town of Minjar-shenkora) are located southwest of Addis Ababa at approximately 82, 106, and138 kms respectively.

3.1.1. Agro-climatic environment

Gimbich district is characterized by tepid to cool moist, mid to high altitude, major agro-ecological zone of altitude about 2456 meters above sea level with eutric vertisol with its heavy clay texture soil type. Lome-ejerie district is characterized by tepid to cool sub humid, low to high altitude major agro-ecological zone of 1700-2100 meters above sea level with eutric vertisol soil type. Moreover, Minjar-shenkora district is characterized by tepid to cool sub humid, low to high altitude agro-ecological zone of altitude about 1770 meters above sea level with eutric vertisol with its clay texture soil type. The districts are respectively characterized by annual average rainfalls of about 900 mm, 780 mm and 800-1000 mm respectively (District Agricultural and Rural Development Office). This indicates that all the three study areas are characterized by the suitable dega-woinadega agro-ecological zone for chickpea production.

3.1.2. Production system

Production for food and cash consists of crops and livestock's mixture agricultural raising system. The main crops grown in the study districts are teff, wheat, chickpea, and lentils. Improved seed was used for teff (about 0.07%), wheat (about 6.5%), chickpea (about 9.2%), and lentil (about 1.6%).

The main rain season starts early June and end in September. Chickpea grain is mainly grown with the residual end of season soil moisture in vertisol areas where water logging hinders agricultural practices at the end of the rainy season (September to December). Growing a second crop therefore results in reducing wastage of land-use and increases income for households while the nitrogen fixed by the crop enriches the cereals crops (teff, wheat, barley and sorghum) that follow in rotation. The livestock production includes cattle, sheep and goat, equine, and poultry. The major livestock diseases are anthrax, black leg, pastrolosis, sheep pox and lumpy skin.

3.1.3. Population and population density

The total number of population in the study districts is about 320,012. Of these the total number of agricultural households is about 295,116. The totals number of farmers in the study areas is 42,696. On average the density of population and area of land under the districts are estimated to be 145.2 per km square and 979.69 km square respectively.

3.2. Sampling Methods

The study districts namely Gimbichu, Lome-ejerie, and Minjar-shenkora from Eastern Shewa zone under Oromia (Gimbichu, Lome-ejerie) and Amhara (Minjar-shenkora) Regional States were selected due to the following reasons:

1. These districts are under ICRISAT's legume project in collaboration with EIAR as the focal reference points in investigating the relevant production and marketing systems for chickpea in Ethiopia.
2. Chickpea is the newly emerging export pulse crop being promoted for expansion in Ethiopia.

A household survey was carried out in 3 adjacent districts of Eastern Shewa Zone in Ethiopia in the year 2007/08. The sampling frame for the survey was obtained from the district Ministry of Agriculture and Rural Development Bureaus. A purposive multistage random sampling technique was used. First 26 peasant associations from the three study areas are purposely

selected based on chickpea production. Following this a random sample of 700 farmers were selected based on probability proportional to size. The survey included 150 respondents from Gimbichu, 300 respondents from Lome-Ejerie, and 250 respondents from Minjar-Shenkora districts.

3.3. Types of Data and Methods of Data Collection

To address the study objectives cross-sectional primary data were collected by trained enumerators using formal survey instrument under continuous supervision by the researcher. Data were collected through face-to-face interviews.

Data collected include: (1) Different socioeconomic characteristics information on gender, age, level of education, year of experience in growing chickpea since formed a family, farm labor participation, household farm assets including buildings in the homestead, (2) Variety adoption information, (3) Characteristics of crop production plots and production of crops in the year 2007/2008, (4) Utilization of crops produced, (5) Information on the marketing of crops including market type and quantity sold (kg), price (birr/kg), month sold, buyer type, crop quality, and transaction cost related variables, (6) Comparison of buyers of chickpea on who pays a better price for the grain delivered, who has reliable weights/measures, which pays timely for the grain delivered, who is located nearest to the residence, who is strict on grain quality requirements, and which marketing outlet is preferred most, (7) Information on livestock production activities, livestock maintenance cost, selling and buying of livestock products and other sources of income (off-farm income),(8) Source of information on marketing of products and technology transformation ,(9) Grads and standards of chickpea crop, 9.Borrowing for different purposes and significant consumption expenses.

In addition to primary data, secondary information on non-labor inputs, labor input costs, average seed and grain output prices for crops grown (2 years data starting from 2005/06) were gathered.

3.4. Analytical Methods Adopted

Both descriptive and econometric methods were used to analyze the data. Descriptive statistics were used to identify key marketing outlets, and used to estimate marketing margins. The objective of identification of marketing outlets is to draw a systematic knowledge why farmers prefer certain outlets. The estimation of marketing margins was aimed at shading some light on the profit that farmers obtain from the sales of chickpea across different outlets. For objective 1, to see if there is no preference for any particular chickpea buyer by farmers, a chi-square tests using cross tabulation procedure is used. For objective 2, ANOVA single factor test is applied to see if farmers' marketing margins are similar irrespective of the selling outlet.

The production costs takes into account costs of ploughing, seed, weeding, chemical application, harvesting, transportations, threshing, and bird guarding and security. The opportunity cost of production in giving up chickpea production for leasing out land to some body else also included in the estimation of profitability of the crop.

Marketing costs were taken to include transaction costs and costs of loading. The transaction costs include the indirect costs of phone calls made to acquire information, search buyers, negotiate and conclude transactions.

The profits of farmers therefore across different outlets is calculated from the estimation of producers marketing margins stated as selling price less total costs (Mendoza 1995).That is,

$$\text{Farmers marketing margin} = \text{selling price} - \text{total cost} \quad (1)$$

$$\text{Total cost} = \text{loading cost} + \text{transaction cost} \quad (2)$$

Econometric methods were used to see the effects of the respective explanatory variables on farm-gate prices and marketable surplus.

3.4.1. Modeling determinants of farm-gate prices

The farm-gate prices are the prices received by producer farmers for their produce at the agricultural fields, excluding any separately billed transport charge. It is type, quality and quantity of product that attracts buyers from different places to its place of origin. It can be demonstrated that there is a premium for certain qualities and types of products, and if that premium is large enough to pay the increased cost of growing a superior product, the individual can and will adapt his production and marketing costs to market demand (Berndt, 1996). This can also be further discussed as consumers can be envisaged as demanding for superior type of product. This shows the market price is the sum of the implicit prices paid for type of product and related quality attributes and consumers preferences. However, in most empirical studies, the observed price may reflect not only consumer preferences but also attributes of buyers and sellers (Parker and Zilberman 1993; Bekele et al., 2006). Implicit prices may also change over time (Berndt, 1996). Therefore, farm-gate prices for chickpea can be the sum of the prices buyers are willing to pay for type of product and related quality characteristics that enhances utility and the characteristics of sellers and buyers and seasonality factors. The important factors hypothesized to affect farm-gate prices are, therefore. types of chickpea sold, quality grades, quantity sold and months of transactions. In addition, characteristics of seller including access to information and buyer type are expected to influence farm-gate prices and thus included in the farm-gate price determinants model. The variables and the hypothesized effects are discussed below.

1. Sex: There is difference in reaction to any deal between male and female because they are influenced by their needs, fears and frustrations. To see the effect of gender on relative farm gate price, a variable male takes on the value of one while a variable female takes on the value of zero.

2. Type of produce sold: High value grains command high prices while the low value grain producers are price takers in the market. Therefore, it can be hypothesized that the price of high value Kabuli type chickpea sold would be higher than the price of low value Desi type chickpea sold at the farm-gate. To quantify the effects of these variables on relative farm gate prices, a

Kabuli variety takes on the value of one while a Desi variety takes on the value of zero. The predicted regression coefficient for Kabuli chickpea could therefore be positive and higher than that of Desi chickpea in this farm-gate price determination model.

3. Crop quality: When markets are free relatively from the problem of asymmetric information and when buyers are able to differentiate products according to observable quality parameters; the market is likely to offer a price premium for superior quality (Akerlof 1970; Fafchamps, 2004). Therefore, other things being equal, it can be hypothesized that 1st quality grade Kabuli and Desi chickpeas sold for significantly higher price than 2nd quality grades. To see the effects of these variables in the farm-gate price determination model, a variable grade1 takes on the value of one while a variable grade 2 takes on the value of zero. Hence, the expected coefficients for this variable would be positive.

4. Quantity sold: It is also true to say that the demand for a product will be affected by the quantity produced. Hence, not only quality but also the quantity of product to be supplied to some extent should be adjusted by suppliers to meet the growing market demand conditions to maximize profit. However, at local level, sudden increases in local production swiftly over supply the consumption needs of a community, causing collapse to prices. Sellers also relatively receive lower prices when they sell larger volumes at any particular time. These may show that sellers who supply larger volumes at once receive relatively discounted prices. This variable is expected to have negative relationship with farm-gate prices.

5. Access to information: Farmers who are able to get timely and reliable information about his/her grains price through mobile phone or other means at different transactions may receive their expectations during actual transaction at farm-gate. The predicted slope parameter could therefore be positive. To see the effect of access to information on farm gate price, a variable owning mobile phone takes on the value of one if farmer who sold chickpea owns mobile cell and zero otherwise.

6. Experience in cultivating chickpeas and schooling years: Man is a complex product of his environment, heredity, education, habits, traditions, experience, wants, fears, superstitions and

frustrations (Yadav, 1993). This implies his reaction to any deal would be influenced at least by one of these factors and his value judgment. Therefore, it can be hypothesized that the more farming years of chickpea the better could be his farm-gate price for this grain. Hence, the expected coefficients for these variables could be positive. Education improves ones bargaining power and the ability to search and analyze information. The more the level of schooling years the better could be his farm-gate price for his/her grain. Hence, the expected coefficients for these variables could be positive.

7. Buyer type: Buyers with more experience in marketing and with more assets may provide farmers fair prices that increase their competitiveness in the market. This is not to say one is good and another is bad buyer to a farmer, but rather identifying a potential buyer type. Therefore, it can be hypothesized that better farm-gate prices are received from competent potential buyer type.

8. Seasonal dummy: The price is expected to be high during low supply (off production) season (from July to December) and expected to be low during the high supply season (January to June following harvest). The slope coefficient of low supply season is therefore forecasted to be positive and higher than that of high supply season.

The farm-gate price function for chickpea can then be expressed as a function of qualitative and quantitative variables:

$$P_f = f(X, D) + e \quad (3)$$

Where P_f = Farm-gate price for chickpea

X = Set of continues explanatory variables

D = Set of qualitative explanatory factors

e = Stochastic term

To impose constant percentage effects of the independent variables on a dependent variable a multivariate log-level linear regression farm-gate price model is applied. A logarithmic specification of the model is therefore described as:

$$LnP_f=\alpha+\beta X+\gamma D+e \quad (4)$$

In this farm-gate price model the coefficients of continues and dummy explanatory variables are computed as: $100[e^{\beta i}-1]$. The interpretation of this elasticity values is the percentage change in the dependent variable per one percentage change in the independent variable (Wooldridge, 2003).

The additional important assumption for multiple regression method is that there is no exact linear relationship between the explanatory variables (Salvatore and Reagle, 2005). This indicates the ability to vary independently is an important requirement to variables used as predictors with this method.

According to Salvatore and Reagle (2005), however, by using the first partial least square components to draw histograms and to fit a regression line, one can view the nature of distributions between response factors and explanatory factors.

The merits and demerits in using multivariate regression analysis are the following: Merits include: close resemblance to how the researcher thinks, easy visualization and interpretation of data, more information is analyzed simultaneously, giving greater power, relationship between variables is understood better, focus shifts from individual factors taken singly to relationship among variables (Maddala and Wu, 1999).

Demerits include: First, it can encourage researchers to act as if they can ignore whatever they have yet to learn or to measure, and second it can encourage researchers to act as if their findings are useless unless they include everything that might be related to the phenomenon of interest (Samuel, 2006).

3.4.2. Modeling determinants of marketable surplus chickpea

Farmers utilize food crops produced for consumption, seed, gifts and sales. However, it is unquestionable that quantity allotted for seed and gifts by household are insignificant compared to quantity allotted for consumption. This shows that marketable surplus (difference between production and consumption and seed) is heavily determined by production made from a given area under the crop and consumption made from the harvested grain by the household. The quantity of production made from a given area under the crop in turn also varies based on differences in productivity of crops and geographical locations. Since Kabuli variety is higher in terms of value and its productivity than the local Desi variety, productivity factor is considered unimportant variable in this marketable surplus equation. The most relevant variables chosen in the marketable surplus function therefore are: areas under Kabuli and Desi chickpeas, districts from which chickpeas originated, and family size. In addition, distance from markets and number of visits by extension agents to introduce improved seed and improved techniques of production, number of oxen owned by households and number of full time workers are variables expected to influence marketable surplus the crop by smallholder farmers. However, only important variables which are statistically significant have to be retained in the multivariate regression model analysis because they help us to understand the relationship between independent variables and dependent variable. Therefore, the important variables and the hypothesized effects are discussed below.

1. District dummy: Even if the study areas are adjacent districts and there are similarities in agro-climatic environment, production system, chickpea varieties produced, average density of population and land holding size; the marketable surplus chickpea by Minjar-shenkora district is expected to be less than that of Lome and Gimbichu districts in the multivariate regression run because as descriptive results show the production by individuals in the case of Minjar-shenkora is less compared to that the two areas of study (Table 16).

2. Number of extension visits: The marketable surplus of agricultural products, like chickpeas, rises because of the continuous result oriented visits of agricultural extension agents to smallholder farmers to introduce those improved seed and improved techniques of cultivation.

Under the influence of new technology, the cost of production falls. Accordingly, the surplus yielded by appropriate cultivation which is resulting from continuous intervention of development agents rises. Therefore, the predictable slope parameter for this variable in the regression model could be positive.

3. Distance to market: An increase in time to transport chickpea over longer distance or due to poor infrastructure will decrease marketable surplus of chickpea by smallholder farmers; because the marketing cost will go up to decrease the profit earning. Effects of the decrease in profit earning which could be resulting from the bad nature of transport cause a decline in marketable surplus of chickpeas grains. Hence, the expected sign of the regression coefficient for this variable is expected to be negative

4. Family size: In the study areas farmers produce both chickpeas mainly for sale and a relatively few portion for consumption (Districts Ministry of Agricultural Development Bureaus).However, the larger the number of family members the higher will be the quantity allotted for consumption. Therefore, the sign of the regression coefficient for the variable could be negative in the regression model.

5. Area of land under Kabuli and Desi chickpeas: A one percent increase in the marginal land under each crop will not yield equal surplus because the surpluses will depend upon the productivity of the crops. Kabuli chickpea which is more yields is expected to arise more surpluses than Desi which is fewer yields. The greater the productivity of Kabuli and higher the price the crop, the greater will be the surplus received by the farmer; provided that if the price is large enough to produce the increased cost of producing the superior Kabuli. Thus, positive sign of slop parameters for the areas under each of these crops could be expected in the multiple linear regression equation.

However, if the previous year prices were higher, the producers will allocate more land under the crop as compared to the land in the previous year. This means that including directly current area data under Kabuli or Desi will yield biased parameter estimates in the marketable regression equation; and hence, first regressing areas under both crops independently on lagged

year prices and then plugging in the predicted areas under grains in the marketable chickpeas equation will help correct biased estimation of regression parameters. However, the farmers attain the desired level of area under more valuable and productive variety gradually, not instantly, due to various factors. The factors affecting attaining of equilibrium level of area under Kabuli variety could be any one or more of the following:

1. Farmers do not attribute the fall in crop yield to the delayed seed replacement; because they are not aware of the recommended replacement schedule for different seeds.
2. Theft during green stage
3. Lack of land
4. Quality seeds are not easily available
5. Lack of access to credit

The function for the desired level of area under the crop can then be expressed as:

$$A^* = f(P_{t-1}) + e \qquad (5)$$

Where, A^* = the desired or equilibrium level of area under crop

P_{t-1} = the average price of crop in the last year

e = the error term

The alternative functional form indicated that a logarithmic specification would be a better fit in estimating the acreage supply response regression parameters. However, Upender (2003) suggested that the log-linear regression coefficients of the price in lagged year gives directly the value of short-run elasticity of the acreage under the crop with respect to changes in prices in lag year.

For estimation purposes, the above supply response function can further be set as:

$$\text{Ln } A^* = b_o + b_1 \ln P_{t-1} + e \qquad (6)$$

This is the long-run acreage supply response function. Since A* is not observable, the Nerlovian's partial adjustment method should be applied.

$\ln A_t - \ln A_{t-1} = \alpha (\ln A_t^* - \ln A_{t-1})$ (7)

$\ln A_t = \alpha (\ln A_t^* - \ln A_{t-1}) + \ln A_{t-1}$ (8)

Substituting eq. (9) in eq. (10) we have,

$\ln A_t = \alpha \ln b_0 + \alpha b_1 \ln P_{t-1} - \alpha \ln A_{t-1} + \ln A_{t-1}$ (9)

$= b_o^* + b_1^* \ln P_{t-1} + (1-\alpha) \ln A_{t-1}$

Where,

$b_o^* = \alpha \ln b_0$

$b_1^* = \alpha \ln b_1$

$(1-\alpha) = b_2^*$

Note that b_1^* is the short run elasticity of the area under the crop with respect to changes in lagged prices. It is given by

$b_1^* = \delta \ln A_t / \delta \ln P_{t-1}$

The long run elasticity of the area with respect to lagged prices is given by

b_1^* / α

Note also that

A_t is the area under the crop in the current year

A_{t-1} is the area under the crop in the lag year

α is coefficient of adjustment

A^* is the desired level of area which is not observable

$(A_t - A_{t-1})$ is the actual change in the area

$(A^* - A_{t-1})$ is the desired change in the area

One could also suspect that the marketable surplus of chickpeas depends upon the price of lentil which is mainly produced for sale in the study areas.

The marketable surplus function can then be described as a function of qualitative and quantitative variables as:

$$Y = f(X, Z) + e \quad (10)$$

Where Y is the quantity of marketable surplus chickpea grains
X is the predicted area under Kabuli or Desi chickpeas, and family size quantitative factors
Z is district dummy variables reflecting changes in sales for chickpea, taking on the value of 1 for Lome-ejerie and Gimbichu districts
e is the error term

The search for alternative functional forms indicated that a logarithmic specification would be a better fit for the data in estimating the regression parameters:

$$LnY = \alpha_o + \alpha_1 Z + \alpha_2 Z + bX + e \quad (11)$$

In this marketable surplus function the coefficients of continuous and dummy explanatory variables are computed as: $100[e^{\beta i}-_1]$. The interpretation of this elasticity values is the percentage change in the dependent variable per one percentage change in the independent variable (Wooldridge, 2003).

4. RESULTS AND DISCUSSION

4.1. Descriptive Results

4.1.1. Sources of income

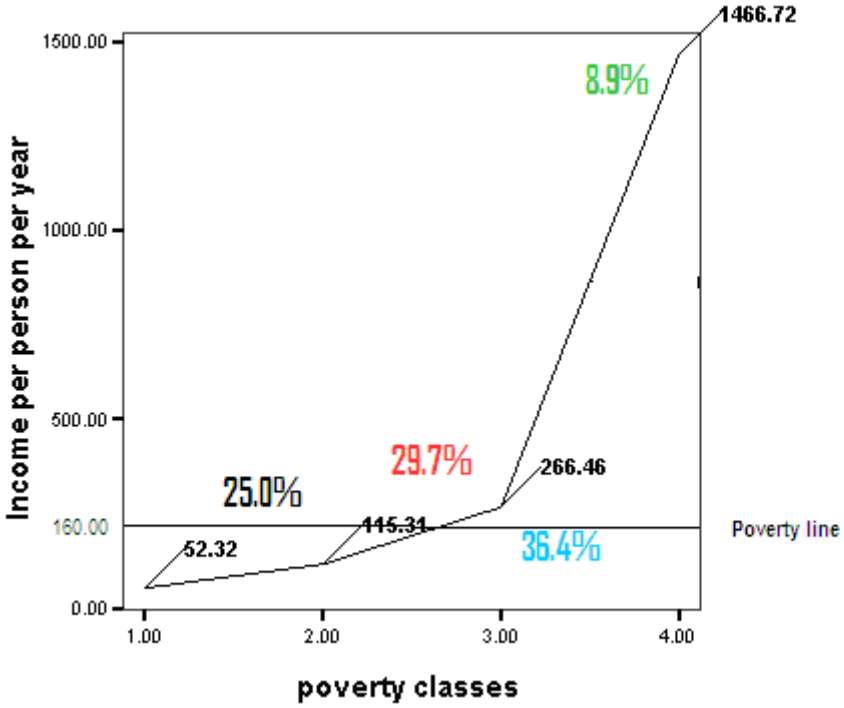
During the two month household survey conducted in 2007/2008 at Gimbichu and Lome-Ejerie and Minjar-Shenkora districts, crop, livestock and off-farm incomes are found to be important sources of income for the households. Of the total income, the share of crop income per household is about 88.80 percent followed by 6.05 percent livestock income and 5.16 percent off-farm income.

4.1.2. Poverty and wealth

Measuring poverty has proved important for anti poverty policy. But it has required research that goes beyond counting the poor. Poverty can be measured at national, regional, household or individual level. Literature indicate that one of the requirements in computing poverty measure is selecting poverty line, that is, a threshold below which a given household or individual will be classified as poor. Encyclopedia defines poverty as lack of enough income and resources to live adequately by community standards. It emphasizes that these standards and definition of poverty vary according to place and time (World Book Encyclopedia, 1994). Internationally comparable poverty lines have been proposed by the World Bank in the 1990 World Development Report. The lower figure (US $275 per capita per year, termed as extreme poverty) corresponds to a poverty line for India (converting local currencies to dollars using 1985 purchasing power parity (ppp) rates), while the relatively higher figure (US $350 per year, termed as poverty) falls in the middle of a range of countries including Bangladesh, Egypt, India, Indonesia, Kenya, Morocco and Tanzania. Thus, for Ethiopia the moderate poverty line is about birr 1,343.78 in the year 2005 would be close to USD 160 in using the study year purchasing power parity rates (MoFED, 2005). This makes Ethiopia one of the poorest countries in the world.

Accordingly the total annual income per person equivalent from total household income (crop and livestock and off-farm) is calculated then thereafter converting it to United States dollars using the study year average exchange rates. This is used to explain the characteristics of poor and wealthy households, in that those who have earned relatively larger income per family equivalent could be taken as wealthy. Larger income per family member has a positive impact on the probability of being wealthy or a negative impact on poverty.

Figure 1. Poverty chart



8.9 percent corresponds to high food secure group

36.4 percent corresponds to food secure group

29.7 percent corresponds to poverty trap group

25 percent corresponds to extremely food insecure group

4.1.3. Livestock ownership

The sampled agricultural households had a total of 244,140 cattle of which 113,952 were oxen, 58,659 were cows, 27,645 were bulls, 23,580 were heifers and the rest 20,304 were calf population. On average, about 6.3 percent farmers had no ox; about 18.4 percent farmers had one ox; about 48.3 percent farmers owned one pair of oxen; about 9.2 percent farmers had three oxen; about 13.8 percent farmers owned two pair of oxen, and; about 4 percent farmers had more than four oxen. Moreover, 97, 932 sheep and 52,587 goats are other belongings of the farm households.

Sums of 76,593 are equines of which 57,630 accounts for donkeys, 13,692 accounts for horses, 2,709 accounts for camels and 2,562 accounts for mules.

4.1.4. Land ownership

About 52 percent of the respondents owned no or less than 2 hectares of land. Following this, about 35 and 13 percent farmers owned 2-4 hectares and 4-10 hectares of land respectively. Only one farmer owned greater than 10 hectares of land (Table 4). However, 87.14 percent of farmers belonged to less than 4 hectares of land category. The higher proportion of them had 1-2 hectares of land, followed by 2-3 hectares of land. The proportion of farmers owning less than 1 hectare of land and 3-4 hectares of land was 21.1 percent and 11.6 percent respectively (Table 4).

Table 4. Distribution of farmers by landholding in hectares (N=700)

Category	Percent
Landless	3.1
Less than 0.99	21.1
1-1.99	26.6
2-2.99	23.7
3-3.99	11.6
4-4.99	7.3
5-5.99	2.9
6-6.99	1.9
7-7.99	0.9
8-8.99	0.7
9-9.99	0.1
Greater than 10	0.1

4.2. Key Market Outlets

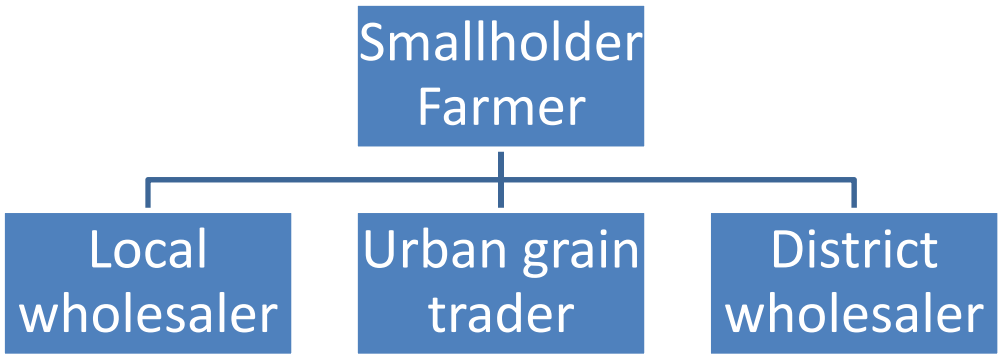
About 42 percent of producers sell to local wholesalers, 27.4 percent of producers sell to urban grain traders, 19.2 percent of producers sell to district wholesalers, 6.1 percent of the producers sell to farmer union or cooperative), 5.1 percent of producers sell to consumers or other farmers, and 0.35 percent of the producers sell to farmer groups (Table 5). Buyers who purchase in a vast majority of occasions (of two digit percent) can be the key market outlets for chickpea crops. Hence, the key marketing channels are: produce r→ local wholesalers, producer → urban grain trader, and producer → district wholesalers (Figure 2).

Table 5. Chickpea sold by districts to particular buyer

Buyers	Sources of chickpea sold			
	Lome disrict	Minjar district	Gimbichu district	Total
	No. of seller farmers	No. of seller farmers	No. of seller farmers	No. of seller farmers
Farmer group	2(0.35)	0	0	2(0.35)
Farmer unions or coops	17(2.97)	5(0.87)	13(2.27)	35(6.11)
Consumer or other farmers	11(1.92)	8(1.40)	10(1.75)	29(5.05)
Local wholesalers	117(20.42)	61(10.65)	62(10.82)	240(41.89)
District wholesalers	49(8.55)	36(6.28)	25(4.36)	110(19.19)
Urban grain traders	104(18.12)	16(2.79)	37(6.46)	157(27.37)

Note that the figures in parenthesis are the percentage share of farmers who sold their chickpea to a particular buyer type.

Figure 2. Key marketing channels



However, about 20.4 % of farmers in Lome district sold their chickpea to local wholesalers followed by 18.1 % and 9 % farmers who sold to urban grain traders and district wholesalers respectively. The same channel trend was observed in chickpea sale by farmers in Gimbichu; whereas 11 % of farmers in Minjar-shenkora district sold their chickpea to local wholesalers followed by 6.3 % and 3 % farmers who sold to district wholesalers and urban grain traders respectively (Table 5). This is, therefore, proving that the key channels for Lome and Gimbichu districts truly resemble the channel indicated above. There seems relatively a week relationship between seller farmers in Minjar-shenkora and urban grain trader buyer type as more of chickpeas were sold to local wholesalers and district wholesalers than to urban grain trader buyers. This is most likely related to the less predominance of chickpea production in this district. Of 250 total sample respondents only 126 (50.4 %) chickpea producers farmers were found at Minjar-shenkora study district. However, 148(98.7 %) respondents from 150 total interviewed respondents at Gimbichu and 300 (100 %) respondents from 300 total interviewed respondents at Lome were found producers farmers of chickpea (Table 16).

From a sample of 574 respondents, 2 (0.35 %) sold to farmer group, 29 (5.05 %) sold to consumers or other farmers, 35 (6.11%) sold to farmer unions or cooperatives, 110 (19.19 %) sold to district wholesalers, 157 (27.37 %) sold to urban grain traders, and 240 (41.89 %) sold to local wholesalers.

4.2.1 Reasons for Dealing with a Particular Buyer

The reasons for buyer preference includes better price (19.68 percent), owns reliable weight measures (20.33 percent), pays timely (19.55 percent), located nearest to farmer's farm (20.30 percent), and being strict on grain quality (20.14 percent). Fair price, reliable weights, and being strict on grain quality were the major reasons why farmers prefer union or cooperatives whereas urban grain trader and farmer groups were preferred by timely pay and being located nearest to farmers, respectively. However, being located nearest to farmers was an attraction to local wholesalers' buyer type in the case of absence of farmer group, farmer cooperatives and consumers or other farmers. District wholesalers were competing with local wholesalers for

timely pay, better price offer, and higher degree of trust in transaction and being strict on grain quality (Table 6).

The majority of the farmers (25%) preferred to sell their chickpea grains to farmer groups because they were located near their homesteads (Table 6). On the other hand, farmers' unions or cooperatives were mainly preferred (52%) because they had reliable weight measures whereas urban grain traders were mainly preferred (34%) due to timely pay (Table 6).

Table 6. Reasons for selling chickpeas to particular buyer (percent)

Buyer	Pays better price	Owns reliable weight measures	Pays timely	Proximity to farmer	Strict on grain quality
Farmer group	0.16	6.00	0.16	25.00	11.78
Farmer union or cooperatives	32.38	51.92	5.27	24.23	47.75
Local wholesaler	13.97	9.52	15.66	13.62	8.06
District wholesaler	15.71	10.75	30.03	13.19	8.68
Consumer or other farmer	8.10	1.06	15.02	19.68	1.71
Urban grain trader	29.68	20.74	33.87	4.27	22.02
Total	19.68	20.33	19.55	20.30	20.14

To test the hypothesis that there is no preference for any particular chickpea buyer by farmers, a chi-square test using cross tabulation procedures is employed. The results are presented in Table 7.

Table 7. Chi-square test results

	Value	df	Asymp. Sig. (2-sided)
Pearson chi-square	108.440(a)	35	.000
Likelihood ratio	112.658	35	.000
Linear-by-linear association	0.420	1	.517

Directional Measures

			Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Lambda	Symmetric	.013	.003	3.861	.000
		Issues for comparison Dependent	.013	.005	2.561	.010
		Buyers Dependent	.013	.004	2.948	.003
	Goodman and Kruskal tau	Issues for comparison Dependent	.002	.000		.000(c)
		Buyers Dependent	.002	.000		.000(c)
	Uncertainty Coefficient	Symmetric	.003	.001	5.428	.000(d)
		Issues for comparison Dependent	.003	.001	5.428	.000(d)
		Buyers Dependent	.003	.001	5.428	.000(d)

The low significance levels for both tau and the uncertainty coefficient indicate that there is preference for any particular chickpea buyer by farmers or the test statistic result rejects the null hypothesis that there is no preference for any particular chickpea buyer by farmers. But the low levels for both test statistics indicate that the preference for any particular buyer by farmers is a fairly weak one (Table 7).

4.3. Profitability Estimation

4.3.1. Profitability estimation for growing and selling Kabuli varieties

To identify whether or not the farmer gets greater profits from growing and marketing high value Kabuli chickpeas, the rental value of land in local factor markets, and production and marketing costs are considered as possible factors for profitability estimation.

The respondents indicated a yield level for Shasho, Arerti and Chefe Kabuli varieties a low of 4 and a high of 6 quintal/ kert (about 0.25 ha). Farmers indicated a low of 5 and a high of 6 quintal per kert for Shasho and Arerti varieties. They also indicated a low of 4 and a high level of 5 for Chefe Kabuli chickpea type. Results show that the rental value of good quality land was also estimated to be birr 650/kert.

Given the rental value of good quality land equal to be birr 650 per kert for a year the net return (profit) has to be greater than or equal to birr 26.00/kert (650*4 percent (bank saving interest rate for the year 2007/08). This shows that the returns to farmers who sold the grain to urban-traders, district wholesalers, farmer cooperatives, local wholesalers, local consumers or other farmers, and farmer groups (difference between selling price and costs) must not be less than 5.20 birr per quintal at the average value of 5 quintal per kert under good situation and management. This must also be associated with the following assumptions:

1. No other crops are grown during water-logging that hinders agricultural practices.
2. All crops are grown once in a year using rain.

Table 8. Farmer's selling price, cost and profit margin across different buyers (Birr/100kg)

Trader type	Selling price	Cost	Profit	Profit margin (%)
Urban trader	367.00	356.27	10.73	3.0
District wholesaler	364.00	356.27	7.73	2.2
Farmer cooperatives	378.00	362.27	15.73	4.3
Local wholesaler	357.00	356.27	0.73	0.2
Local consumer or other farmer	353.00	356.27	-3.27	-.9
Farmer group	352.00	356.27	-4.27	-1.2

The necessary condition for estimating the profitability of high value Kabuli chickpeas is to understand the opportunity costs of land under the low value Desi chickpea in giving up producing Kabuli varieties; given that there is no good rental market for land.

To perform the test of the null hypothesis that farmers' marketing margins are similar irrespective of outlets, we choose "ANOVA Single Factor". Of 2998 transactions of chickpea made, the number of farmers who sold Kabuli chickpea at farm gates is 33, while the remaining 55 observations belongs to Desi chickpea seller farmers.

Table 9. ANOVA test for hypothesis that farmers' marketing margins are similar irrespective of the selling outlets

ANOVA: Single Factor

SUMMARY

Buyer Groups	Count	Sum	Average	Variance		
Farmer group	2	-8.54	-4.27	0		
Farmer coops or unions	4	94.42	15.73667	2.67E-05		
Rural wholesalers	3	2.21	0.736667	3.33E-05		
District wholesalers	6	46.35	7.725	3E-05		
Consumer or other farmer	3	-9.79	-3.26333	3.33E-05		
Urban grain trader	15	160.89	10.726	2.57E-05		
ANOVA						
Source of Variation	SS	Df	MS	F	P-value	F- crit
Between Groups	1310.141	5	262.0282	9783885	2.4E-89	2.545386
Within Groups	0.000777	27	2.68E-05			
Total	1310.142	32				

Since the calculated F value exceeds the critical value we reject the null hypothesis that farmers' margins are similar across all the outlets.

Although farmer' profits are within an acceptable range across the marketing outlets (Farmer cooperatives, Urban grain traders and District wholesalers), the surplus income received is only 1 to 5 points more than the bank's saving account interest. According to Kaplinsky (2001), smallholder farmers do not get acceptable profits across the outlets (Rural wholesalers, Farmer group and Local consumers or other farmers) that can be incentive for them for expansion of the chickpea's cultivation for another year, other things remain constant. This shows the size or extent of the existing markets is inadequate for the effective demand to exist; and thus, it has an

implication that the marketing agents still do not carry out their functions in a manner to create utilities in the product.

Table 10. Production and marketing costs for Kabuli chickpea varieties in the study area (2007/08)

Activities	Costs
1.Production	
Plaughing, harrowing & planting	7*40*4=1120.00
Seed	130*4.8=624.00
One time weeding	6*12*4=288.00
Chemical application	0.5*80 *4+30*4=280.00
Harvesting	8*12*4=384.00
Transporting harvest to point of threshing	(4*15 +4*6)*4=336.00
Threshing and transporting the produce	(4*15 +6*10 +2*6)*4=528.00
Bird watching & security	(20*30)/3=800.00
Total	4360.00
2. opportunity cost of production	
Interest on rental value of good quality land	650*4%=26
3.Marketing	
Phone calls made to search buyers, negotiate and conclude transaction	100.00
Loading	10.00
Broker's fee	10.0
Managerial allowance (5% of total average cost of production, opportunity cost and marketing cost)	16.97
Grand total average cost per quintal	356.27

Notes about costs

1. Three times frequency of ploughing requires six working days with a pair of oxen and planting requires 1 working day with a pair of oxen. The rental rate for a laborer with a pair of oxen is birr 40/day.
2. The seed price at local market for the Kabuli varieties on average equals birr 480/quintal. The seed rate is 130 kg/ha.
3. One time weeding requires six person days per kert.
4. Chemical application requires 0.5 liters per kert (birr 80/litre) and birr 30 per kert for sprayer.
5. Harvesting requires eight person days per kert.
6. Harvesting requires four workers with four donkeys for one working day per kert.
7. Transporting harvest requires four workers with six oxen for 1 working day per kert. Two donkeys for transporting produce
8. For bird watching, four hired laborers shared birr 600 among three cultivators for one month. On average, estimating a yield level of 4 quintal/kert under good situation equals a production cost of birr 211.75/quintal.
9. Given the rental value of good quality land about birr 650 per kert, the opportunity cost of giving up chickpea crop growing for leasing land to some one else is equal to birr 26/kert, or birr 1.63 per/ quintal.
10. Telephone costs on average birr 100 to hold phone contact with each buyer types.
11. Loading costs is birr 10/quintal
12. Broker is paid commission of birr 10/quintal
13. Managerial allowance for the trouble of cultivation and marketing of chickpea

4.3.2. Profitability estimation from growing and selling Desi varieties

The estimation of the profitability of Desi chickpea to smallholder farmers include all the components used above under the profitability estimation of Kabuli chickpea. The respondents indicated a yield level for local Desi, Akaki and Worku Desi varieties a low of 3 and a high of 5 quintal/ kert (about 0.25 ha).

Given the rental value of good quality land equal to be birr 650 per kert for a year the net return (profit) has to be greater than or equal to birr 26.00/kert (650*4 percent (bank saving interest rate for the year 2007/08). This shows that the returns to farmers who sold the grain to urban-traders, district wholesalers, farmer cooperatives, local wholesalers, local consumers or other farmers, and farmer groups (difference between selling price and costs) must not be less than 6.50 birr per quintal at the average value of 5 quintal per kert under good situation and management.

Table 11. Farmer's selling price, cost and profit margin across different buyers (Birr/100kg)

Trader type	Selling price	Cost	Profit	Profit margin (%)
Urban trader	358.00	350.05	7.95	2.3
District wholesaler	354.00	350.05	3.95	1.1
Farmer cooperatives	365.00	356.05	8.95	2.5
Local wholesaler	350.20	350.05	0.15	0.04
Local consumer or other farmer	346.00	350.05	-4.05	-1.2
Farmer group	345.00	350.05	-5.05	-1.4

Table 12. ANOVA test for hypothesis that farmers' marketing margins are similar irrespective of the selling outlets

ANOVA: Single Factor

SUMMARY

Buyer Groups	Count	Sum	Average	Variance
Farmer group	2	-25.27	-5.054	8E-05
Farmer coops or unions	4	62.66	8.951429	8.1E-05
Rural wholesalers	3	1.19	0.14875	4.11E-05
District wholesalers	6	35.54	3.948889	8.61E-05
Consumer or other farmer	3	-28.32	-4.04571	2.86E-05
Urban grain trader	15	151.06	8.947778	4.18E-05

ANOVA

Source of Variation	SS	df	MS	F	P-value	F- crit
Between Groups	1592.408	5	318.4817	5737024	2.2E-137	2.408514
Within Groups	0.002665	49	5.55E-05			
Total	1592.411	54				

Since the calculated F value exceeds the critical value we reject the null hypothesis that farmers' margins are similar across all the outlets.

Farmer received lower profits from sales of Desi chickpea than from the sales of Kabuli chickpea to the same outlets called farmer cooperatives, urban grain traders, district wholesalers, rural wholesalers, local consumers or other farmers and farmer group. This implies that the greater the production and the higher the price of superior Kabuli chickpea, the greater will be the surplus received by the smallholder farmers.

Table 13. Production and marketing costs for Desi chickpea varieties in the study areas (2007/08)

Activities	Costs
1.Production	
Plaughing, harrowing & planting	7*40*4=1120.00
Seed	113*4=452.00
One time weeding	6*12*4=288.00
Chemical application	0.5*80 *4+30*4=280.00
Harvesting	8*12*4=384.00
Transporting harvest to point of threshing	(4*15 +4*6)*4=336.00
Threshing and transporting the produce	(4*15 +6*10 +2*6)*4=528.00
Bird watching	(20*30)/3=800.00
Total	4188.00
2. opportunity cost of production	
Interest on rental value of good quality land	650*4%=26
3.Marketing	
Phone calls made to search buyers, negotiate and conclude transaction	100.00
Loading	10.00
Broker's fee	10.0
Managerial allowance (5% of total average cost of production, opportunity cost and marketing cost)	16.67
Grand total average cost per quintal	350.05

Notes about costs

1. Three times frequency of ploughing requires six working days with a pair of oxen and planting requires 1 working day with a pair of oxen. The rental rate for a laborer with a pair of oxen is birr 40/day.
2. The seed price at local market for the Kabuli varieties on average equals birr 400/quintal. The seed rate is 113 kg/ha.
3. One time weeding requires six person days per kert.
4. Chemical application requires 0.5 liters per kert (birr 80/litre) and birr 30 per kert for sprayer.
5. Harvesting requires eight person days per kert.
6. Harvesting requires four workers with four donkeys for one working day per kert.
7. Transporting harvest requires four workers with six oxen for 1 working day per kert. Two donkeys for transporting produce
8. For bird watching, four hired laborers shared birr 600 among three cultivators for one month. On average, estimating a yield level of 4 quintal/kert under good situation equals a production cost of birr 211.75/quintal.
9. Given the rental value of good quality land about birr 650 per kert, the opportunity cost of giving up chickpea crop growing for leasing land to some one else is equal to birr 26/kert, or birr 1.63 per/ quintal.
9. Telephone costs on average birr 100 to hold phone contact with each buyer types.
10. Loading costs is birr 10/quintal
11. Broker is paid commission of birr 10/quintal
12. Managerial allowance for the trouble of cultivation and marketing of chickpea

4.4. Econometric Results

4.4.1. Results on the determinants of farm-gate prices

Nine explanatory variables were included in the multivariate regression model to identify factors affecting farm-gate prices of chickpeas.

Regarding the selection of variables used here in modeling farm-gate price equation, except for variables crop sold, sex and seasonality the other variables were also used in modeling farm-gate price to determine channel choice decision in the Ethiopian banana markets by (Getachew Wolde et al., 2009).

Table 14. Descriptive statistics for parameters in modeling farm-gate price equation

Variables	Measurement	N	Min	Max	Mean	Std.
Crop sold	1= if Kabuli, 0 if Desi	88	0	1	0.38	0.49
Experience in growing chickpea	Years	87	1	52	21.56	12.02
Access to market information	1= if owning mobile phone,0 otherwise	88	0	1	0.08	0.27
Crop quality	1= if 1st grade, 0 otherwise	88	0	1	0.55	0.50
Selling time from April to June	1= if sold from April-June, 0 otherwise	88	0	1	0.17	0.38
Selling time from July to September	1=if sold from July-September, 0 otherwise	88	0	1	0.13	0.33
Selling time from October to December	1=if sold from October-December, 0 otherwise	88	0	1	0.11	0.32
Education	Years of schooling	88	0	12	2.47	3.44
Quantity sold	Quintal	88	0.50	60.00	5.55	7.38
Sex	1= if male, 0 if female	88	0	1	0.92	0.27
Rural wholesaler	1=if rural wholesaler, 0 otherwise	88	0	1	0.14	0.35
Urban grain trader (dummy)	1=if urban grain trader, 0 otherwise	88	0	1	0.53	0.50
Price in kg	Birr	88	2.05	6	3.65	0.96

The estimated regression results for farm-gate price determinants model are presented in Table 15. The coefficient of multiple determinations (R-square) shows that about 58.9 percent of variation in farm-gate prices is explained by the model variables. The estimated coefficients for all significant variables generally have the expected signs.

Table 15. Determinants of farm-gate prices

Variable names: Dependent variable is ln (farm-gate price of chickpea)	Parameter estimates	t-values	Estimated p-values	Elasticity of farm-gate prices
Constant	0.393***	2.745	0.008	
Sex	0.226**	2.407	0.019	.254
Crop type sold	0.345***	6.001	0.000	.412
Access to market information	-0.113	-1.125	0.264	-.107
Educational level	0.005	0.643	0.522	.005
Crop quality	-0.016	-0.321	0.749	-.016
Selling time from April to June	-0.032	-0.618	0.539	-.031
Selling time from July to September	0.132**	2.226	0.029	.141
Selling time from October to December	-0.164***	-2.743	0.008	-.151
District wholesaler	-0.089*	-1.777	0.080	-.085
Urban grain trader	0.119***	3.306	0.001	.126
Ln(Chickpea experience)	0.156***	4.255	0.000	
Ln(Quantity sold)	0.041	1.433	0.156	

Note: 1.*, ** and *** indicate levels of significance at 10, 5 and 1 percent level respectively

2. Rural consumers or other farmers is considered as base group

3. Selling time from January to December is considered as base group

As expected, the econometric result suggests that crop type sold is by far the most important factors affecting farm-gate prices positively in Eastern Shewa zone implying that markets in the study areas demand Kabuli type chickpea than Desi type chickpea. The difference in estimated lnprice between Kabuli chickpea and Desi chickpea is 0.412. This shows that Kabuli varieties

are forecasted to sell for about 41.2% more birr per kg than that of Desi varieties, holding other factors constant. If this price premium for Kabuli type is considerable enough to cover its cost of production, greater income can be distributed to the participating farmers. Thus, the result confirms that farmers in the study areas should improve and adapt his/her production and marketing decisions to market demand to make increased profitability from chickpea transaction. The result suggests that Kabuli has more market demands than Desi. This implies that farmers need to plan a priori that production has to be linked to market demands in terms of volume, dates and quality to increase profitability.

Male farmers seem to receive higher prices than female farmers which could perhaps be due to the fact that male farmers have better bargaining and negotiation ability and hence are able to earn higher prices. The lower slope coefficient for female farmers might probably be due to the reason that the time at home raising children could reduce their negotiation time with buyers during transaction and thus results in lower prices earning. However, this does not take us to a conclusion on its likely impacts on the overall competitiveness of male and female farmers because the net effect depends on the price elasticity of demand for chickpea.

The educational status of the farmer has no significant effect on the chickpea price received. On the other hand, experienced farmers seem to get higher prices for their crops. This is partly due to the fact that they are likely to have a large number of buyers which allows them to sell at higher prices.

The quality of the grain has no significant effect on farm-gate prices. This is probably an indication of a less competitive market as quality parameters designed by QSA cannot progressively be implemented and monitored. Hence, buyers are unable to differentiate products according to observable quality parameters. This leads to production with little attention to quality and hence low crop profitability. The quantity sold has also no significant effect on price received perhaps because of the relatively fragmented and spatially dispersed production and hence making chickpea less competitive in the market. The loss of competitiveness reduces the possibility for export and opening of new markets for high value crops like Kabuli chickpea.

The explanatory variable access to market information has no effect in explaining the variation in farm-gate price indicating that the low bargaining power during transaction which seems to favor buyers if they take the grain to a relatively well organized market. This might partly be due to the fact that getting timely market price information through mobile phone is difficult as there is no well developed net work. However, farmers with mobile phone seem to receive lower prices than farmers with no mobile phone perhaps because farmers with mobile phone might be with better negotiation ability to set lower and highly competitive prices, which seems they get their expectation for prices during actual transaction. On the other hand, farmers with no mobile phone seem to receive higher prices may also get higher net margins which may increase their competitiveness.

The seasonal patterns in the supply of chickpea affect farm-gate prices significantly. However, the dummy variable named selling time from April to June shows no significant effect on farm-gate prices. Since the remaining dummy variables called selling time from July to September and selling time from October to December are significant their intercept slop coefficients respectively are 0.141 and -0.151. This means the crop was sold respectively about 14% more and about 15% less than the harvest selling season (January to March), holding other factors fixed. This implies an increasing pattern for farm-price at increasing rate during the sowing time from July to September and an increasing pattern at a decreasing rate starting likely from the end of December when new harvest starts to enter the market. This has an indication that, most likely, due to an increase in number of chickpea seed buyer farmers, the sowing season is able to fetch seller farmers' better prices. The price difference between July to September and October to December is [0.141-(-.0.151)] equal to be 0.292. This means the price for the crop received by farmers during July to September selling season is about 29.2 percent higher than the price received during October to December selling season. Although, the increment in prices seem to follow the underlying supply and demand relationships for the grain over the selling time periods, the increment between the two seasons shows relatively a high fluctuation in prices for chickpea that could generally contribute to loss of competitive farm-gate prices for the sector.

It is expected that price may vary depending upon nature of buyers' demand for chickpea. Rural consumers or other farmers' buyers group are considered as a base group in modeling determinants of farm-gate prices. Rural wholesaler dummy variable is perfectly collinear with district wholesaler dummy variable and hence dropped from the final model. It is found that the partial correlation between farm-gate prices and district wholesaler approximately equals 0.743, while the partial correlation between farm-gate prices and rural wholesales approximately equals 0.602. Therefore, district wholesaler dummy variable is preferred and included in the final model. Farmer cooperatives and farmer group buyers' dummy variables are also excluded from farm-gate price determinants model because of the instability characteristics of these variables over time. District wholesaler dummy variable shows not a significant effect in the modeling of farm-gate prices regression partly due to the reason that this group might not participate in buying large volumes of grains or their participations are relatively very less compared to urban grain traders' types of buyer groups. On the other hand, urban grain buyer type dummy variable shows significant effect on farm-gate prices perhaps implying that the participation of this group of buyers in farm gate market from distance location increases the quantity of sales and the value of quantity sold, and hence, enhance competitiveness for crop production and selling's. A one percent increases in the number of urban grain trader's yields about 12.6 percent more price receivables by seller smallholder farmers than from the rural consumer or other farmers' buyer group, holding other factors fixed.

Table 16. Distribution of farmers who produced and sold chickpea by districts

District	Number of producer farmers	Percent share	Number of seller farmers	Percent Share
Lome district	300	100.0	300	100.0
Gimbichu district	148	98.7	148	100.0
Minjarshenkora district	126	50.4	126	100.0
Total	574	100.0		

Of 700 respondents, 574 (about 82 %) are chickpea producers which show that the study districts are one of the major chickpea production areas in Ethiopia (Table14)

4.4.2. Determinants of marketable surplus

In order to examine the responsiveness of marketable surplus to the changes in family size and area under the crop, and variation in districts the linear marketable surplus regression equation was employed.

It is quite common that the cultivators will take the decisions of allocating the area under the crop depends mainly on the previous year prices. Since the previous year prices for Kabuli were higher throughout the year than that of Desi, the farmers in the study areas are likely to allocate more land under Kabuli than its rival local Desi as compared to the land in the previous year.

Regarding the selection of variables used here in modeling marketed surplus equation, except for dummy variables named crop sold from study districts the remaining all variables were also used in modeling marketable surplus equation in Applied Econometrics, 2nd revised edition (Upender, 2003).

Table 17. Descriptive statistics for land under Kabuli and Desi chickpeas and corresponding lagged year's prices in the marketed surplus equation

Variables	N	Min	Max	Mean	Std
Area of land under Kabuli chickpea in hectare	169	0.17	4.00	1.56	0.89
Lagged year's price in birr per kg	169	2.10	5.50	3.44	0.74
Area of land under Desi chickpea in hectare	343	0.13	4.00	1.36	0.85
Lagged year's price in birr per kg	343	1.10	4.50	2.34	0.71

The estimated regression results for predicted farm land area under Kabuli and Desi chickpeas determinants model are presented in Table 18 and Table 19, respectively. The coefficient of multiple determinations (R-square) shows that about 10.5 variation in predicted farm land area under Kabuli chickpea and about 10.3 percent variation in predicted farm land area under Desi are explained by the model variables. The estimated coefficients for all significant variables generally have the expected signs.

Table 18. Determinant of predicted farm land area under Kabuli chickpea

Variable names:	Coefficients	t-values	P-values
Dependent variable is ln (predicted farm land under Kabuli chickpea in hectare)			
Constant	1.420	15.140	.000***
Ln (Lagged year's price in birr per kg)	.314	6.231	.000***

Note: *** indicates level of significance 1 percent.

Table 19. Determinant of predicted farm land area under Desi chickpea

Variable names: Dependent variable is ln (predicted farm land under Desi chickpea in hectare)	Coefficients	t-values	P-values
Constant	1.186	8.887	.000***
Ln (Lagged year's price in birr per kg)	.277	4.413	.000***

Note: *** indicates levels of significance at 1 percent.

Table 20. Descriptive statistics for parameters in modeling marketable surplus chickpeas

Variables	N	Min	Max	Mean	Std
Marketable surplus quantity in quintal	574	2.30	44.5	13.23	.84918
Number of visits by extension agents in number	574	4.00	10.0	4.6508	2.99113
Family size in number	574	2.00	16.00	7.0171	2.28748
Crop sold from Gimbichu in quintal	148	.00	1.00	.0474	.21273
Crop sold from Lome in quintal	300	.00	1.00	.6114	.48802
Predicted area under Desi in hectare	574	.0.25	1	.2835	.22249
Predicted area under Kabuli in hectare	574	0.5	2.00	.1854	.35447
Distance to market in minutes	718	30.00	600	123.231	.86846

Note: Except for the variable named Distance to market (N=number of transaction), N represent number of observation.

The estimated regression results for marketed surplus model are presented in Table 21. The coefficient of multiple determinations (R-square) shows that about 98.4 percent of variation in chickpea sale is explained by the model variables. The estimated coefficients for all significant model variables generally have the expected signs for the variable called family size.

Table 21. Determinants of marketable surplus chickpea

Variable names: Dependent variable is ln (chickpea sales in kg)	Coefficients	t-values	P-values	Exact percentage change in coefficients
Constant	0.823	6.667	0.000***	
Number of visits by agricultural development extension agents	0.001	2.035	0.043**	0.001
Family size	0.009	1.239	0.789	0.009
Crop sold from gimbichu	0.025	1.847*	0.087	0.025
Crop sold from lome	-0.025	-1.860*	0.064	-0.025
Predicted area under Desi	0.500	5.373	0.000***	0.648
Predicted area under Kabuli	0.534	6.272	0.000***	0.706
Ln (distance to market)	-0.022	-2.847	0.005***	

Note: ** and *** indicate levels of significance at 10, 5 and 1 percent level respectively.

Crop sold from Minjar-shenkora district dummy variable is considered a base group

A worth noting points in the interpretation of the pooled model of marketable surplus regression outputs are as follows:

First, the slope coefficients of the areas under Kabuli and Desi type's chickpeas are statistically significant. Second, as expected there is a positive relationship between log hat (sales) and estimated coefficients on predicted areas under both grains, holding other variables (family size, distance to market and number of visits by extension agents to smallholder farmers) fixed in the regression equation. Third, to find the resulting effect on the dependent variable in the case of changing more land under both crops (a one percent increase on hectare of land under each Kabuli and Desi crops) at the same time holding other continuous explanatory variables which are included in the regression model constant if individual farmer stays on farming both crops for another year perhaps because of some forces (theft of high value Kabuli during its green stage and lack of availability of improved seed of high value Kabuli cultivars) that seem uncontrollable to farmers, this pooled multiple linear regression model for chickpea marketable surplus is used to add the coefficients on land under these grains varieties to turn the effect into 1.354 (0.706 + 0.648) percent more quintal marketable surplus chickpeas.

Interestingly this pooled regression function for chickpea varieties of high value Kabuli and its rival Desi shows that holding area under Desi and other variables constant, another area under Kabuli alone is associated with 0.706 coefficients in the marketable surplus determination model and if land under Kabuli is one percent higher than land under Desi ,the Kabuli varieties likely to have a marketable surplus of 70.6 percent quintal higher than that of Desi (this says nothing about marketable surplus of the two chickpeas types but based on Wooldridge, 2003).

Fourth, the expected signs are also come out by multiple regressions run for variables named distance to market, number of visits by smallholder farmers and family size. The slop parameter effect by distance to market indicates that a one percent increase in minute of time to transport chickpea to markets causes the marketable surplus of chickpeas to decline by 2.2 percent. This implies improving roads or creating new markets that are nearest to homesteads of farmers will push up the marketable surplus of chickpeas to the markets. On the other hand, the regression coefficient for variables called number of visits by agricultural development agents would have effect on increasing the marketable surplus by 0.1 percent. This implies

result oriented continuous supervision by the development agents would help to improve the uptake of improved varieties by farmers and use of good agronomic practices by the same actors to increase the market participation and thus competitiveness in the chickpea sector.

This regression result and farm-gate price analysis together determine that Kabuli varieties can be considered in the production and marketing plan whereas Desi varieties can be eliminated because its agronomic potential and agro economic potential are by far less than that of Kabuli varieties. The regression results provide clues for appropriate plan but decision may only be developed by the farmer's mind.

The variable family size shows no significant effect on determining the quantity of marketable surplus chickpea crop perhaps indicating that relatively a very small percentage of grains are used for household consumption.

The study sites do not have significant effect on estimation of slop intercept coefficients on marketable surplus chickpea grain most likely showing insignificant variation in production and then supplying to market amongst the three study areas.

5. SUMMARY AND RECOMMENDATIONS

5.1. Summary

Econometric tests for variables that affect farm-gate price were conducted to supplement model predictions and survey results. Results show crop type factor considerably influence farm-gate price. Farmers particularly in the study areas and Ethiopia in general do not get enough benefit from income of chickpea sales mainly due to the predominance of low value local Desi types. The grains marketing system is generally characterized by low volume, lack of effective demand for the product, and low awareness about market preferred chickpea varieties replacement thereby hindering the uptake of these profitable varieties. Thus, the supply in the market of these high values Kabuli chickpea types are in very limited quantities and from several highly dispersed small producers. Given the low adoption of improved varieties at present, the marketed surplus by individual farmers and the overall traded volume are low, and hence a disincentive to grain producers to increase production and be competitive in price and quality.

Inadequate market information flow, little attention for quality parameters control mechanisms and monitoring cause price variability and difficulty for buyers to differentiate products according to observable quality parameters. This has resulted in farmers loosing competitiveness in chickpea grain marketing.

The descriptive statistics result shows that the chickpea grains are sold mostly to local wholesalers, urban grain traders, and district wholesalers. This indicates that farmers are now with the problems of trying to supply markets of (especially rural wholesaler) ineffective demand for chickpea product, with little attention to make profitable production and marketing planning in the sector, as these only lead to production for lower prices. The reasons for preferring these buyers are in the nature of availability and easy accessibility, and timely pay which clearly show that it is not sufficient rational activity to have competitive markets. On the other hand, farmers are now with the problem of lacking alternative ample profitable market opportunities; as all these prove that the sellers and buyers and government bodies in chickpea

markets still do not carry out their functions efficiently in a manner as to create time, place and form utility in the product by way of its marketing. And thus, the farm-gate price for chickpea crop failed to fetch farmers highly profitability income or it brought them only medium profitability income estimated about between 1 and 5 points over the bank's saving account interest rate.

Finally, the marketable surplus chickpeas regression run indicates that smallholder farmers in Ethiopia need to consider primarily the yield enhancing inputs to enhance the market participation. The regression run also suggests that improvement in infrastructure will help to convert good agronomic potential to agro-economic potential. Continuous result oriented supervision by agricultural development agents to introduce the uptake of improved varieties and use of good agronomic practices will help to push up the marketable surplus of chickpea offer to markets. On the other hand, creation of new markets those are nearest to the farmers' residential areas to decrease cost of marketing will increase the surplus offer when there are effective demands for products at these markets.

5.2. Recommendations

As econometric test proved, to improve farm-gate prices and volume of marketable surplus, farmers should go for production and marketing of superior Kabuli product to meet the market demand. This needs extension efforts to raise the farmers' awareness about the uptake of improved varieties for which the marginal value product must be considerably high relative to the price of inputs. The farmer must learn and know of this opportunity and must exhibit entrepreneurship in exploiting this opportunity.

The descriptive statistics result confirmed that a fairly weak preference of chickpea buyers by smallholder farmers or the margins display a high expectation from the supplier farmer and government bodies in terms of creating effective demand for the product. Therefore, farmers need to learn not only how to produce but first how to expand the size of market to improve profitability of his/her production. Identifying potential buyers enables farmers to have production and marketing plans guided by demand led markets. In another word there is a

There is also a need for policy interventions in the product quality control as the development of market is possible only when quality based marketing systems that offer better differentiated prices for products that differ in observable quality parameters.

Marketable surplus chickpeas model determined that production of yield enhancing Kabuli varieties provides the means for higher profit because they increase market participation and reduce the associated transactions costs for participating individual farmers and traders.

Future research need to be conducted on most critical points in the marketing of chickpea to identify existing limits in the cultivation of quality seeds of market preferred varieties to avoid the problem of supplying the same limited markets with little quantity and little attention to quality.

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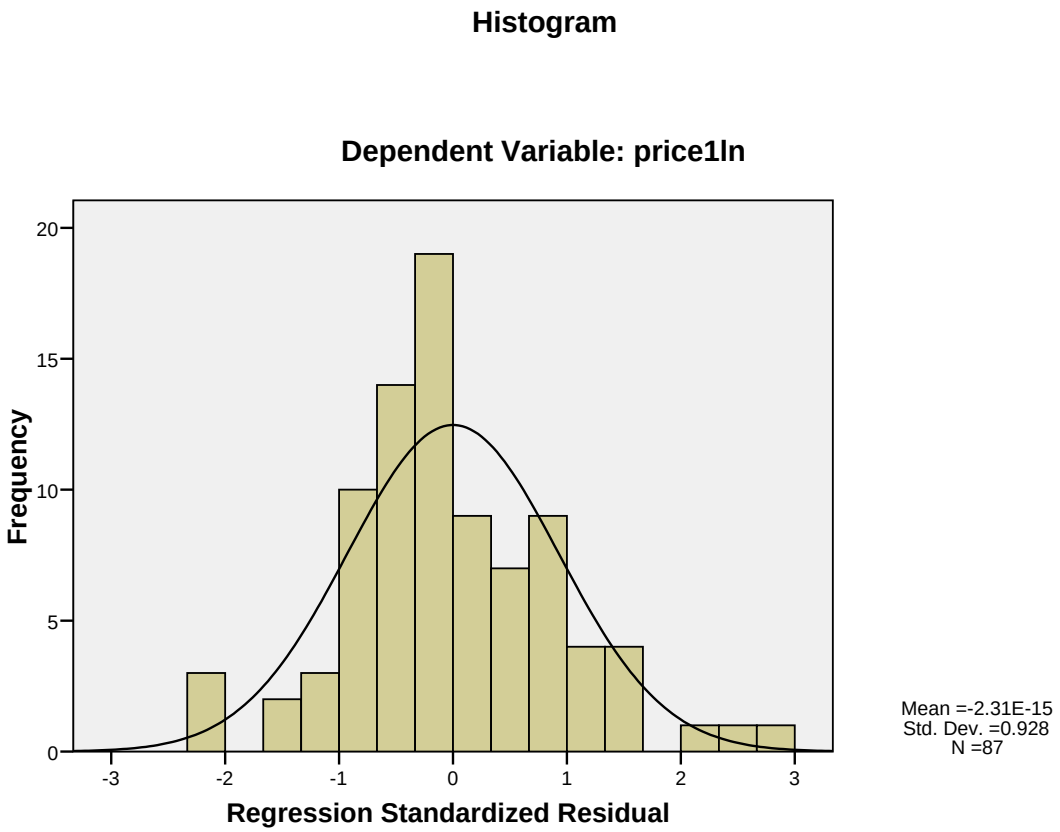
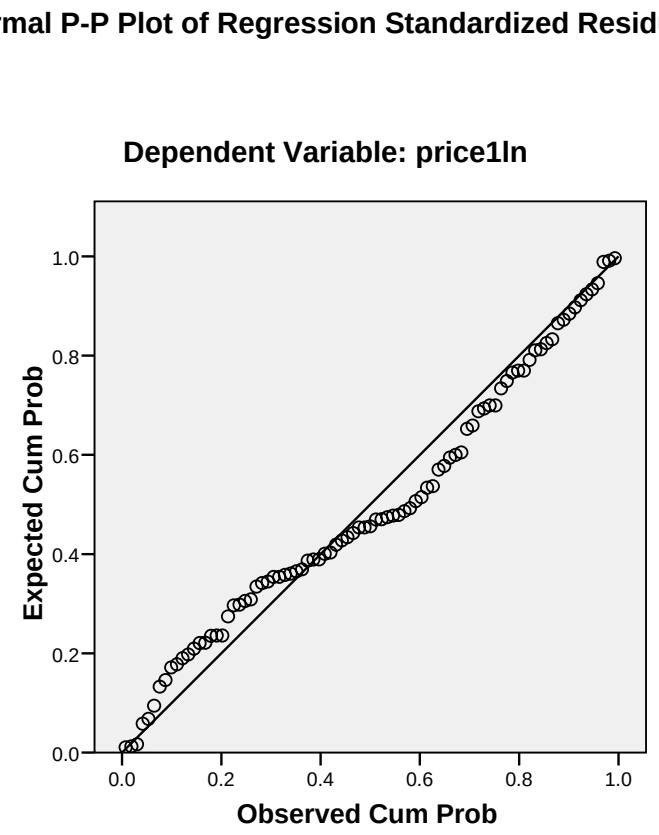
7. APPENDICE

Plot 1. Plot to prove normal distribution of observations for farm- gate price model formation



The histogram shows the standard normal distribution converted from normal distribution of values of both dependent and independent explanatory variables. The normal distribution is a continuous probability distribution and the most commonly used distribution in statistical analysis (Dominick Salvatore and Derrick Reagle. Statistics and Econometrics, 2nd edition 2005)

Plot 2. A residual normal p-p plot showing values lining up along the diagonal that goes from lower left to upper right (normality is evident) for farm- gate price regression analysis



A residual normal p-p plot showing values lining up along the diagonal that goes from lower left to upper right for marketable surplus chickpea regression analysis. It is another method of testing if the residuals are normally distributed Dominick Salvatore, PhD and Derrick Reagle,PhD Statistics and Econometrics, 2nd edition 2005).

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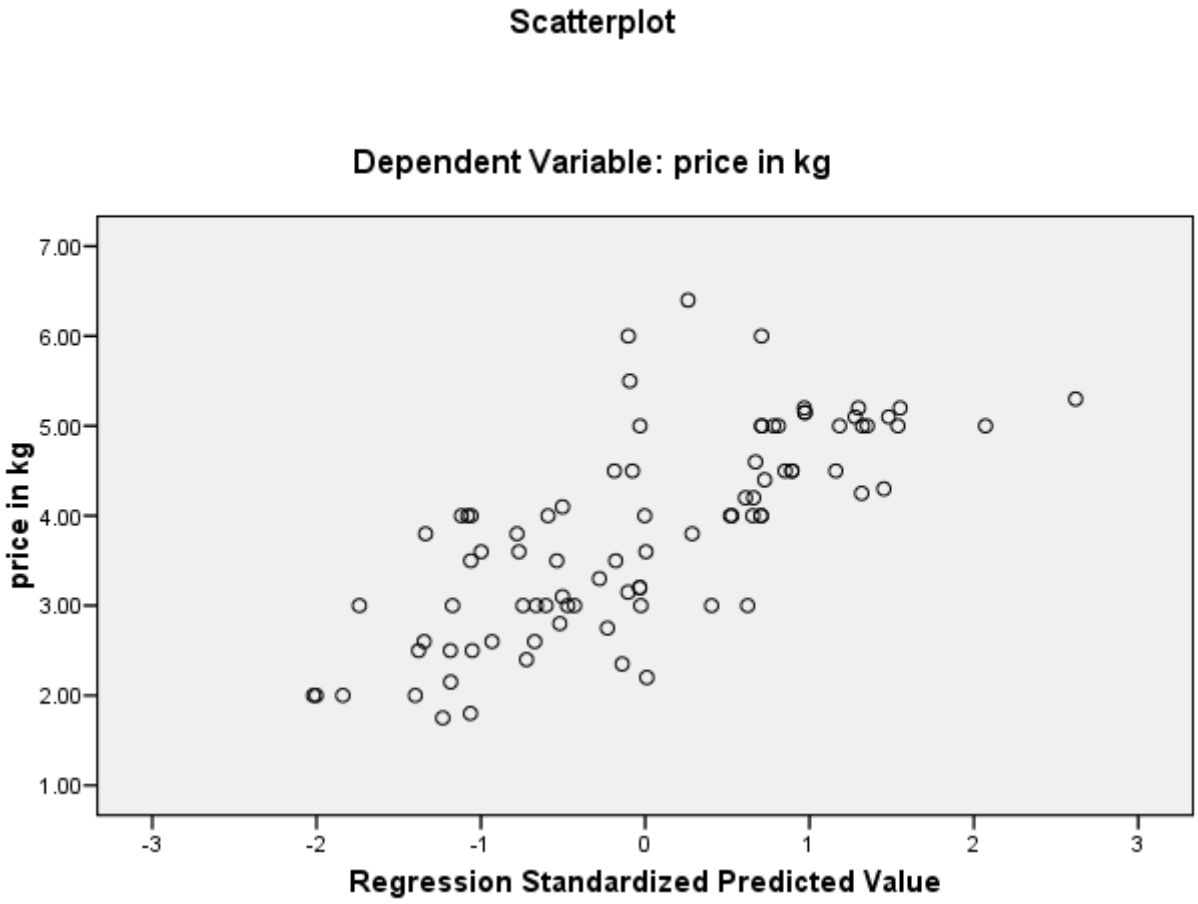
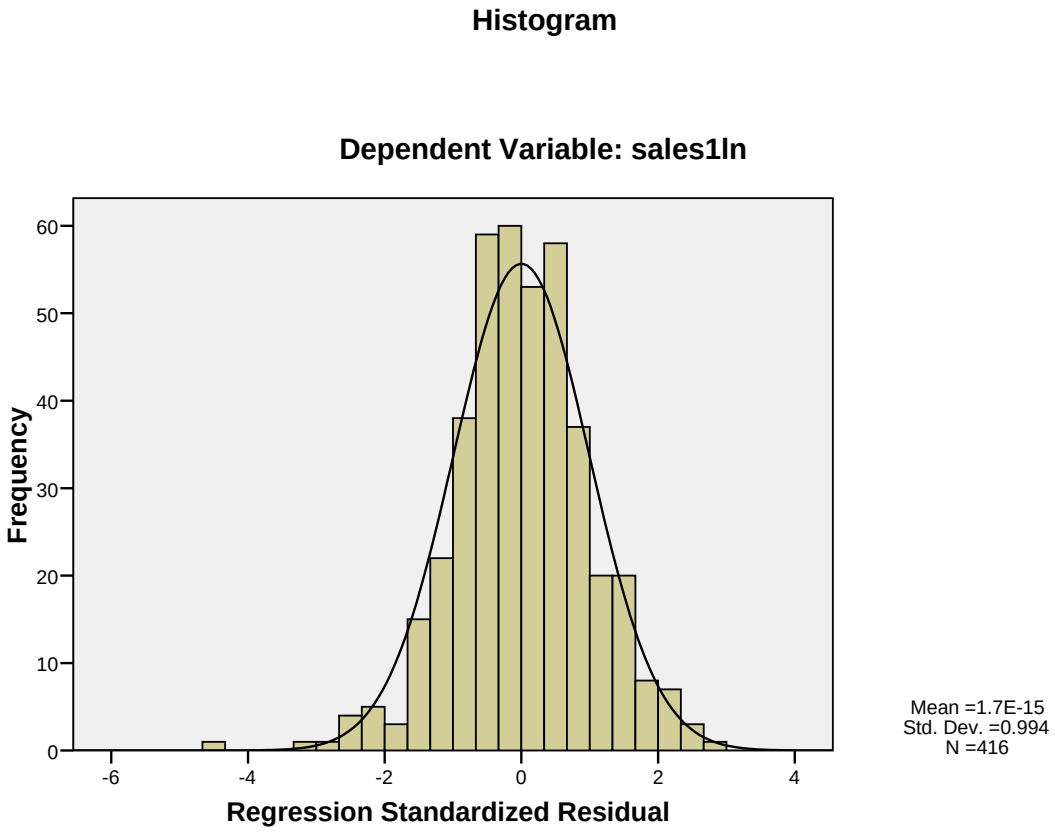
Plot 3. A scatter plot to prove linearity assumption in the farm-gate price regression model



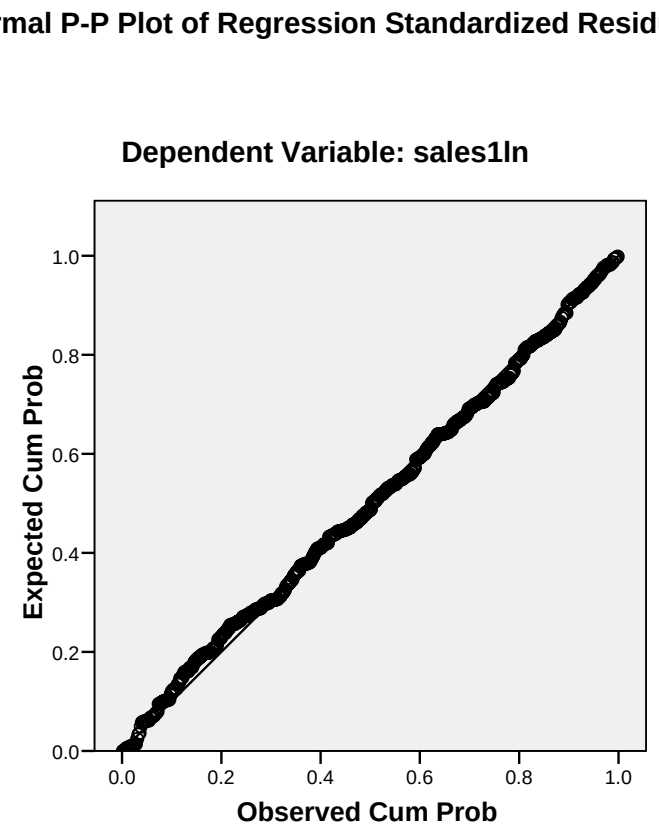
Linearity is evident in this plot of the observed versus the predicted values because the points are distributed around a diagonal line by way of rectangular shape (according to Osborne *et al*, 2001).

Plot 4. Plot to prove normal distribution of observations for marketable surplus chickpea model formation



The histogram shows the standard normal distribution converted from normal distribution of values of both dependent and independent explanatory variables. The normal distribution is a continuous probability distribution and the most commonly used distribution in statistical analysis (Dominick Salvatore, PhD and Derrick Reagle,PhD Statistics and Econometrics, 2nd edition 2005).

Plot5. A residual normal p-p plot showing values lining up along the diagonal that goes from lower left to upper right for marketable surplus chickpea regression analysis



A residual normal p-p plot showing values lining up along the diagonal that goes from lower left to upper right for marketable surplus chickpea regression analysis. It is another method of testing if the residuals are normally distributed Dominick Salvatore, PhD and Derrick Reagle,PhD Statistics and Econometrics, 2nd edition 2005).

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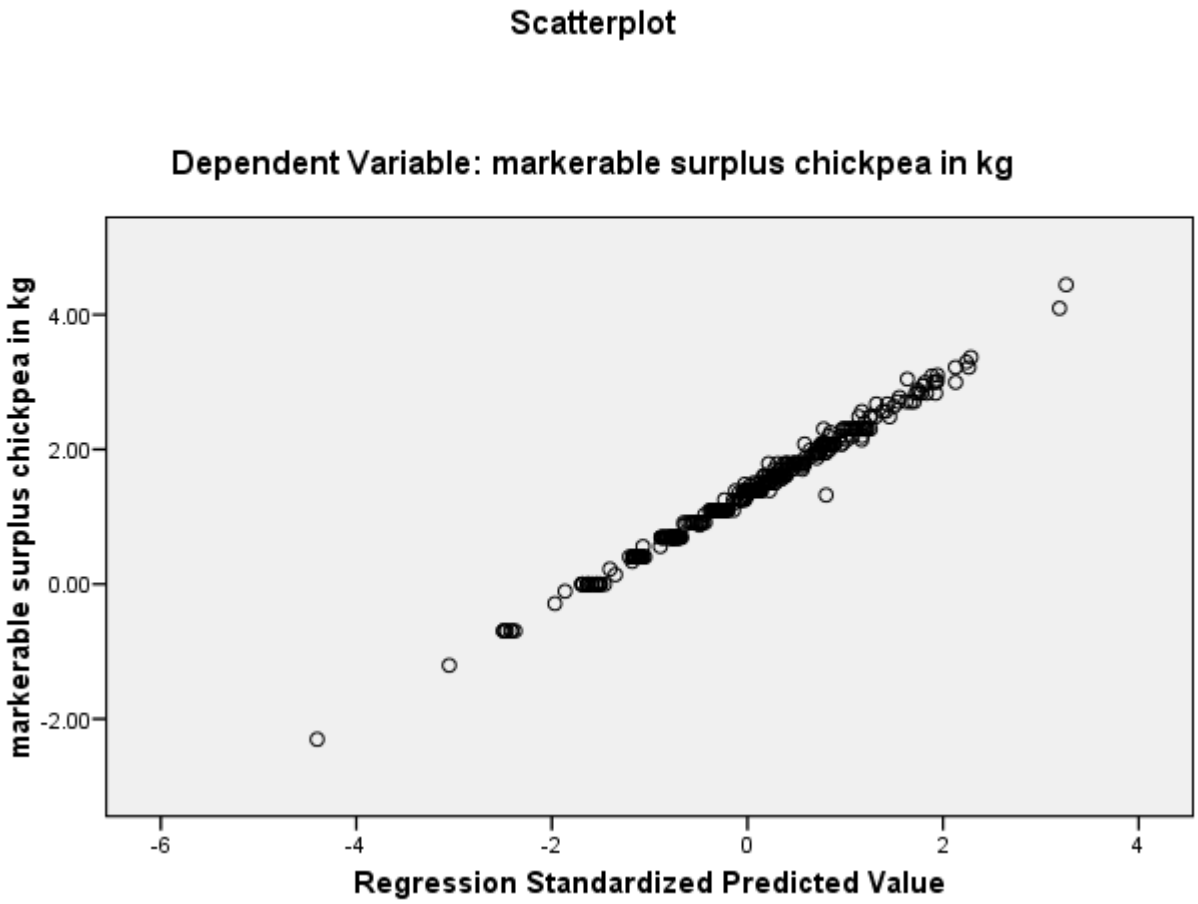
Plot 6. A scatter plot to prove linear relationships between dependent variable and independent variables in the marketable surplus chickpea regression model



Linearity is evident in this plot of the observed versus the predicted values because the points are distributed around a diagonal line (according to Osborne *et al*, 2001).

Questionnaire No……. (To be filled by the supervisor)

1. Name of Respondent _____
2. Wereda _____ 3. Kebele_____ 4. Village _____
5. Name of local market _____ 6. Distance to local market (km) _____
7. Name of main market_____ 8. Distance to main market (km) _____
9. Year of experience in growing chickpea since formed family_____

2.0 HOUSEHOLD COMPOSITON AND CHARACTERSTICS

Name of HH member start with respondent	Gender Cods A	Marital status Cods B	Age (years)	Education (years) Cods C	Relation to HH Cods D	Main Occupation Cods E	Months on the farm in the last 12 months	Farm labor participation
		3	4	5	6	7	8	9

Codes:

Cods A	Cods B	Cods C	Cods D	Cods E
Male	1. Married living with Wife/husband	0.None (illiterate)	1.household head	1. Farming (Crop+ livestock)
Female	2.Married but wife/husband away	1.Adult education or one year of education	2.spouse	2. Salaried employment
	3. Divorced/separated	*Give other education In years	3.son or daughter	3. Self employed off-farm
	4. widow/widower		4.parent	4. Casual laborer on-farm
	5. Never married		5. Son/daughter in law	5. School/college child
	6.others, specify--------		6. Grand child	6. Herds boy/girl
			7. Other, relative	7. Household chores
			8. Hired worker	8. Non-school child
			9, Other, specify	9. Other, specify

Code F

1. Full time
2. Part-time
3. Not a worker

Questionnaire No……. (To be filled by the supervisor)

3.HOUSEHOLD FARM ASSETS OTHER THAN LAND

3.1 Currently owned assets

Asset name	number	Current per unit value (birr)	Total value (birr)
1	2	3	4
Ox-ploughs			
Ox cart or horse cart			
sickle			
machetes			
axe			
spade			
hoes			
sprayer			
Wheel barrow			
Other motorized vehicles			
radio			
Mobile phone			
Television (tv)			
Buildings in the home stead			
residential			
Livestock pen			
store			
Others, specify			

3.2 land holding (hectare) during Eth Calendar (1999/200) cropping year or (2007/08)

	Long rainy season (meher)	Fallow (example:- grazing)
Own used (A)		
Rented in (B)		
Rented in (C)		
Borrowed in (D)		
Borrowed out (E)		
Total owned (A+B+E)		
Total operated (A +B+D)		
Total irrigated (owned)		
Total rainfed (owned)		

Questionnaire No……. (To be filled by the supervisor)

4.0 VARIETY ADOPTION

4.1Knowledg of Varieties, Sources of Information and Seed, Adoption and Disadoption

Chickpea varieties known Codes A	Main source of variety information Codes B	Ever planted? Codes C	If no, why? Cods D	If yes, year first planted	First seed			Planted variety in August/Sept 2007 season Codes C	If no (Sept 2007).	
					Main source of first seed Codes E	Quantity kg	Means of acquiring first seed Codes F		Will plant chickpea variety in future Codes C	Why not (Codes D) Rank 3
1	2	3	4	5	6	7	8	9	10	11
1										
2										
3										
4										
5										
6										
7										

A
Arerti
Shasho
Chefe
Marye
Worku
Akaki
Local Desi
Other,specify

B
1. Government extension
2. Farmer cooperative/union
3. NGO
4. Research center: on-farm trials, demos, field days
5. Seed/grain stocklist
6. Another farmer/neighbour
7. Radio/ newspaper/TV
8. Producer marketing groups (PMG)
9. Other, specify……

C
0. No
1. Yes

D
1. Cannot get seed at all
2. Lack of cash to buy seed
3. Susceptible to disease & pests
4. Poor taste
5. Theft during green stage
6. Cannot get credit
7. Low yielding variety
8. Poor prices
9. No market
10. Requires high skills
11. Seeds are expensive
12. Other, specify …….

E
1. Research Participatory variety selection
2. Extension demo plots
3. Coops
4. Bought from local seed producers
5. Bought from local trader or
6. Farmer to farmer seed exchange (relative, friend, etc)
7. Inheritied from family
8. Other, specify……..

F
1. Gift/free
2. Borrowed seed
3. Bought with cash
4. Payment in kind
5. Exchange with other seed
6. Own saved seed
7. Other, Specify…….

Questionnaire No……. (To be filled by the supervisor)

4.2Main sources and quantity of seed used for August/Sept, 2007 planting season

Variety planted in Augs/Sept 2007 Cods A of page 5	Total amount of seed(kg)	Quantity of seed from major sources (kg)							
		Source 1		Source 2		Source 3		Source 4	
		Codes A	Amount (kg)	Code A	Amount (kg)	Code A	Amount (kg)	Codes A	Amount (kg)
1	2	3	4	5	6	7	8	9	10

Codes A

1. Own saved seed
2. Research PVS
5. Bought from local seed producers
6. Bought from local trader or agro-dealers
7. Farmer to farmer seed exchange (relative, Friend, etc
8. Provided free by NGOs
9. Provided free by other govt agency
10. Inherited from family
11. Other, Specify…….

Questionnaire No……. (To be filled by the supervisor)

5.0 CHARACTERISTICS OF CROP PRODUCTION IN 2007/08 (FOR ALL CROPS) [RECORD SEPARETLY BY PLOT AS CLEARLY INDICTED IN TABLE 5 ABOVE]

Plot code (number starting from nearest plot to house)	Plot specific location name	Crop grown (codes A)	Crop variety (codes B)	Plot size (kert)	Plot ownership (Codes C)	Soil fertility (Codes D)	Soil depth Codes (E)	Soil type (Codes F)	Soil slope (Codes G)	Soil water conservation (Codes)	Plot distance to residence (km)	Water logging on plot (Codes I)
1	2	3	4	5	6	7	8	9	10	11	12	13

Codes A

1. Areti chickpea
2. Shasho chickpea
3. Chefe chickpea
4. Marye chickpea
5. Worku chickpea
6. Akaki chickpea
7. Local Desi chickpea
8. White teff
9. Mixed teff
10. Red teff
11. Bread wheat
12. Durum wheat
13. Faba bean
14. Lentil
15. Grass pea (guaya)
16. Other, specify

Codes B

1. Improved
0. Local

Codes C

1. Owned
2. Rented in
3. Borrowed in

Codes E

1. Poor
2. Medium
3. Good

Codes F

1. Shallow
2. Medium
3. Deep

Codes G

1. Black
2. Brown
3. Red
4. Grey
5. Other, Specify

Codes H

1. Gently slop (flat)
2. Medium slope
3. Steep slope

Questionnaire No……. (To be filled by the supervisor)

6.0 CHICKPEA CROP PRODUCTION IN 2007/2008 (RECORD SEPARATELY BY PLOT AS TABLE 5.0 ABOVE)

Plot code (from table 5.0; Column 1)	Seed			Field pest chemical		Hired oxen (birr)	Total labor (labour man-days)								Production (kg)
	Own saved/gift (kg)	Bought		Liters	Birr/liter		Hired labor	Ploughing, harrowing & planting	Frequency of ploughing	Wedding (1^{st}) and 2^{nd} etc	Frequency of wedding	Chemical application	Harvesting	Threshing/ shelling	
		Amount (kg)	Birr/kg												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1															
2															
3															
4															
5															
6															
7															

Questionnaire No……. (To be filled by the supervisor)

7.0 UTLIZATION OF CHICKPEA CROPS PRODUCED 2007/08 SEASON

Crop type (Code A)	Production (kg) (from last column of Table 7.0)	Sales (kg)	Seed (kg)	Gift, tithe, donations (kg)	Consumption (kg)

Codes A

8. Areti chickpea
9. Shasho chickpea
10. Chefe chickpea
11. Marye chickpea
12. Worku chickpea
13. Akaki chickpea
14. Local Desi chickpea

Questionnaire No……. (To be filled by the supervisor)

8.0 MARKETING OF CHICKPEA CROPS (2007/08 SEASON) [RECORD SALES BY SEASON, BUYER AND MONTH SOLD]

Crop codes A	Market type	Quantity sold kg (from column 3 of table 9)	Price (birr/kg)	Month sold Codes B	Period to payment after selling weeks	Buyer Codes C	Relation to buyer Codes D	Crop quality Codes E	Sales tax/charges (birr)	Distance to point of sale (minutes)	Time taken to sell minutes	Mode of transport codes F	Transport cost (Birr)
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Codes A
15. Areti chickpea
16. Shasho chickpea
17. Chefe chickpea
18. Marye chickpea
19. Worku chickpea
20. Akaki chickpea
21. Local Desi chickpea

Codes B
1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

Codes C
1. Farmer group
2. Farmer union or Coop
3. Consumer or other farmer
4. Rural wholesalers
5. Woreda wholesalers
6. Urban grain trader
7. Other, specify…..

Code D
1. Next of kin
2. Friend
3. Preferred customer
4. Other, specify…..

Code E
1. Grade one
2. Grade two
3. Other, specify

Code F
1.Bicycle
2.Hired truck
3.Public transport
4.Donkey
5.Oxen/horse cart
6.Back load
7.Other, specify

Questionnaire No……. (To be filled by the supervisor)

9.0 COMPARISON OF BUYRS FOR CHICKPEA (RANK,1=MOST IMPORTANT)

Issues for comparison or elicitation of time preferences	Farmer group	Cooperative /Farmers' union	Rural wholesalers	Woreda wholesaler	Urban grain trader	Consumers or other farmer	Other, specify…
	1	2	3	4	5	6	7
1. Who pays a better price for the grain delivered?							
2. Who has reliable weights/measures?							
3. Who pays timely for the grain delivered?							
4. Who is located nearest your residence?							
5. Who is stricter on grain quality requirements?							
6. Which marketing outlet do you prefer most? Rank							

Questionnaire No……. (To be filled by the supervisor)

10.0 LIVESTOCK PRODUCTION ACTIVITIES (JAN-DEC 2008)

Animal type	Original stock Jan 2007	Stock changes during 2007							Average total days milked per animal	Avg. daily milk yield per animal (liters	Total milk production (literes
		Born/weaned	Died	Consumed	Bought	Gifts in	Gifts out	Sold			
1	2	3	4	5	6	7	8	9	10	11	12
Cattle											
Indigenous milking cows											
Crossbred/improved milking cows											
Exotic milking cows											
Other non milking cows											
Trained oxen for ploughing											
Bulls											
Heifers											
Calves											
Goats											
Mature milking goats											
Mature male goats											
Young goats											
Sheep											
Mature female sheep (ewe)											
Mature male sheep											
Young sheep (ram and lamb)											
Other livestock											
Mature trained donkeys											
Young donkeys											
Mature chicken											
Mature trained horses or mules											
Young horses or mules											
Beehives											
Other livestock, specify											

Questionnaire No……. (To be filled by the supervisor)

11.0 LIVESTOCK MAITENANCE COSTS (2007) (2008)

Description	Targeted animal group Codes A	Total quantity bought per year	Units	Per unit price (Birr)	Market name if outside the village	Distance to market (km)	Total cost (Birr)
1	2	3	4	5	6	7	8
Crop residue							
Teff crop residue							
Legume crops residue							
Wheat and barley residue							
Maize and sorghum residue							
Green fodder/grazing land							
Hay							
Concentrates							
Veterinary services							
AI services							
Herds boy (animal tending)							
Other costs, specify							
1							
2							
3							

Codes A

1. Milking cows
2. Other cow
3. Oxen
4. Other cattle (heifer, bulls, calves)
5. Sheep
6. Goats
7. Poultry
8. Donkeys
9. Other, Specify …..

Questionnaire No……. (To be filled by the supervisor)

12. SELLING AND BUYING OF LIVESTOCK, LIVESTOCK PRODUCTS AND OTHER ASSETS (JAN-DEC 2008)

Livestock and livestock products	Selling						Buying					
	Quantity sold (Table 10 column 9 + ask also livestock products)	Units	Price (Birr/unit)	Month sold Codes A	Animal condition/product quality Codes B	Sales tax or charges (Birr)	Quantity bought (Table 10 column 6 & ask also livestock products(	Units	Price (Birr/unit	Month bought Codes A	Animal condition/product quality Codes C	Sales tax or charges (Birr)
Other assets												
Land rent in/out (hectare)												

Codes A

1. January average
2. Feb
3. March average
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

Codes C

Land Quality

1. Poor soil fertility
2. Medium/average
3. High/above average

Codes C

1. Below average
2. Average
3. Above

13.0 GRADES AND STANDARDS

Question	Local consumer	Local wholesaler	Woreda wholesaler	Other urban traders	Codes
1. Are you aware of Kabuli chickpea quality preferred by these buyers?					1. Yes 0. No
2. If Yes to Q1, then rank 3 most important Kabuli chickpea qualities preferred by the buyers (use cods)	Rank 1… Rank 2… Rank 3…	Rank 1… Rank 2… Rank 3…	Rank 1… Rank 2… Rank 3…	Rank 1 Rank 2 Rank 3	1. Free from impurities/foreign matter 2. Well dried/low moisture content 3. not mixed varieties (pure) 4. White colored grains (Kabuli) 5. Brown coloured grains (Desi) 6. Free from damage by pest and insects 7. Large size grain 8. Small size grain 9. Having no damaged or wrinkled skin 10. Other, specify…..
3. Are you aware of Desi chickpea quality preferred by buyers?					1. Yes 0. No
4. If Yes to Q 1, then rank 3 most important Desi chickpea qualities preferred by the buyers (Use codes)	Rank 1 Rank 2 Rank 3	Rank 1 Rank 2 Rank 3	Rank 1 Rank 2 Rank 3	Rank 1 Rank 2 Rank 3	Same as above for Kabuli
5. How many quality grades of chickpea do you know? Name them. - Kabuli_____ - Desi_____					
6. Which grain quality grade do you normally sell? Name them - Kabuli_____ - Desi _____					
7. Do buyers offer different prices for different grades of chickpea? Kabuli Desi					1. Yes 0. No
8. Give the price difference between grade ` and grade 2 (birr/kg) Kabuli _____ Desi_____					
9. Give the minimum price difference (Birr/kg) that will motivate you to market the highest chickpea grade Kabuli_____ Desi_____					
10. Give the minimum price increase over that of grade 2 that would motivate you to supply grade 1 chickpea Kabuli_____ Desi_____					

Questionnaire No……. (To be filled by the supervisor)

14.0 OTHER SOURCES OF INCOME (JAN-DEC 2008)

(If several household members earn the same income source, fill according to the earning family member in separate rows)

Sources	Earning family member (Codes A)	Where earned? (specify if out of village)	Units for amount	Actual amount sold	Price per unit (cash & in-kind)		Total income (cash & in-kind)	
					Cash payment (Birr)	Payment in kind (Cash equivalent	Cash (Birr)	Payment in kind (Cash equivalent)
1	2	3	4	5	6	7	8	9
Selling of crop residue								
Rented out land (…… Codes B)								
Rented out oxen for ploughing								
Permanent non-farm labor								
Casual non-farm labour								
Long-term farm labor								
Casual farm labor								
Non-farm agribusiness NET income (eg. Grain mill)								
Other business NET income (shops, trade, tailor, etc)								
Pension income								
Drought relief								
Remittances (sent from non-resident family and relatives living elsewhere)								
Marriage gifts								
Sale of own trees (firewood, etc)								
Sale of dung cake for fuel								
Sales from CRPs (firewood, charcoal making etc)								
Other, specify								

Code A: 1. = Respondent, 2. Spouse, 3. Son/daughter. 4. Parent, 5. Son/daughter in-law, 6. Grand child, 7. Other relative, 8. Hired worker 9. Other, specify……

Codes B: 1. Poor fertility 2. Medium fertility 3. High fertility

Questionnaire No……. (To be filled by the supervisor)

15.0 BORROWIG FOR DIFFERENT PURPOSES (2007/08)

Transactions	Relation (Codes)	Collateral used		Month Received	Amount (Birr)	Purpose of borrowing (codes)	For duration of (month)	Rate of interest (% per year)	Amount paid with interest by end of 2007 (Birr)	Outstanding loan (Birr)
		Code	Value (Birr)							
Borrowing from (codes)										
1	2	3	4	5	6	7	8	9	10	11

Questionnaire No……. (To be filled by the supervisor)

16.0 SIGNIFICANT CONSUMPTION EXPENSES IN THE YEAR (JAN –DEC 2008)

Expense item	Frequency of purchase (e.g., 2 times per month)	Average quantity each time	Total quantity	Units	Average price of unit purchase (Birr)	Total value of purchase (Birr)
1	2	3	4	5	6	7
Kabuli chickpea						
Desi chickpea						
Teff						
Wheat						
Barley						
Maize						
Beans						
Sorghum						
Finger millets						
Oats						
Field pea						
Faba bean						
Linseed						
Niger seed						
Vetch (grass pea)						
Lentil						
Other, specify						
1						
2						
3						
4						
5						