PERFORMANCE OF VEGETABLE MARKET: THE CASE OF KOMBOLCHA DISTRICT, EAST HARARGHE ZONE OF OROMIA NATIONAL REGIONAL STATE, ETHIOPIA

MSc. THESIS

MERON YOHANES

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By

Meron Yohanes

October, 2015
Haramaya University

HARAMAYA UNIVERSITY

Postgraduate program Directorate

We hereby certify that we have read and evaluated this Thesis entitled **"Performance of Vegetable Market**: **the case of Kombolcha District, East Hararghe Zone of Oromia Regional State, Ethiopia"** prepared under my guidance by Meron Yohanes I recommended that it be submitted as fulfilling the thesis requirement.

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Major Advisor	Signature	Date	

			-
Co-Advisor	Signature	Date	

As members of the Board of Examiners of the M.Sc. Thesis Open Defense Examination, I certify that I have read and evaluated the Thesis prepared by Meron Yohanes Birhanu and examined the candidate. We recommended that the thesis be accepted as fulfilling the Thesis requirements for the degree of Masters of Science in Agriculture (Agricultural Economics).

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Chairperson	Signature	Date	

			-
Internal Examiner	Signature	Date	

			-
External Examiner	Signature	Date	

DEDICATION

Affectionately I dedicated this manuscript to my beloved family, Yohanes Birhanu, Abay Bizuneh and Abebech S/Mariyam.

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this Thesis is my own work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this Thesis. Any scholarly matter that is included in the Thesis has been given recognition through citation.

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Name: Meron Yohanes Birhanu   Signature: ---------------------

Date: -------------------------------

School/Department: Agricultural Economics

BIOGRAPHICAL SKETCH

The author was born in July, 1983 at Assella in Arsi zone of Oromia Regional State, Ethiopia. She attended her elementary and junior education at Alem School. After exultantly completed the primary school she then joined secondary education at Chilalo Terara Secondary School. She then joined Assella Preparatory School to attend the preparatory class.

After elatedly passed the ESLCE, she joined Haramaya University in November, 2011, for her first degree. Staying for consecutive three years she received the degree of Bachelor of Arts in Economics in July, 2013. Immediately, after the successful completion of her first degree in Economics, in October, 2013 she joined the school of graduate studies for her MSc. degree in Agricultural Economics.

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ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey Fuller
BoARD	Bureau of Agriculture and Rural Development
CC	Contingency Coefficient
CR	Concentration Ratio
CIAT	International Center for Tropical Agriculture
CRDW	Co-integrating Regression Durbin-Watson
CSA	Central Statistics Agency of Ethiopia
DF	Dickey Fuller
ECM	Error Correction Model
EHDA	Ethiopian Horticulture Development Agency
HDC	Horticulture Development Corporation
KWoARD	Kombolcha Woreda Office of Agriculture and Rural Development
MSFD	Ministry of State Farm Development
OLS	Ordinary Least Squares
OoARD	Office of Agriculture and Rural Development
TGMM	Total Gross Market Margin
VIF	Variance Inflation Factor
WFP	World Food Program

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ABSTRACT

Markets are important for economic growth and sustainable development of a given country. However, in the absence of well-functioning markets, agricultural production can experience several drawbacks. With the main objective of examining vegetables marketing system in Kombolcha district of eastern Hararghe zone, Oromia region, Ethiopia, primary data from 123 randomly selected vegetable farmers and time series data from CSA were used. Descriptive statistics and econometric models were used to analyze data. Heckman two stage model was used to analyze the determinants of vegetables marketed surplus. To measure market integration between Kombolcha and Jigjiga markets of Eastern Ethiopia, this study followed the most widely used test called Engle Granger counteraction test and Error-Correction Model (ECM). The result of descriptive analysis shows that out of the total sample households 70 were market participants while the remaining 53 were non-participants. The first stage estimation result of Heckman two stage model shows that Age, total land holding, frequency of irrigation extension contact and family size are the factors that are positively and significantly affecting both potato and cabbage market participation decision in Kombolcha district. However, education and non-farm income of the farm households are found to affect potato and cabbage marketed surplus adversely. The co-integration test results revealed that Kombolcha and Jigjiga potato and cabbage markets are co-integrated indicating the positive long run relationship between the two markets. In addition, granger causality test confirmed that Jigjiga cabbage market have been playing the leading role in price formation and affects Kombolcha cabbage price setting during the specified study period Therefore, to increase marketed surplus of vegetables, introduction of modern technologies for the efficient use of the irrigation water, controlling disease and pest practices should be promoted to increase production. In addition, strengthening the supportive activities such as information centers and input supply systems, building the asset base of the producers would also boost vegetable surplus and market performance. Moreover, practicing efficient extension system, updating the producer's knowledge and skill with improved production, handling, storing and marketing system that enables to increase benefits of producers are the way forward.

Keywords: Marketing, Vegetables, Heckman two stage model, Kombolcha.

- **INTRODUCTION**

1.1. Background of the Study

Markets are important for economic growth and sustainable development of a given country, but, emphases in development policies in agrarian countries have usually been placed on increasing agricultural production to serve as a base for rural development. In the absence of well-functioning markets, agricultural production can experience several drawbacks (Belay, 2009). Horticultural crops play a significant role in developing country like Ethiopia, both in income and social spheres for improving income and nutrition status. In addition, it helps in maintaining ecological balance since horticultural crops species are so diverse. Further, it provides employment opportunities as their management being labour intensive, production of these commodities should be encouraged in labour abundant and capital scarce countries like Ethiopia (ital).

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

The marketing of vegetables in Eastern Ethiopia is characterized by seasonal gluts and shortages which in turn affect the marketing behavior of producers, traders and consumers (Jema, 2008). The Hararghe highland is one of the highly populated areas in Ethiopia. As a result, intensive horticultural production has become a means of promoting agro-enterprise development and increasing the land productivity.

Horticulture production gives an opportunity for intensive production and increases smallholder farmers' participation in the market. Vegetables produced in the eastern part of Ethiopia are supplied to the local markets and to the neighboring countries. Potato and onion/shallot are the most commonly marketed vegetables accounting for about 60% and 20% of the marketed products (Bezabih and Hadera, 2007). The other products such as cabbage, beetroots, carrot, garlic, green pepper and tomato are marketed at relatively smaller quantities by few farmers (ital).

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

1.2. Statement of the Problem

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

Eastern Ethiopia, especially eastern Oromia has a comparative advantage of producing vegetables due to its high domestic and export markets. Eastern Ethiopia has access to export markets in Djibouti, Hargesa, Wuchale, Bosaso and domestic markets in Kombolcha, Dire Dawa, Jijiga, etc. Despite this potential, the farmers in the area rarely utilize the opportunity to improve their livelihoods. The smallholder producers are price takers since they have little participation in the value chain and imperfection of the marketing system. As a result, smallholder farmers have repeatedly faced risk of unexpected fall in horticultural product prices.

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

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

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

Potato and cabbage are major vegetable crop produced by the majority of farmers in Eastern Hararghe specially Kombolcha district. Potato accounted for about 70% of the vegetables marketed. About 75% of the potatoes were supplied from east Hararghe and about 25% from central Ethiopia including the Rift Valley and Shashemene. The supply from other parts of the country is seasonal; often needed to bridge the gap between demand and supply. The potatoes supplied from the central part of the country are considered inferior in terms of quality and sold relatively cheaper. Kombolcha, Jarso and Haramaya districts supply sufficient quantity of carrots, beetroots and cabbages and these commodities are not supplied from other sources. About 94% of the vegetables marketed in Kombolcha were exported to Somalia (KWOoARD, 2012).

Numerous studies have looked in to the performance and challenges of Grain marketing in Ethiopia. However, only few of them looked in to the performance and challenges of vegetable marketing. To the best of our knowledge there is no any study conducted on vegetable marketing performance in Eastern Ethiopia, particularly Kombolcha District. Therefore, with a view to bridge the existing research and knowledge gap this study aimed to examine the determinants of vegetables marketing performance in Kombolcha District.

1.3. Research Question

This study is attempt to answer the following research questions

1. What are the major factors that affect the supply of vegetable in Kombolcha woreda?

2. What do the structure, performance and conduct of the vegetable market looks like?

3. What does the market integration look like?

1.4. Objective of the Study

The general aim of this study is to examine the vegetables marketing system in

Kombolcha district of eastern Hararghe zone with the following specific objectives:

1. To analyze structure, conduct and performance of Potato and Cabbage market;

2. To identify the determinants of vegetables marketed surplus at farm level;

3. To analyze market integration between secondary and the reference market; and

1.5. Scope and Limitations of the Study

Attempting to analyze the entire vegetables and markets are an impossible action given the limited resources and human skill. Thus, the research was narrowed down to concentrate on the production area Kombolcha and major receivers Jigjiga. The types of vegetables were limited to potato and cabbage for their increasing coverage and the marketing problem they used to face. Other vegetable crop types are left, because either their production is limited, or they did not pass through a number of stages.

Different market levels, determinants of marketed surplus, price discovery and bargaining characteristics of producers, buying and selling strategies, and traders' behavior in the marketing process were seen.

Due to shortage of budget, and logistics, the researcher couldn't cover all vegetables producing PAs and vegetables markets found in the study areas. And also due to lack of secondary data on all sample markets the study was unable to evaluate the market integration among all markets.

1.6. Significance of the Study

The primary significance of the study is to all actors in the marketing system. Analysis of the whole system and identifying clearly the challenges will benefit policy makers and implementers in indicating the area of advantage for what should be done to improve vegetable marketing.

1.7. Organization of the Study

This thesis is organized in to six chapters. The remaining part of the thesis is organized as follows, the second chapter reviews detailed literature on relevant topics on the study of production, marketing, and challenges of vegetables. The successor deals with the research methodology starting with description of the study district and end up with definition of econometric variables. The second from the last chapter presents results and discussions, including data presentation on respondents' socio economic characteristics, and econometric analysis of determinants and extent of market participation. The final chapter obviously summarizes the findings of the study with some recommendations.

- **LITERATURE REVIEW**

In this chapter, the basic concepts of market, marketing, agricultural marketing, approaches to the study of agricultural marketing, vegetables, characteristics of vegetables and its marketing, vegetable production and marketing in Ethiopia, structure-conduct- performance, market integration, measures of market concentration and integration and analysis of factors affecting marketed surplus were discussed.

2.1. Concepts and Definition of Terms

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

Marketing: According to (Branson and Norvel, 1983), marketing is defined as the process of satisfying human needs by bringing products to people in the proper form, time and place. Marketing has an intrinsic productive value, in that it adds time, form, place and possession utilities to products and commodities. Through the technical functions of storage, processing and transportation, and through exchange, marketing increases consumer satisfaction from any given quantity of output (Mendoza, 1995). Kotler and Armstrong (2003) also stated shortly marketing as the task of creating, promoting, and delivering goods and services to consumers and businesses.

Agricultural Marketing: It is defined as agriculturally oriented marketing. It embraces all operations and institutions involved in moving farm products from farm to consumers (Pritchard, 1969). It covers all the activities associated with the

agricultural production and food, feed, and fiber assembly, processing, and distribution to final consumers, including analysis of consumers' needs, motivations, and purchasing and consumption behavior (Branson and Norvell, 1983).

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

2.2. Approaches to the Study of Agricultural Marketing

Different circumstances involved in the demand and supply of agricultural products, and the unique product characteristics, require a different approach for analyzing agricultural marketing problems (Johan *et.al,* 1988). The major and most commonly used approaches are functional, institutional and commodity approaches.

2.2.1. Functional approach

Functional approach to study marketing is to break up the whole marketing process into specialized activities performed in accomplishing the marketing process (Kohls and Uhl, 1985). The approach helps to evaluate marketing costs for similar marketing middlemen and/or different commodities and costs and benefits of marketing

functions (Kohls and Uhl, 1985; and Andargachew, 1990). The widely accepted functions are: exchange (buying and selling), physical (processing, storage, packing, labeling and transportation), and facilitating (standardizing, financing, risk bearing, promoting and market information). The exchange function involves pricing, buying and selling which is a transfer of title between exchanging parties.

2.2.2. Institutional approach

This approach focuses on the description and analysis of different organizations engaged in marketing (producers, wholesalers, agents, retailers, etc) and pays special attention to the operations and problems of each type of marketing institution. The institutional analysis is based on the identification of the major marketing channels and it considers the analysis of marketing costs and margins (Mendoza, 1995). An institutional approach for the marketing of agricultural product should be instrumental in solving the three basic marketing problems, namely consumers' demand for agricultural products, the price system that reflects these demands back to producers and the methods or practices used in exchanging title and getting the physical product from producers to consumers in the form they require, at the time and place desired (Johan *et.al*, 1988).

2.2.3. Commodity approach

In a commodity approach, a specific commodity or groups of commodities are taken and the functions and institutions involved in the marketing process are analyzed (Kohls and Uhl, 1985). This approach is said to be the most practical as it helps to locate specific marketing problems of each commodity and improvement measures. The approach follows the commodity along the path between producer and consumer and is concerned with describing what is done and how the commodity could be handled more efficiently. This approach will be used in this study as a guideline to identify different aspects of the problem.

2.3. Characteristics of Vegetables and its Marketing

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

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

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

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

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

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

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

2.4. Vegetable Production and Marketing in Ethiopia

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

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

share of 31%, and green pepper 10% (ital).

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

The Ethiopian Fruit- and Vegetables Marketing Enterprise (ETFRUIT) is a state trading organization established in April, 1980 under the Horticulture Development Corporation (HDC) of the Ministry of State Farm Development. ETFRUIT is a wholesale institution dealing with domestic and export trade of fresh fruits, vegetables, flowers, processed horticultural products and some slice crops. The marketing operation of the enterprise includes the collection of products from production sites, transportation, storage, grading and quality control, packing and distribution of these horticultural, floriculture and spice crops (MSFD, 2012).

2.5. Structure-Conduct-Performance(S-C-P)

The development of reliable and stable market system has been an important element in commercialization and specialization in the agricultural sector. In order to study the functioning of markets many researchers have applied the Structure-Conduct-Performance (SCP) paradigm.

The structure-conduct-performance approach was developed in the United States of America as a tool to analyze the market organization of the industrial sector and it was later applied to assess the agricultural marketing system. It was designed by Edward S. Madson in pioneering work in 1939, Wolday (1994).

The S-C-P approach analysis the relationship between functionally similar firms and their market behavior as a group and provides a broadly descriptive model of the

nature of various sets of market attributes, and the relationship between them and performance. Its basic tenet is that, "given certain basic conditions", the performance of particular industries   depends on the conduct of its sellers and buyers, which in turn is strongly influenced by the structure of the relevant market (Scarborough and Kydd, 1992).

2.5.1. Market structure

Market structure includes those characteristics of the organization of the market that seem to exercise strategic influence on the nature of competition and pricing within the market (Bain, 1986). The most salient characteristics of market structure according to Scarborough and Kydd (1992) include:

1. The degree of seller's and buyer's concentration which refers to the number and size distribution of firms in relation to the size of the market;

2. The degree of the product differentiation among outputs of the various sellers in the market; and

3. Barriers to entry or freedom to entry and exit from the market: this refers to the conditions for entry of new firms into the market or exit of existing firms.

Entry or the exit, with which an individual can join and leave business, is important to a competitive market structure. This may refer to the process of setting a license or professional qualification or skill or to the need of having a minimum amount of capital or other resources in order to operate successfully. Lack of available capital could effectively restrict entry of new firms if a large initial outlay is required (Staal, 1995).

2.5.2. Market conduct

Market conduct refers to the behavior that firms pursue in adopting or adjusting the market in which they sell or buy. The major aspects according to Scarborough and Kydd (2004) include pricing and selling practices and tactics, overt and tacit inter-firm co-operation, or rivalry, and research and development activities.

The specified structural features of atomistic numbers, homogeneous product, and free entry and exit require a form of conduct such that each firm must operate as if in isolation. The market behavior of firms will determine whether or not they compete and whether they are acting innovatively to improve market efficiency. Informal association between even a small numbers of firms (collusion) can cause price distortions and seemingly independent firms can have joint ownership (subsidiaries) (Staal, 1995).

2.5.3. Market performance

Market performance refers to the composite of end results which firms in the market arrive at by pursuing whether lines of conduct they espouse-end results in the dimensions of price, output, production and selling cost, product design, and so forth (Bain and Qualls, 1987). The principal aspects of the market performance according to the same authors are:

1. The relative technical efficiency of production so far as this is influenced by the scale or size of plants and firms (relative to the most efficient), and by the extent, if any, of excess capacity;

2. The selling price relative to the long-term marginal cost of production and to the long run average cost of production (usually about the same as long-run marginal cost), and the resultant profit margin;

3. The size of industry output relative to the largest attainable consistent with the equality of price and long-run marginal cost;

4. The size of sales promotion costs relative to the costs of production;

5. The character of product, or products including design, level of quality, and variety; and

6. The rate of progressiveness of the industry, both products and technologies of production relative to rate which are attainable and also economic in view of the costs of progress.

The above dimensions of marketing performance such as technological progressiveness efficiency of resource use and product improvement and maximum market services at the least possible cost must fit with goals of the agricultural

marketing system in developing countries. Due attention should be given to the interrelatedness between the categories of structure, conduct, and performance in studying agricultural marketing efficiency.

2.7. Market Integration

Market integration is considered an important determinant of food flow, availability, accessibility and price stability. As Nyange (1999), puts it, the extent to which markets make food available and accessible, and keep price stable, depends on the degree of market integration across a region. Goletti and Christina (2000), define integrated markets as markets in which price of comparable goods do not move independently. According to the Law of One Price(LOP), if two markets are integrated, change in price in one market due to excess demand or supply shocks will have an equal impact in the related market price. If this equilibrium condition holds, the two spatially separated markets are said to be integrated. In other words, the Law of One Price prevails between the two markets (Zanias, 1999; Sexton et al., 1991) or the two markets are spatially price efficient (Tomek and Robinson, 1998). Otherwise, markets may have some constraints on efficient arbitrage such as barriers to entry and information asymmetry (Barrett, 2001; Mohr *et al*., 2008) or imperfection competition in one or more markets (Faminow and Benson, 1990). Hence, the study of spatial market relationships provides the extent to which markets are related and efficient in pricing.

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

Among the key factors, weak infrastructure and large market margins that arise due to high transfer costs have been asserted as the main factors that partly insulate domestic market integration. Especially in developing countries, poor infrastructure, transport

and communication services gives rise to large marketing margins due to high costs of delivering locally produced commodities to the reference market for consumption .High transfer cost and marketing margins hinder the transmission of price signals, as they may prohibit (Sexton et al., 1991;Bernstein and Amin, 1995). As a result, change in reference market price is not fully transmitted to local prices, resulting in economics agents adjusting partially to shift in supply and demand.

2.8. Market Supply

Agricultural products differ from manufactured goods in terms of supply and demand. Agricultural products supply is different because of the very seasonal biological nature while their demand is comparatively constant throughout the year. In economic theory, it is stated that human being is always under course of action of choice from a number of options. The basis for the decisions could be issues ranging from household characteristic to the exogenous unmanageable factors. A case in point here is market supply where researchers put each owns point of determining variables.

The analysis can identify factors that determine market supply. A clear understanding of the determinants helps to know where to focus to enhance production and marketed surplus. The study of market supply helps fill the gap for success of commercialization. There are different factors that can affect market supply.

2.9. Methodological Framework

2.9.1. Measures of market concentration ratio

Competition plays a key role in harnessing the rivalry and the profit seeking of the market place in order that it may serve the public interest (Khols and Uhl, 1985). Determining the presence or absence of the requirements of the model of perfect competition can be used indirectly to assess the economic efficiency of markets. Many studies concerned with the efficiency of agricultural markets begin in this form of analysis. Following, three methods of measures of market concentration are discussed.

Market concentration ratio

Considerable attention has been focused on market concentration as a measure of competition in marketing. Concentration refers to the proportion of industry sales made by its largest firms. In general, the more concentrated the industry sales, the more likelihood that the market will be imperfectly competitive (Khols and Uhl, 1985).Concentration ratio is one of the commonly used measures of market power, which in other words, refers to the number and relative size of distribution of buyers or sellers in a market.

Khols and Uhl (1985) suggest that as a rule of thumb, a four enterprise concentration ratio of 50 percent or more is indicative of a strong oligopolistic industry; of 33-50 per cent ratio denotes a weak oligopoly, and less than that an un concentrated industry.

Despite wide application of concentration ratio as a measure of the ratio of market concentration, there are limitations against the index. Scarborough and Kydd (1992) suggest that calculating and using concentration ratios as a measure of market structure is subject to empirical, theoretical and inferential problems.

Hirschman Herindal Index (HHI)

The other method of measure of market power commonly used is Hirschman Herfindahl. The index takes into account all points on the concentration curve. It also considers the number and size distribution of all firms. In addition, squaring the individual market share gives some more weight of the larger firms, which is an advantage over concentration ratio.

A very small index indicates the presence of many firms of comparable size, whilst one of 1 or near 1, suggests that the number of firms is small and/or that they have unequal shares in the market (Scarborough and Kydd, 1992).

Gini- coefficient

Gini-coefficient is a very convenient shorthand summary measure of concentration. It

is done based on Lorenz curve and is obtained, by calculating the ratio of the area between the diagonal and the Lorenz curve divided by the total area of the half square in which the curve lies. It is this ratio that is known as the Gini-concentration ratio or more simply as the Gin- coefficient, named after the Italian statistician who first formulated it in 1912 (Todaro, 1998).

Gini-coefficients are aggregate inequality measures and can vary anywhere from zero (perfect equality) to one (perfect inequality). However, although Gini-coefficients provide useful information based on Lorenz curve shapes, a problem arises when Lorenz curves cross. It is problematic whether we can in this special case claim that a higher coefficient means a more unequal distribution, so more careful analysis is required (Todaro, 1998).

The other problem associated with Gini-coefficients is that it favors equality of market shares without regard to the number of equalized firms.

Several mathematical models that have been employed to analyze the structure of different markets are discussed, among the different analytical techniques because of its simplicity for calculation Concentration Ratio(C) was used in this study.

Marketing margins

Marketing margin refers to the difference between the retail price paid by the consumer and the price received by the producer. This amount can be interpreted as the cost of providing a mix of marketing services. In a perfectly competitive market, the margin should, on average and in the long run, be equal to the cost of marketing including costs of capital with a competitive return to labor, management, and risk. Marketing margins can be defined alternatively as the price of a collection of marketing services which is the outcome of the demand for and the supply of such services. The price of such services is determined by particular primary and derived demand computing the total gross marketing margin (TGM) is always related to the final price or the price paid by the end consumer and is expressed as a percentage.

The implication that a higher marketing margin diminishes the producer's share and

vice versa. It also provides an indication of welfare distribution among production and marketing agents.

2.9.2. Measures of market participation

Heckman two-stage models, Double-hurdle model, and Tobit model have been used to examine crop market participation (Komarek, 2010). Tobit model is a statistical model proposed by James Tobin (1958) to describe the relationship between non-negative dependent variable and independent variable. Hobbs (1997) and Holloway et al. (2004) used Tobit model to model farmers" market participation behavior. The Tobit (Tobin, 1958) modeling approach presumes that the participation and sales volume decisions are made simultaneously and hence factors that affect the participation decision and the sales volume decision are the same. Hence, this model is prone with the limitation that it assumes that the same set of parameter and variables determine both the probability of market participation and the level of transaction. Tobit model also assumes that zero values traded are because of rational choice, although it may be a prohibitive entry barrier that is limiting market entry (Komarek, 2010).Tobit model is "limited"in the sense that we observe it only if it is above or below some cut off level hence it underestimates the intercept and overestimate the slope. Tobit seems also to conceal some information on that, it tends to combine both the direct and partial effects of the explanatory variables on the dependent variables (Makhura, 2001).This study will not adopt this model because recent empirical studies have shown the inadequacy of the Tobit model in cross sectional, stressing the relevance of alternative approaches. A two-step model relaxes the Tobit model assumption by allowing different mechanisms to determine the discrete probability of participation and level of participation. These models allow for separation between the initial decision to participate and the extent of participation. These studies have used either the sample selection model of Heckman (1979) or the two hurdle models (Omiti, et al.,2009). A most commonly used two-tier model is the double-hurdle of Craig (1971). In this model, an input market decision is a two-step decision process. This is based on the assumption that household makes two separate decisions; one involves the decision to participate in the market or not and secondly the extent of participation. The model estimation involves a Probit regression to

identify factors affecting the decision to participate in marketing using all sample populations in the first stage, and a truncated regression model on the participating households to analyze the extent of participation, in the second stage.

According to Burke (2009), the double hurdle model is useful because it allows a subset of the data to pile-up at some value without causing a bias in estimating the determinants of the continuous dependent variable in the second stage; hence you can obtain all the data in the remaining sample for the participants. Thus, in double models, there are no restrictions regarding the elements of explanatory variable in each decision stage. This model is not appropriate in this study because of sample selection problems, and more precisely in the case of incidental truncation, some part of the dependent variable is not observed because of the outcome of another variable. Heckman two-stage model was developed by Heckman (1979) and has been used extensively to correct for biases arising from sample selection. The Heckman procedure provides consistent and asymptotically efficient estimates for all the parameters (Heckman, 1979; Maddala, 1983; Amemiya, 1985). This model assumes that the missing value of dependent variable implies that the dependent variable is unobserved (not selected). Heckman's model first uses a Probit regression with all variable data to estimate the probability of market participation. Then the inverse Mills ratio, computed from the Probit regression, is used with other explanatory variables to help explain variances to the continuous, non-zero dependent. To cater for the problem of selectivity bias and to relax the assumptions in the Tobit model, the study will therefore utilize a Heckman two-step procedure.

Numerous studies employed different models in order to identify the factors that determine market supply (Behrman, 1996; Bardhan, 1970; Strauss, 1984; Geoz, 1992, Vella, 1998; Minot, 1999; Sigelman, 1999; Matshe 2004). Most of these scholars used tobit and hechman's sample selction model. However, the tobit model assume that both the decision to participate and the amount of product marketed given participation are determined by the same variables, and that a variable that increases the probability of participation also increases the amount of product marketed. This problem can be overcome using the Heckman's sample selection model where a Probit model for the participation or 'selection' equation is estimated and OLS, which is corrected for selectivity bias, is specified to account for the level of the amount

marketed.

Therefore, this study employed heckman's sample selection model to probe the determinants of market performance of vegetables in the study area.

2.9.3. Measures of market integration

Several methodologies have been proposed to examine spatial price relationships. However, some of the early approaches have been unreliable or inadequate to measure spatial price relationship correctly. Advances in time series econometrics over the last three decades have led to the development of models that address some of the perceived weaknesses. In what follows, review three different methods: Simple Bivariate Correlation Coefficients, Ravallion method, Co-integration and Error Correction model, each of which has been applied to test for market integration across various goods and industries.

Bivariate correlation coefficients

Early research on market integration focused on measuring the co movement of two price series in distinct markets. The correlation coefficient is a relative measure of the linear association between two series. Though there are some limitations in using correlation coefficient to express the relationship between time series variables, it is still one of the most popular, frequently used and easy to calculate tools (Dahlgram and Blank, 1992; Tschirley, 1991).

The correlation coefficient is commonly used owing to its simplicity. Useful information about market integration can be obtained from the coefficient if carefully carried out and interpreted with a good knowledge of the workings of the market (Alexander and Wyeth, 1994).

Despite wide application of the bivariate correlation as an index of market integration, the approach has important weaknesses, as a tool for market integration testing. The most frequently referred drawback is the existence of common trends within price series over time. The approach produces high correlation results for markets with even no physical contact, road, or any other means of transport connection. The high

correlation could be the result of the common price trends such as inflation, common seasonal variation due to similar climatic conditions, legal factors simultaneously affecting prices, or other shocks among the markets (Heytens, 1986).

Ravallion method

In order to avoid the inferential dangers of received models using static price correlations, Ravallion (1986) developed a new approach to market integration testing. Ravallion's model enables an investigator to distinguish between short-run (instantaneous) market integration and the long run (i.e. equilibrium) integration, i.e., the end of short-run, disequilibrium dynamic adjustment processes.

The model assumes that there are local markets from which price shocks originate and local markets linked to the central one by traders. The idea behind Ravallion model is to regress the current local market price on its own lagged prices and present and past prices from the central market as well as on common trend variables like inflation and seasonality. The central market price is taken as an exogenous variable in predicting the local markets' prices.

Co-integration and Error-correction model

Due to non-stationary nature of many economic time series, the concept of co-integration has become widely used in econometric analysis. The concept of co-integration is related to the definition of a long-run equilibrium. The fact that two series are co-integrated implies that the integrated series move together in the long run (Golleti and Tsigas, 1991).

Testing co-integration of two price series is sometimes believed to be equivalent to detecting long-run market integration. The co-integration-testing framework has been well developed by Engle and Granger; Engle and Johansen.

Co-integration testing has some alternative features that don't exist in the other market integration testing. First of all, a co-integration test doesn't require the tested series to be stationary thus, the controversy surrounding pre-filtering and stationary transformations can be avoided. A co-integration test can be applied to any pair of

series provided they are integrated of the same order. Co-integration testing can also provide a method of testing whether one series is exogenous or not and the direction of causality between markets, which is a problem in Ravallion's model.

Co-integration testing, it is still a popular methodology for testing market integration in the recent literature. Co-integration tests have been applied to examine the market for food by Baulch (1997). Goodwin and Schroeder (1991) used co-integration with rational expectations to test regional U.S. cattle markets. Another study by Sinahory and Nair (1994), on pepper price variation in the international trade, found that international prices of pepper have significant influence on co- integration relations between Indian and Indonesian markets. Furthermore, co-integration tests have been used to test for market integration in some developing countries. For instance, Dercon (2004) applied co-integration testing to evaluate the effects of liberalization and war on food markets in Ethiopia. Alexander and Wyeth (1994) offer reduced form of an error correction mechanism to examine the Indonesian rice market.

Several mathematical models that have been employed to analyze the market integration are discussed. Co-integration and Error-correction model will be used in this study.

2.10. Empirical Literature Review

Many scholars such as, Rehima, Gizachew, Solomon, Yacob etc. has studied marketing in Ethiopia. However, majority of these studies focused on live animal and grain marketing. The only few to mention are Jema Haji (2008) and Bezabih and Hadera (2007) as far as vegetable marketing are concerned. This shows that vegetable marketing study is at infant level. To bridge the gap aforementioned this study was inclined to investigate the challenges of and performance of vegetable marketing in Kombolcha District of Eastern Ethiopia.

2.10.1. Empirical literature on S-C-P

Rehima (2006) conducted study on pepper marketing chains analysis in Alaba and Siltie ones in southern Ethiopia using marketing margin analysis and had found that the gross marketing margin obtained by pepper retailers was 43.08% of the consumer's price. The same study reported that producer's share and net marketing margins obtained by retailers were 50.7% and 29.47% of the consumer's price respectively.

Gizachew (2005) also conducted a research inAda'liben district of Oromiya. He applied a concentration ratio methods and identified that milk market to be weakly oligopolistic of 41.2%, where the four firms dominated milk market. The dairy cooperative got 28.3% of market share and the three processing industries combined have a market share of 12.9%. Intimate traders got net marketing margin of 7.6% for butter and the dairy processing enterprises got the highest net marketing margin (19.9% of retail price) while the least marketing margin (1.05% of the retail price) was obtained by the dairy cooperative

Solomon (2004) conducted a study using marketing cost and margin analysis on performance of cattle marketing system in southern Ethiopia with special emphasis on Borena found that butchers at Addis Ababa (Kera) market received relatively a larger share from total gross marketing margin amounting to 69.5%, 63.4% and 61.6% for cattle supplied from Yabelo, Negelle and Dubluk markets, respectively. Regarding producers' portion, which is the portion of the price paid by the end consumer that goes to the producers, he found that the highest percentage was found for cattle supplied from Dubluk market (21.9%), and followed by Negelle and Yabelo characterized with gross margins of 20.6% and 18.6%, respectively.

Yocab (2002) found that butcheries operating in Addis Ababa got total gross margins of 31.7% from average purchase price; more over the study identified that the increase in the profit margin was not transferred to the producer. He further noted that the producer's share of the retail price was decreased from 76% in 1983/84 to 55% in 1995.

Study conducted by Scott (1995) on potato marketing using marketing margin

analysis in Bangladesh indicated that producer's price and margin were 1.27 and 67 %, respectively. Similarly, study conducted by Pomerory (1989) on four fish markets using concentration ratio (market share ratio) in Philippines found that 50% of the industry made 80% of the fish purchases. In the Gulf of Nicoya study, Scheid and Sutinen (1981) reported that the fisher's share of retail prices was 41%, whereas the wholesale and retail sector received 22% and 37%, respectively.

2.10.2. Empirical review on factors affecting marketed surplus

Mamo and Degnet (2012) identified that gender and educational status of the household head together with household access to free aid, agricultural extension services, market information, non-farm income, adoption of modern livestock inputs, volume of sales, and time spent to reach the market have statistically significant effect on whether or not a farmer participates in the livestock market. The study uses binary logit to explore the determinants of smallholder livestock farmer's market participation using a micro-level survey data from Ethiopia.

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

Adugna (2009) identified major factors that affect marketed supply of papaya in Alamata District. Adugna's study revealed that papaya quantity produced influenced marketable supply positively. Similarly, Gizachew (2005) analyzed factors affecting dairy household milk market entry decision using Logit model and marketed milk surplus using Tobit model in Ada'haLibendistrict in Oromiya region by using data from 61 sampled dairy households. His study revealed that education level of the dairy household head, extension visits and income from non-dairy sources had positive relationship with household milk market entry decision. Gizachew (2005) also found that dairy cow breed, loan, income and extension visit, education level of spouse and distance from milk market were related to marketed surplus positively; however, distance from district and education level of the household head were related

negatively with marketed milk supply.

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

A Similar study on cotton at Metama by Bosena (2008) also indicates that four variables affecting cotton market supply. Owen oxen number, access to credit, land allocated to cotton, productivity of cotton in 2005/06 were the variables affecting positively cotton supply. Similar study on sesame at Metema by Kinde (2007) also pointed out six variables that affect sesame marketable supply. Yield, oxen number, foreign language spoken, modern input use, area, time of selling were the variables affecting positively sesame supply and unit cost of production was found to negatively influence the supply.

Wolday (1994) used about four variables to determine grain market surplus at his study in AlabaSiraro. The variables included were size of output, access to market center, household size, and cash income from other crops. In his analysis, factors that were affecting market supply of food grains (teff, maize and wheat) for that specific location include volume produced, accessibility (with negative and positive coefficients), were found significant for the three crops while household size in the case of teff and maize still with negative and positive coefficients. Cash income from other crops was insignificant.

2.10.3. Empirical review on market integration

Solomon (2004) conducted a study on integration of cattle marketing in southern Ethiopia using monthly average price data of cattle from October 1996 to September 2002 of primary markets(Yabelo and Dubluk), secondary market (Negelle) and border terminal market (Moyale) by using co- integration and error correction model. He found that there was a spatial linkage between cattle market in Borena rangeland. Moreover, he also identifies that there was no short run integration but long run

integration in these sample market.

Palaskas and Harris (1993), Bahrumshah and Habibulla (1994), Alexander and Wyeth (1994) and Dercon (1995), have all applied co-integration and error correction models to test level of market integration. The price changes in one market may be fully transmitted to other markets.

Markets that are not integrated may convey inaccurate price information that might distort marketing decisions and contribute to inefficient product movement (Bahrumshah and Habibulla, 1994).

Wolday (1994), Mulat and Bekele (1995) and Asfaw and Jayne (1997) had undertaken market integration studies on grain price by applied a co-integration and error correction approach found that grain prices were strongly integrated in the long-run and markets were fully integrated in the short-run.

Admasu (1998) and Solomon (1996) conducted a study on performance of coffee marketing in
Sidama,Illubabor and Jimma zones, respectively. Both of the study had used a co-integration and error correction approach analysis and found that that local and central coffee markets were integrated in the long run but there was no short run and full market integration between local and central markets.

3. RESEARCH METHODOLOGY

This chapter presents description of the study areas, source and data requirement, sample size and sampling procedure and methods of data collection

3.1. Description of the Study Area

This study was undertaken in Kombolcha district of Oromia Regional State in eastern Ethiopia. This district was purposively selected because of its potential for vegetable production.

Kombolcha District is one of the nineteen districts found in east Hareghe Zone of Oromia Regional State, Ethiopia. The district is composed of 19 rural kebeles and 1 urban kebele. Komblocha district is located at about 542 kms south-east of Addis Ababa and 16 kms northwest of Harar town, the capital of East Hararge Zone of Oromia Region. The district strategically located between the two main cities of Harar and Dire Dewa. In addition, due to its proximity to Djibouti and Somalia, the district has access to potential markets in the area.

The district had total population of about 157,444, of which 77,659 were females in 2011 (CSA, 2012). About 45.1%, 53.0% and 1.9% of the total population were young, economically active and old age, respectively. Average family sizes for the district were 4.9 persons per household. The crude population density of the estimated was as 517 persons per km (ital).

Lowland and midland agro-ecological zones characterize the climate of the district. The district receives mean annual rainfall of 600-900 mm, which is bimodal and erratic in distribution. The main rainy season in the district is from February to mid-May and from July to end of August. The economy is dominated by traditional cash

crop farming mixed with livestock husbandry. The major crops produced include sorghum, maize, vegetables (potato, cabbage, beetroot, and carrot), chat, groundnut, coffee and sweet potato (KWOoARD, 2012).
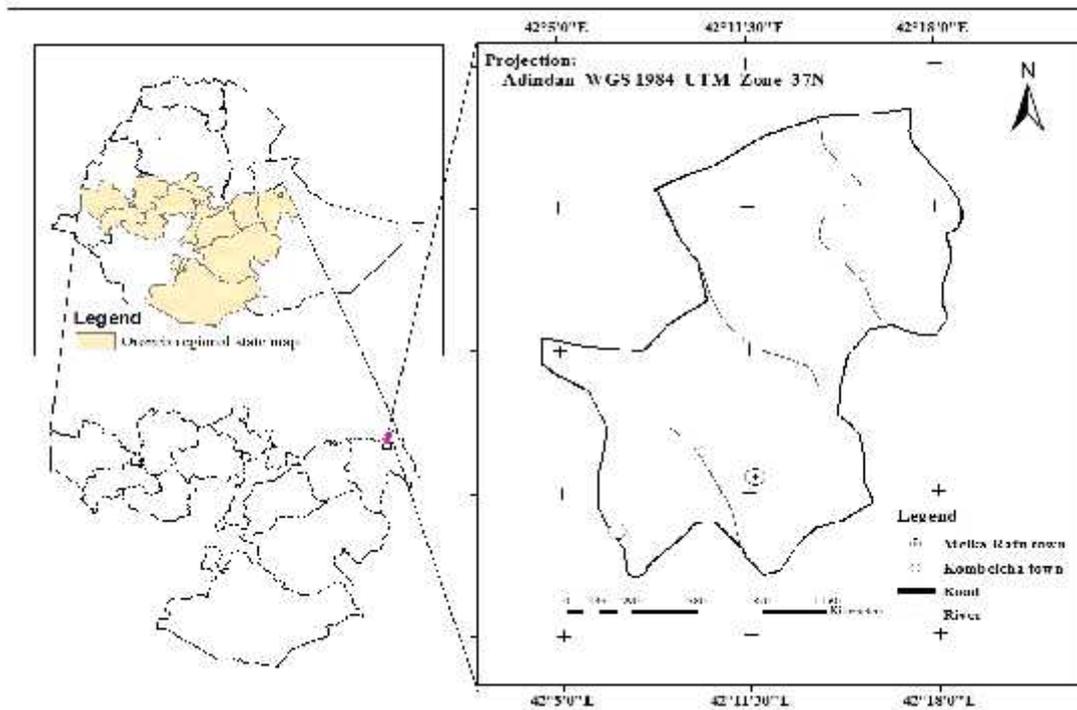

Figure 1: location of the study area

Source: Ethio GIS

3.2. Types, Sources and Methods of Data Collection

To achieve the stated objectives, both primary and secondary data were employed. Primary data on different variables like vegetable production, vegetable market, vegetable price and others included in the study were collected using semi-structured

questionnaire through formal and focus group discussion. The formal survey was undertaken through face-to-face interviews with randomly selected households and traders using a pre-tested semi-structured questionnaire for each group. Additionally, secondary data were collected from Central Statistical Authority (CSA), and Bureau of Agriculture and Rural Development (BoARD).

3.3. Methods of Sampling and Sample Size

For this study, in order to select a representative sample a two-stage sampling technique were implemented to select vegetables producer households. In the first stage, with the consultation of district agricultural experts and development agents, out of 19 kebeles of Kombolcha district four vegetables producer kebeles were purposively selected based on their vegetable production potential. In the second stage, from the identified or selected rural kebeles using the fresh farm households list 123 sample households were selected randomly based on probability proportional to the population size of the selected kebeles The sample size was determined by using a formula developed by Yamane (1967). (Table 1)

Table 1: Sample size distribution in the sample kebeles

Name of selected kebeles	Total number of vegetables producers	Sample households
Bilusuma	214	43
Kakali	150	30
Waltalami	139	28
Kerensa	113	22
Total	**616**	**123**

Source: Own computation based on OoARD and administration data

For this study, data from traders were also collected. The sites for the trader surveys were markets in which good sample of vegetable traders exist. The lists of wholesalers were obtained from the respective Office of Trade and Industry (OoTI) and for other traders there is no recorded list. From 55 wholesalers, 12 wholesalers were selected randomly. In addition, 8 retailers and 5 collectors were randomly selected constituting

a total of 25 traders from Melkarafu and Kombolcha markets.

3.4. Methods of Data Analysis

Two types of data analyses, namely; descriptive and econometric analyses were used for analyzing the primary data collected from the sample farmers and traders. Descriptive statistics like percentages, figures, means, standard deviations, t-test, and 2-test were used to describe the surveyed sample household characteristics, market functions, facilities, services, market intermediaries and markets.

3.4.1. Descriptive methods of analysis

i. Analysis of market structure

Concentration ratio (CR) was used to analyze the structure of vegetable market as characteristics of the organization of the market that seem to exercise strategic influence on the nature of the competition and pricing within the market. These are designed by formula:

$$C = \sum_{i=1}^{n} S_i$$

(1)

C = concentration ratio,

S_i = the percentage market share of ith firm, and

r = the number of largest firms for which the ratio is going to be calculated.

ii. Analysis of market conduct

There are no agreed up on procedures for analyzing the elements of market conduct. Rather, few points are considered to systematically detect indications of unfair price setting practices and conditions under which such practices are likely to prevail. The points include checking the existence of formal and informal producing and marketing groups; the availability of price information and its impact on prevailing prices; and the feasibility of utilizing alternative market outlets (Scarborough and Kydd, 1992).

Accordingly, discussions and observations have been employed to investigate the market conduct prevailing in the marketing system.

iii. Analysis of market performance

Marketing Margin- In a commodity subsystem approach, the institutional analysis is based on the identification of the marketing channels. This approach includes the analysis of marketing costs and margins (Mendoza, 1995). A marketing margin can be defined as a difference between the price paid by consumers and that obtained by producers; or as the price of a collection of marketing services that is the outcome of the demand for and supply of such services (Tomek and Robinson, 1990). It measures the share of the final selling price that is captured by a particular agent in the marketing chain (Mendoza, 1995).

When there are several participants in the marketing chain, the margin is calculated by finding the price variations at different segments and then comparing them with the final price to the consumer. Consumer price is the base or common denominator for all marketing margins (Mendoza, 1995). The relative size of various market participants' gross margins can indicate where in the marketing chain value is added and/or profits are made.

The total marketing margin is given by the following formula

Where, TGMM = Total gross marketing margin

Producers' gross marketing margin is the proportion of the price paid by the end user or end buyer that goes to the producer.

Where, GMM_p = the producers share in consumer price

3.4.2. Econometric models

i. Factors influencing participation and extent of participation in potato and cabbage market

To determine the factors influencing participation and extent of participation in vegetables marketing, the Heckman two-stage selection model was used. The decision to either participate in the market or not and level of participation were dependent variables and they were estimated independently. Heckman two-step procedure was identified as an appropriate model for such independent estimation. Heckman two-step model involved estimation of two equations: First, whether a household participated in the vegetables market or not, and the second is the extent of market participation. The proportion of vegetables sales were conditional on the decision to participate in the market (Hoffman and Kassouf, 2005).

The model consists of two steps; firstly, participation equation was estimated using a probit model and secondly, an extent of participation equation was estimated using OLS regression. A probit model predicts the probability of individual households' participation in the vegetables market.

The participation equation/the binary probit is specified as:

$$Y_{1i}^* = \quad (4)$$

$$Y_{1i} = 1, \text{ if}$$

$$Y_{1i} = 0, \text{ if}$$

Where: Y_{1i}^* = the latent dependent variable, which is not observed,

X_{1i} = explanatory variables that are assumed to affect the probability of participation decision in vegetables market by the sample vegetable producing households,

$_{1i}$ = vector of unknown parameter in participation equation,

U_{1i} = residuals that are independently and normally distributed with zero mean and constant variance, and

Y_{1i} = participation in vegetables market

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

Y_{2i} is observed if and only if $Y_{1i}^* = 1$. The variance of u_{1i} is normalized to one because only Y_{1i}^*, not Y_{1i} is observed. The error terms, u_{1i} and u_{2i}, are assumed to be bivariate, normally distributed with correlation coefficient, . $_{1i}$ and $_{2i}$ are the parameter vectors.

Y_{2i} is regressed on the explanatory variables X_{2i} and the vector of inverse Mill's ratio ($_i$) from the selection equation by ordinary least squares.

Where:

Y_{2i} = Amount of marketed surplus,

X_{2i} = factors assumed to affect the volume of vegetables supplied to the market,

= vector of unknown parameters to the market, and

U_{2i} = residuals in the observation equation that are independently and normally distributed with zero mean and variance ^{2}.

ii. Analysis of integration

This study has also tried to analyze market integration between secondary (Jigjiga) and the reference market (Kombolcha). To measure vegetable market integration between Kombolcha and Jigjiga markets this study followed the most widely used test called Engle Granger co-integration test and ECM.

Testing co-integration of two price series is sometimes believed to be equivalent to detecting long-run market integration. The co-integration-testing framework has been well developed by Engle and Granger; Engle and Johansen. To use the co-integration procedure, several steps needed to be carried out on the price series under examination. Before proceeding to the different steps, consider the following basic relationship between two markets.

$$P_{it} = a - b_{it} p_{jt} - e_t$$

(8)

Where:

P_{it} and P_{jt}, are price series in two markets i and j at time't'

a= represents domestic transportation, processing, storage costs, etc.

b= the coefficient,

a and b are parameters to be estimated, and

e_t= residual term assumed to be distributed identically and independently at time t.

The first step is to pre-test the integrating orders of the series, i.e., each price series is tested for the order of econometric integration, that is, for the number of times the series need to be differenced before transforming it into a stationary series. A series is said to be integrated of order 'd', I (d), if it has to be differenced 'd' times to produce stationary series.

The most commonly employed test for stationary and order of integration is the Augmented Dickey Fuller (ADF) test specified as:

$$\Delta p_{it} = a \quad b_{it} p_{it-1} \quad \sum_{i-1}^{n} b_k \Delta p_{it-i} + e_t$$

(9)

The test t-statistics on the estimated coefficient of P_{it-1} is used to test the null and alternative hypotheses. The null hypothesis is that the series P_{it} is integrated of order 1 and the alternative hypothesis is that the series is of order 0. In short, H_0: P_{it} is I (1) Versus H_1: P_{it} is I (0). If the t-statistics for the coefficient b_0 is greater in absolute value than a critical value given by the ADF critical value, then the null hypothesis is rejected, and the alternative hypothesis of stationary is accepted. If the null hypothesis is not rejected, then one must test whether the series is of order of integration higher than just 1, possibly of order 2. In this case, the same regression equation is applied to the second difference, i.e. the test will be repeated by using (P_{it} in place of P_{it}) i.e. by applying the regression:

$$\Delta^2 P_{it} = a + b_1 \Delta P_{it-} + \sum_{i=1}^{n} b_k \Delta^2 P_{it} \quad k + \gamma$$

(10)

Where:

$^2 P_{it}$ = denotes second deference.

The ADF statistic therefore, tests the following hypotheses. H_0:　ΔP_{it} is I (1) versus H_1: P_{it} is I (0) i.e. H_0: P_{it} is I (2) versus H_1: P_{it} is I (1), respectively. If the ADF statistic is not large and negative, H_0 is not rejected.

The second step is to estimate the long-run equilibrium relationship of the two time series, which are of the some order of integration (co-integrating regression).i.e.

$$P_{it} = a + b_o P_{it} + e_t$$

(11)

Where, e_t is the deviation from equilibrium and this equilibrium error in the long-run tends to zero. This equilibrium error of the co-integration equation has to be stationary for co-integration between two integrated variables to hold good.

Hence, the third step is to recover the residual from the co-integration regression and to test their stationary. The most commonly employed test for stationary is the Augmented Dickey Fuller (ADF) unit root test. To perform the ADF test, the auto regression equation must be estimated.

$$\Delta \hat{e}_t = a\, e_{t-1} - \sum_{i=-}^{n} a_{k-1} \Delta e_{t-k} - \hat{e}_t$$

(12)

Where, $\hat{e}_t$　is the first stage estimate of the residual for the co-integrating regression and e_t is the error term of equation.

The null hypothesis of the ADF test is $a_1=0$. Rejection of the null hypothesis is that the series is non-stationary in favor of the negative one sided alternative hypothesis means the two series are co- integrated of order (1, 1) provided both series are I (1), i.e., the ADF test statistic is the t-ratio of the coefficient of $\hat{e}_{t-1}$.

The other alternative test for stationary (Co-integration) is the standard Durbin Watson test statistic from the first stage ordinary least squares (OLS) estimate of the co-integrating regression.

It is designated as:

$$CRDW = \frac{\sum_{t=2}^{t}(\hat{e}_t - \hat{e}_{t-1})^2}{\sum_{t=1}^{t}\hat{e}_t^2}$$

(13)

The null hypothesis of no co-integration is rejected for values of CRDW, which are significantly different from zero.

The fourth step involves the dynamic error correction representation of the co-integrated variables. If two variables are integrated of the same order and thus can be co-integrated, then there exists an error correction representation of the variables where the error corrects the long-run equilibrium. This is also known as Granger Representation Theorem (Sinahory and Nair, 1994). The dynamic model is obtained by introducing the residuals in to the system of variables in levels. Therefore, the Error Correction Model (ECM) is represented by the formula:

$$\Delta P_{it} = a_0 + a_2(P_{it-1} - b_0 P_{jt-1}) + a_1 \Delta Pjt + \sum_{k=1}^{n}(\delta_{1k}\Delta P_{it-k} + \delta_{2k}\Delta P_{jt-k}) + e_t$$

(14)

It is evident from the above equation that the disequilibria in the previous period (t-1)

are an explanatory variable. Here it can be said that if in period (t-1) P_j exceeds the equilibrium price, the changes in p_i will lead the variable to approach the equilibrium value. The speed at which the price approaches equilibrium depends on the magnitude of a_2. Hence the expected sign of a_2 is negative. This test confirms that the errors correct to the equilibrium in the long run. Therefore, the final test of market integration can be performed by testing the restriction $a_1 = 1$, $a_2 = -1$, and the coefficients of any lagged terms be zero using F-statistic.

3.5. Definition of Variables and Hypothesis

3.5.1. Dependent variables

Decision to participate in vegetable market (MRK_PART): It is a dichotomous dependent variable that represents the probability of market participation of the household in the vegetable market that is regressed in the first stage of two stages estimation procedure. For the household who participate in vegetable market the variable takes the value of 1, whereas it takes the value of 0 for the household who does not participate in the market.

Volume of vegetable sales (VEG_SALE): It is a continuous dependent variable used in the second step of the Heckman selection equation which is measured in quintal (100kg) and represents the actual supply of vegetable to the market by the household during the survey year.

Potato and cabbage market price at Kombolcha (PC_PRI): The parallel movement in prices between markets, which usually involves pair wise comparisons between price series, was estimated by analyzing the integration of the secondary markets and terminal market prices using a time-series data.

3.5.2. Independent variables

The independent variables hypothesized to affect participation in and volumes of sales of vegetables are the following:

Age of the household head (HH_AGE): It is a continuous variable measured in years. Aged household heads are believed to be wise in resource use. Moreover, as an individual stays long, he/she will have better knowledge and will decide to participate. On the other hand, young household heads have long investment horizon and are more likely to participate in the market compared to older farmers. Adugna (2009) found

that age of the household head have negative effect on the elasticity of onion supply to the market. Hence, age may have either positive or negative effect on market participation status and marketed surplus.

Education of the household head (HH_EDU): It is a continuous variable measured in terms of years of schooling. Education broadens farmers' intelligence and enables them to perform the farming activities intelligently, accurately and efficiently. Moreover, better educated farmers tend to be more innovative and are therefore more likely to adopt the marketing systems. Formal education enhances the information acquisition and adjustment abilities of the farmer, thereby improving the quality of decision making (Fakoya et al., 2007). Astewel (2010) found that if paddy producer gets educated, the amount of paddy supplied to the market increases, which suggests that education improves level of sales. Therefore, this variable is hypothesized to influence market participation status and marketed surplus positively.

Household size (HH_SIZE): Household size is a continuous variable measured in terms of number of   members in a household. As vegetable production is labour intensive activity, vegetable production in general and market supply of vegetable products in particular is a function of labour. Accordingly, households with more family members tend to have more labor which in turn increases vegetable production and hence vegetable market supply. On the other hand, household size might also decrease market supply because high proportion of the product would be used for consumption. Hence, for this study the effect of household size on market participation status and marketed surplus was not determined a priori.

Farm size (FAR_SIZE): This is a continuous variable and it refers to the total area of farmland that a farmer owns in hectare. In agriculture, land is one of the major factors of production. It is assumed that the larger the total area of the farmland the farmer owns, the higher he would allocate for vegetables and obtain higher output. The availability of land enables the owner to earn more agricultural output which in turn increases the marketable supply (Desta, 2004). Therefore, farm size is expected to have direct relationship with both market participation status and marketed surplus.

Access to market information (MRK_ INFO): It is a dummy variable with a value

of one if a household head has access to market information and zero otherwise. Access to market information is assumed to have positive impact on both market participation status and marketed surplus. The general idea is that maintaining a competitive advantage requires a sound business plan. Again, business decisions are based on dynamic information such as consumer needs and market trends. This requires that an enterprise is managed with due attention to new market opportunities, changing needs of the consumer and how market trends influence buying (CIAT, 2004). Therefore, those who have access to market information will produce more vegetables for market. Muhammed (2011) found that if wheat producer gets market information, the amount of wheat supplied to the market increases.

Access to credit (ACC_CRD): This is a dummy variable with a value of one for a household who have access to credit, and zero otherwise. Access to credit would enhance the financial capacity of the farmer to purchase the necessary inputs. Therefore, it is hypothesized that access to credit would have positive influence on market participation and volume of sale. Alemnewu (2010) and Muhammed (2011) who found that if pepper and teff producer gets credit, the amount of pepper and teff supplied to the market increased. Therefore, it is hypothesized that credit access would have positive influence both on market participation status and marketed surplus.

Income from off/non-farm activities (OFF_INCOME): It is continuous variable measured in terms of amount of income obtained from off and non-farming activities. This income may strengthen farming activity on one side and may weaken it on the other side. Rehima (2007) found that if pepper producer have non-farm income, the amount of pepper supplied to the market decreases. Similarly, for this study it is assumed to have inverse relation with market participation status and marketed surplus.

Frequency of extension contact (FRQ_CONT): It is a continuous variable measured by number of extension contact and representing extension services as a source of information on technology. It is expected that extension service widens the household's knowledge with regards to the use of improved technologies and has

positive impact both on market participation status and marketed surplus. Ayelech (2011) found that if access to extension increase, the amount of fruits supplied to the market increases.

Distance to the nearest market (MRK_DIST): It is the distance of the vegetables producer households from the nearest market and it is measured in hours of walking time. The closer the market, the lesser would be the transportation charges, reduced walking time, and reduced transaction costs, better access to market information and facilities. In this study, distance to the nearest market is hypothesized to affect both market participation status and marketed surplus negatively. Similar result was obtained by Ayelech (2011) on fruit markets in Goma woreda and identified that poor market access has significant and negative effect on quantity of avocado and mango supplied.

Vegetable farming experience (FAR_EXP): It is the total number of years a farmer stays in production of vegetables. A household with better experience in vegetable farming is expected to produce more amounts of vegetables and, as a result, he is expected to supply more vegetables to the market. Farmers with longer farming experience are expected to be more knowledgeable and skillful (Ayelech, 2011). Therefore, this variable is hypothesized to positively influence both market participation status and marketed surplus.

Livestock holding (LIV_HOLD): This is a continuous variable measured in tropical livestock unit (TLU). Farmers who have large number of livestock are anticipated to specialize in livestock production so that they allocate large share of their land for pasture. Study by Rehima (2006) on pepper marketing showed that TLU showed a negative sign on quantity of pepper sales. On the other hand, it is assumed that household with larger TLU have better economic strength and financial position to purchase sufficient amount of inputs (Kinde, 2007). Hence, in this study the effect of TLU on market participation status and marketed surplus is indeterminate a priori.

Access to irrigation (ACC_IRR): This is a dummy variable which takes a value of 1

if the household has access to irrigation and 0 otherwise. Access to irrigation is hypothesized to affect both market participation status and marketed surplus as access to irrigation increases vegetables production hence participation in vegetables market and supply.

4. RESULTS AND DISCUSSION

In this chapter, descriptive statistics and econometric models results are presented and discussed in comparison with results of similar studies.

4.1. Descriptive Results

This section presents descriptive statistical results of household and farm characteristics.

4.1.1. Demographic Characteristics of the Sample Households

The demographic characteristics of sample households include age, education, household size and farming experience. As indicated in Table 2, the average household size of the sample farmers was found to be 11 persons with a maximum and minimum of 18 and 5 respectively. The average family size was about 11 persons per household for participant farmers, while it was 10 for non-participant farmers and the two tailed t-test was statistically significant at 5% probability level meaning that the average household size between the market participants and non-participants was different.

The age structure of the sample households shows that the average age of the participant and non-participant farmers was almost the same (36 years). The mean years of schooling for vegetable marketing participants was found to be 2 while non-participants average years of schooling was 3. The result of the t-test shows that education level was statistically significant at 1% indicating that the educational level of market participants was lower than those of non-market participants. In terms of vegetables farming experience, the result shows that the least experienced market participant had 8 years while the most experienced had 33 years. The vegetables farming experience mean was found to be 17 years. In essence, vegetables farming

experience captures the aspects related to social networks and linking with marketing players, which accrue over time. The existence of such links reduces transaction costs for searching trading partners, contracting, negotiating and enforcing contracts which in turn increases market participation.

Table 2: Demographic characteristics of sample vegetable farmers

Variable	Market participation status3								t-value
	Participants (70)				Non-participants(53)				
	Min	Max	Mean	Std.	Min	Max	Mean	Std	
Age	25	65	36.5	6.70	22	50	35.5	7.53	0.271
Education	0	8	2	2.37	0	8	2.96	2.54	0.004***
Household size	5	18	11	3.40	5	18	10	3.53	0.016**
Farming experience	8	30	17	4.49	8	33	16	5.47	0.479

Source: Own survey (2014/15)

The results in Table 3 show that 95.71% of market participants were male, while 4.29 % were female. On the other hand, 100% of non-market participants were male.

Table 3: Sex composition of the sample farm households

Sex	Market participants		Non-market participants		Total	^{2}-value
	Freq.	%	Freq.	%		
Male	67	95.71	53	100	120	
Female	3	4.29	0	0	3	0.127
Total	70	100	53	100	123	

Source: Survey result, 2015

4.1.2. Socio-economic factors

The socio-economic characteristics of farmers are identified in terms of land and livestock holding, and off/non-farm income. In terms of total land holding, the result shows that the average size of cultivated land owned by the sample respondents was

about 0.45 ha, the minimum and the maximum being 0.25 ha and 1 ha, respectively. Participant farmers owned on average 0.48 ha cultivated land. The corresponding figure for the non-participant farmers was 0.42 ha. The mean difference of own cultivated land for the two groups was significant at 5 percent significance level. Livestock are important assets for rural households in Ethiopia. They are used as sources of food, draft power, income, and energy. Moreover, livestock are indicators of wealth and prestige in rural areas. All of the sample households reared livestock, which constituted cattle, small ruminants, and pack animals. On average, the sample households kept about 1.96 TLU. The minimum number of livestock kept was 0.26 TLU whereas the maximum was 3.97 TLU.

Table 4: Average land (ha), and livestock holdings (TLU) of sample households

	Market participation status								t-value
Variable	Participants (70)				Non-participants(53)				
	Min	Max	Mean	Std.	Min	Max	Mean	Std	
Land holding	0.25	1	0.48	0.16	0.25	1	0.42	0.16	0.041**
Livestock holding	0.26	3.97	2.05	0.98	0.26	3.65	1.85	1.01	0.141

Source: Survey result (2014/15)

The average cash income from different off/non-farm sources was about Birr 1587.32 for the participant and Birr 1564.71 for non-participant sampled households (Table 5).

4.1.3. Institutional factors

In terms of access to extension services about 97.56% of the sample respondents reported that they had contact with agricultural extension agents. Table 6 shows that 97.14% of sample household heads who were participating in vegetables market had contact with extension agents. The corresponding figure for non-participant farmers was 98.1%. In terms of credit access, 31.43% of the participant sample households had access to credit while 20.75% non-participant had access to credit. Moreover, the chi-square result shows that there is statistically significant difference between market participants and non-participants at 5% level in terms of access to credit.

In terms of market information, 77.14% of sample household heads who were participating in vegetables market had access to market information. The corresponding figure for non-participant farmers showed that 88.68% of the participant farmers and 27.27% of the non-participant household heads had no access to information related to vegetables market. The chi-square result shows that there is statistically significant difference between the two groups at 10% level of significance in accessing the vegetables market information access. The mean distance to the market place in hours of walking time for the sample households was about 53 minutes, the minimum and the maximum being 45 minutes and 6 hour, respectively. The average for participant households was 54 minutes while for the non-participant households 51 minutes.

Table 5 Extension contact, market information and credit access by vegetable s market participation

Variables	Market participants		Non-market participants		Total sample	x^2-value
	Freq.	%	Freq.	%		
Extension contact						
Contact	68	97.14	52	98.1	97.56	0.730
No-contact	2	2.86	1	1.89	2.44	
Total	70	100	53	100	100	
Market information						
Information	54	77.14	47	88.68	82.11	
No- information	16	22.86	6	11.32	17.89	0.098*
Total	70	100	53	100	100	
Credit access						
Credit	22	31.43	11	20.75	26.83	
						0.029**

Credit access						
Credit	22	31.43	11	20.75	26.83	
No-credit	48	68.57	42	79.25	73.17	0.029**
Total	70	100	53	100	100	
Market distance						
Mean	51		54		0.332	
Std	0. 09		0.11			

Source: survey result, 2015

- **Post-harvest handling**

Post-harvest handling, which includes different activities like sorting, grading, packing, storing, transportation, loading and unloading is done by the farmers themselves or traders or brokers. If vegetables are sold at the farm gate all the aforementioned activities are performed by the buyer (traders or broker). Most of the farmers use sacks, underground storage and ground floor of their residential house as a store. There are high postharvest losses due to improper harvesting, handling, packaging and poor facilities to market. The result shows that 25.4% and 20.2% of potato and cabbage are damaged before they reach the market. Survey result also shows that 43.8% of sample producers conduct sorting and grading of vegetables by separating damaged and undamaged vegetables, cleaning and cutting when needed before they supply to the market.

4.1.5. Demographic characteristics of traders

The demographic characteristics of traders summarize in terms of age, sex, marital status, education level and religion. The average age of traders was around 30 year which ranges between 19-45 years. About, 72 percent of the sample vegetables traders are male and about 28 percent of them were female. Regarding marital status

84 percent of traders were married and 18 percent of them were single. Regarding education level of traders 52 %, 36% and 12% of traders were at the level of illiterate, have a read and write knowledge and formal education respectively. (Table 6)

Table 6: Demographic characteristics of traders

Variable	Wholesalers	Retailers	Brokers
	Frq.	Frq.	Frq.
	%	%	%
Sex			
Male	11	1	6
Female	0	7	0
Religion			
Muslim	11	5	6
Orthodox	0	3	0
Marital status			
Single	0	2	2
Married	11	6	4
Education			
Illiterate	0	3	0
Read and write	8	2	3
Formal education	3	3	3

Source: survey result, 2015

4.2. Marketing participants, their roles and linkages

This survey identified major market participants between farmers and consumers. Market participants in the study area include: producer/farmers, collector, wholesalers and retailers.

Producers: Producers or farmers produce and harvest their vegetables. They transport vegetables (potato and cabbage) to the nearest markets(village market) or sold to collectors at farm gate; secondary market and destination markets themselves, either carrying sack themselves over a distance of 53 minutes on an average. Alternatively, they sell to village collectors known as "farmer traders" who assemble/ collect vegetables (potato and cabbage) from large number of farmers. Farmers also sell their products directly to wholesalers in destination market.

Village markets are a market which are the closest to the farmers, but has less marketing facilities (electricity, storage, water, etc) and farmers sell large quantity of vegetables to these agents. Regional markets are surplus markets, which are found in the woreda town where, most of surplus agricultural products are transacted. Terminal or destination markets are deficit markets which are found in town, and most of surplus products flow to these markets.

Brokers: These are agents specializing in negotiating buyers and sellers. They were operating between bulk buyer and seller agents. Their major duty is on potatoes market collection market due to its wideness. They negotiate the farmer during production and force them to sell for the collector or wholesaler they were dialed with. They disseminate information to the market participants and influence trade. As the reward they got 10 birr/quintal.

Wholesalers: Wholesalers are those who buy large quantity of goods and resell to merchants rather than to the ultimate consumers. Wholesalers are the major actors in the marketing channels. These were those participants of the marketing system who buy vegetables (potato and cabbage) on a large volume than what other actors do.

They resell vegetables (potato and cabbage) in Kombolcha and Jigjiga towns and some quality potatoes were sent abroad (Somali land) using trucks.

Retailers: retailers are agents who resell commodity to end users. The majority of vegetables (potato and cabbage) retailers are characterized by having road side shade and used to sell vegetables purchased from wholesalers or farmer traders or farmers to ultimate consumers in pieces after receiving large volumes.

4.3. Marketing channels

Marketing channels refers to the sequence of intermediaries and market through which goods pass in route from producer to consumer. It is an alternative route of product flow from producer to consumer. The analysis of marketing channel is intended to provide a systematic knowledge of the flow of the goods and service from their origin (produce) to the final destination (consumer). This section presents results for the identified marketing channels.

Potato marketing channel

I. Producers $\Rightarrow$ Consumers (6%)

II. Producers $\Rightarrow$ Retailers $\Rightarrow$ Consumers (10%)

III. Producers $\Rightarrow$ Wholesalers $\Rightarrow$ Exporters (54.6%)

IV. Producers $\Rightarrow$ Wholesalers $\Rightarrow$ Retailers $\Rightarrow$ Consumers (1.4%)

V. Producers $\Rightarrow$ Collectors $\Rightarrow$ Wholesalers $\Rightarrow$ Exporters (28%)

Cabbage market channel

I. Producers $\Rightarrow$ Consumers (21.26%)

II. Producers $\Rightarrow$ Retailers $\Rightarrow$ Consumers (37.66%)

III. Producers $\Rightarrow$ Wholesalers $\Rightarrow$ Consumers (5.21%)

IV. Producers $\Rightarrow$ Wholesalers $\Rightarrow$ Exporters (28.03%)

V. Producers $\Rightarrow$ Wholesalers $\Rightarrow$ Retailers $\Rightarrow$ Consumers (7.82%)

 Figure 2: marketing channels of vegetables

4.4. Structure of the market

Market structure is a description of the number and nature of participants in a market. The structure should be evaluated in terms of 1) the degree of market concentration 2) barrier to entry (licensing procedure, lack of capital and policy barriers), and 3) the degree of transparency (Pender et al., 2004). In this study, the structure of vegetables market is characterized using the following indicators: market concentration and the degree of transparency (market information).

4.4.1. Degree of market concentration

Concentration ratio is used as an indicator of the relative size of the firm in relation to the whole. Concentrations have been seen for wholesalers who are found in the study area as they have a direct impact on vegetables trade. Concentration was calculated as the sum of the percent market share of the top four firms by considering the levels capital of these agents in 2013/2014 from wholesalers.

Table 7: Concentration ratio for marketing agents per the two major vegetable types

Vegetables	Marketing agent	Concentration ratio top four firms (%)
Potato	Wholesaler	54.24
Cabbage	Wholesaler	55.88

Source: survey result, 2015

The study has used the 4 largest firms' method; the concentration ratio is computed by taking the sample traders annual sold that is from 2013/14. High concentration leads to monopolistic behavior which leads to high mark up and abnormal/excess/ profits. The result of the concentration ratio as indicated in Table 7 is 54.24% for potato and 55.88 for cabbage market. Applying the market structure criteria suggested by Kohls and Uhl 1985, (less than or equal to 33 % weak oligopoly, 33-50% medium oligopoly and greater than 50% strong oligopoly), the Kombolcha potato and cabbage market show strong oligopoly market.

4.4.2. Degree of market transparency

Survey result indicated that 60%, 24%, 12% and 4% of the sample potato traders got price information through personal observation, telephone, other traders and brokers, other traders and telephone, other traders and telephone respectively. Moreover, 56%, 24 %, 12% and 8% of the sample cabbage traders got price information through telephone, personal observation, other traders and brokers, other traders and telephone, other traders and telephone and personal observation respectively. It was observed that village collectors had limited information at destination market. In this case price information was the main problem in the vegetables (potato and cabbage) market. There was system of dissemination of market information; however it was not transparent in the market among sample traders and farmers.

About 96% of the sample traders stated willingness to pay for information cost, if there were well organized and transparent information center while 4% of them were not willing to pay for information. However, in the vegetables markets, all traders had information through different sources. They use a combination of sources to retrieve and use information.

Moreover, 64%, 16%, 12% and 8% information on supply of potato obtained from personal observation, telephone, other traders and brokers, other traders and personal observation, other traders and telephone and personal observation respectively, and 64%, 16%, 12%, 4% and 4% information on supply of cabbage also obtained from personal observation, telephone, other traders and brokers, personal observation, other traders, telephone and brokers respectively. While, 64%, 24%, 8% and 4% of demand information on potato were obtained from personal observation, telephone, other traders and brokers, other traders, personal observation and telephone respectively, 56%, 24%, 12% 4% and 4% information on demand of cabbage were obtained from personal observation, telephone, other traders and brokers, other traders, personal observation, telephone and brokers respectively.

4.5. Conduct of vegetables (potato and cabbage) market

Market conduct deals with the behavior of firms or patterns of behavior that firms follow in adopting or adjusting to the markets in which they sell or buy. In this thesis conduct of the vegetables market is analyzed in terms of traders' 1) price setting 2) purchasing and 3) selling strategies.

4.5.1. Traders' price setting strategy

The method of price formation is of a critical importance. About 60% of the sampled traders set purchasing price through negotiation or through colluding with other traders, 28% of the sampled traders reported that purchasing price was set by the market and 12% of the traders reported that the purchasing price was set by the sellers. This indicated that the vegetable farmers had no significant role in price setting.

Focus group discussion revealed that price setting is done, in such a way that, wholesalers collect vegetables from farmers directly bulk in their store and start to negotiate with the farmers on a predetermined price. On the other hand, producers have no power to present their produce to wholesaler. Wholesaler did not offer them a good price and differentiated vegetables into good quality and poor quality called 'magasha' locally. But after they buy from farmers, they mix together as a good quality product and sell out to the buying agents.

They also collected vegetables from collectors and farmers without any payment with a predetermined price. After they set the selling price by mutual negotiation no other traders permit to pay above the set price. Even if the farmers refuse to sell their vegetables, nobody can buy above the set price. Farmers will be left with have no option except selling their products at a price level imposed on them. The vegetables will be damaged if they have to stay for longer time. Therefore, farmers are forced to sell at whatever price set by the buyers.

About 44%, 32%, 12% and 12% of the sampled traders reported that they set purchasing price one day before the market day, at the evening of the market day,

early in the morning of the market day and at the time of purchase respectively following observed fluctuation of demand in the market. While retailer set a purchasing price during buying from a supplier based on suppliers price. That is, if the price of vegetables increase from where it stood previously, they were increase their selling prices to get a profit. On the other hand 36%, 32%, 20% and 12% of the sampled traders set their selling price one day before market day, at the time of selling, at the evening of market day and early in the morning of market day depending on the supply of vegetables respectively.

4.5.2. Traders purchasing strategy

Collectors were collecting vegetables from the farmers daily searching for the area where the product is available. But wholesalers use Kombolcha's markets to purchase.

About 36%, 32%, 16% and 16% of the sample traders purchased potato from farmers, farmers and urban wholesalers, farmers, retailers, wholesalers and urban assemblers and wholesalers respectively, and 60%, 24%, 12% and 4% of traders purchased cabbage from farmers, farmers and wholesalers, farmers, retailers, wholesalers and urban assemblers and wholesalers respectively. While 36%, 32%, 24% and 8% of the sampled potato traders sell to wholesalers, wholesaler, retailer, urban assembler and consumer, consumer and urban assembler respectively, and 52%, 24%, 16% and 8% of the cabbage traders sell to wholesalers, consumers, retailers and urban assemblers respectively.

Focus group discussion made with farmers indicated that many traders take advantage by cheating the farmers by means of manipulating the weighting scale. The common local weight measurement for vegetables (potato and cabbage) is kilogram.

4.5.3. Traders selling strategy

Result show that, about 36% traders set selling price one day before market day when there was information disseminated on the supply side, 32% of them set depending on

the supply of vegetables (potato and cabbage), 20% set the selling price if there was high demand and low supply observed they charged their selling at the time of sell and the remaining 12% of traders set their selling price also at the evening of the market day and early in the morning of the market day depending on the supply of vegetables . Wholesalers and collectors were shown a negotiation to each other to set a selling price when there was a supply shortage observed and during fasting time when there was observed high demand.

4.6. Performance of the market

Marketing cost and profitability analysis

Methods employed to analyze vegetables (potato and cabbage) market performance were marketing margins by taking into account associated marketing costs for key marketing channels. Hence, considering 2014/15 production year, costs and purchase price of channel actors, margin wholesalers and retailers level was conducted. The structure of marketing cost revealed that transportation cost is item the highest cost for village collectors compared to other actors.

Among vegetables (potato and cabbage) traders, informal survey revealed that commission agents had lowest marketing cost because they buy vegetables at market place and wholesalers receive all the vegetables at market place on time and cover other related cost. Farmer traders /village collectors do relatively incur highest cost of all other traders because they incur additional cost (transport) since they transport vegetables from farmers' homesteads to the market.

Table 8: Marketing margin of traders (mean), birr/qt

Traders	Wholesaler		Retailer	
Vegetables	Potato	Cabbage	Potato	Cabbage
Purchasing price	486.33	261.81	338.12	192.5
Labour cost	15	15	10	10
Loading and unloading	20	20	12	12
Transport cost	25	25	17	17
Pack material	15	15	10	10

Loss	2	5	3	7
Tax	10	10	10	10
Total marketing cost	**573.33**	**351.81**	**400.12**	**258.5**
Selling price	**650**	**368.18**	**562.5**	**275**
Gross marketing margin	**163.67**	**106.37**	**224.38**	**82.5**

Source: survey result, 2015

4.7. Results of the Heckman Two-Stage Model

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

Factors determining the Potato and Cabbage market participation decision of households

In the first stage of Heckman sample selection model, Probit model was used to identify factors affecting the potato and cabbage market participation decision of households. A number of variables were hypothesized to affect the market participation decision of households. Results of the Probit model showed that out of the 12 explanatory variables that were entered to the model, seven of them, namely age, access to credit, total land owned, frequency of irrigation, education level of households, frequency of extension contact and off/non-farm income were found to significantly affect producers' decision to sell vegetables. The results of the Probit model are depicted in Table 9.

Table 9:   Probit estimation of participation decision to vegetables market

Vegetable	Potato			Cabbage		
Variable	Coef.	Mfx.	Std. Err.	Coef.	Mfx.	Std.err
_Cons	-11.17			-13.30		
Age	.088**	.021	.007	.100 ***	.023	.007
Education	-.311***	-.076	.029	-.305***	-.070	.026
Land	4.21 ***	1.02	.351	4.92 ***	.032	.353
Livestock	.120	.029	.060	.153	1.14	.054
Freq. irrigation	.853 ***	.208	.061	.888 ***	.035	.060
Farming experience	-.016	-.004	.006	.047	.206	.008
Extension contact	.232 ***	.056	.014	.243***	.056	.014
Credit access	.279	.068	.110	.390	.090	.104
Market distance	.031	.007	.077	.007	.001	.071
Off/ income	-1.07***	-.263	.077	-1.14***	-.266	.077
Access information	.493	.138	.155	.481	.129	.141
Family size	.130 ***	.031	.015	.141 **	.010	.014

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

Source: survey result, 2014/15

Potato

Age of the household head significantly and positively influenced potato market participation. An increase in the age of household head by one year increases the probability of participating in potato market by 21 percent, all other factors held constant. This implies that as an individual stays long, he will have better knowledge and experience and hence participates in the market than young farm households. The finding concurs with that of Woldemichael (2008), who found older dairy household head could have more milking cows increasing the probability of the household milk market entry decision.

Education level of the household head significantly and negatively influences market participation. One year increases in household head's education decrease the probability of participating in potato market by 7.6 percent, all other factors held

constant. This can be explained by the fact that as an individual access more education he/she is empowered with the other skills and knowledge than farming that will spur individual to participate in the other professions. The finding concurs with that of Holloway et al. (2000) who found that education of the household has negative coefficient and inverse relationship with market participation decision

Total land holding significantly and positively influences market participation. An increase in land holding by one hectare increases the probability of participating in potato market by 102   percent all other factors held constant. This implies that as the land holding increase the farmer's plant more vegetables yield increases, market participation also increases. This is in line with Desta (2004) who found that land enables the owner to earn more agricultural output which in turn increases the market participation and marketable supply.

Frequency of extension contact significantly and positively influences market participation. An increase in contact by unit increases the probability of participating in potato market by 5.6 percent, all other factors held constant. This implies that contact with agents improves the household's intellectual capital, which improves vegetables production and post-harvest management practices. Therefore, number of extension visit has direct influence on market participation. This is in line with Holloway et al. (2000) who have shown that visits by extension agent improve participation and volume decision of dairy sale.

Income from non-farming and off-farm activities significantly and negatively influences market participation. An increase in income of household head's from non/off-farm activities decreases the probability of participating in potato market by 26.3 percent, all other factors held constant. This may be explained by the fact that farmers who have better non-farm income does not have motive to produce vegetables which is perishable by nature. The finding concurs with that of Rehima (2006) who found that if pepper producer have non-farm income, the amount of pepper supplied to the market decreases.

Frequency of irrigation significantly and positively influences market participation. Increase in the number of irrigation by one increase the probability of participating by 20.8 percent all other factors held constant.

Household size significantly and positively influences market participation. An increase in size of the house hold family by one person increases the probability of participating in potato market by 3.1 percent all other factors held constant. This implies that as vegetable is labour intensive activity, larger family size provides higher labor to undertake vegetable production and management activities easily which in turn increases vegetables yield leading to increased market participation. The results is consistent with that of Woldemichael (2008) who found that family size has a positive effect on probability of dairy household milk market participation decision.

Cabbage

Age of the house hold head positively influence the cabbage market participation decision. An increase the age by one year increase the probability of participating in cabbage market by 10 percent all the other factors held constant.

Education level of the household head significantly and negatively influences cabbage market participation. One year increases in household head's education decrease the probability of participating in cabbage market by 30.5 percent, all other factors held constant.

Total land holding significantly and positively influences cabbage market participation. An increase in land holding by one hectare increases the probability of participating in cabbage market by 49.2 percent all other factors held constant.

Frequency of irrigation significantly and positively influences cabbage market participation. Increase in the number of irrigation by one increase the probability of participating by 88.8 percent all other factors held constant.
Frequency of extension contact significantly and positively influences market

participation. An increase in contact by one increases the probability of participating in cabbage market by 24.3. Percent, all other factors held constant.

Income from non-farming and off-farm activities significantly and negatively influences market participation. An increase in income of household head's from non/off-farm activities decreases the probability of participating in cabbage market by 114 percent, all other factors held constant.

Household size significantly and positively influences market participation. An increase in size of the house hold family by one person increases the probability of participating in cabbage market by 14.1 percent all other factors held constant.

Factors influencing the extent of market participation

Table 10 shows Heckman extent of participation equation results. Household size, frequency of irrigation and frequency of extension contact are found to significantly influence the extent of market participation in vegetables marketing.

Table 10: OLS (Robust) regression result of extent of market participation

Number of observation	=123
Prob > F	=0.0060
R-squared	=0.6123
Adjusted R-squared	=0.6103

Vegetables	Potato		Cabbage	
Variable	Coef.	Std. Err.	Coef.	Std. Err.
Constant	107.63	27.82	18.02	15.83
Age	-.252	.408	-.095	.209
Education	1.491	1.23	-.901	.620
Total land	-13.526	18.96	18.80 **	9.64
Livestock	2.085	2.817	1.01	1.43
Freq irrigation	3.786**	1.84	1.21	.916
Farming experience	.250	.452	.320	.300
Freq extension contact	-1.68 ***	.467	-.175	.236
Credit access	-.718	5.83	-3.65	2.97
Market distance	-8.18 **	3.77	- 4.22 **	1.90
Off/income	4.75	4.11	1.46	2.07
Access information	-5.94	7.67	4.00	3.94
Family size	1.26	.825	.734 *	.419
Lamda	-14.19 ***	3.37	.277	1.59

***: significant at 1% level; **: significant at 5% level:* significance at 10%

Source: survey result, 2014/15

Potato

Frequency of irrigation significantly and positively influences the extent of market

participation. An increase in the frequency of irrigation increase proportion of potato sales by 37.8 qt. This is because of that as the frequency of irrigation increasers the soil fertility   than before as a result the productivity of the soil and yields of the product increases and this increase the volume of vegetables sale.

Distance from market significantly and negatively influence the extent of market participation. An increase in the market distance by one kilometer decrease the volume of potato supplied to market by 81.8 quintals all the other factors held constant.

The coefficient of Inverse Mills ratio (Lamda) in Heckman two-stage estimation is significant at 1% probability level. This indicates sample selection bias, existence of some unobservable household characteristics affecting the likelihood to participate in vegetables market and thereby affecting volume of supply which justifies the appropriateness of the model used.

Cabbage

Household size significantly and positively influences the extent of market participation. An increase in a household size by one person increases the volume of cabbage   sale by 73.4 qt. The households with the large family size are believed to have cheap labor force used for the production and sales of cabbage which in turn increases the proportion of cabbage sales. This is in line with Wolday (1994) who showed that household size had significant positive effect on quantity of teff marketed. Similarly Bezabih and Hadera (2007) have also witnessed that different sources of labor are employed in horticultural production of eastern Ethiopia where family labor takes the lion share for labor allotments.

Total land holding significantly and positively influences extent of market participation. An increase in land holding by one hectare increases the volume of cabbage sale by 18.8 qt. all other factors held constant. This implies that as the land holding increase the farmer's plant more vegetables yield increases, sales volume also increases. This is in line with Desta (2004) who found that land enables the owner to

earn more agricultural output which in turn increases the marketable supply.

Distance from market significantly and negatively influence the extent of market participation. An increase in the market distance by one kilometer decrease the volume of cabbage supplied to market by 4.22 quintals all the other factors held constant.

4.8. Market Integration (Cabbage and Potato)

4.8.1. Stationarity and Co-integration tests

Econometric analysis of time series data begins by checking the stationarity and non-stationarity of the price data. For co-integration relationship to exist, one of the assumptions is that data must be integrated of either same order or different order. Unit root testing procedures like Augmented Dickey Fuller (ADF) test is then applied to test the stationarity or non-stationarity of the price series empirically. After this, co-integration techniques are used to check if long-run relationship exists between Kombolcha and Jigjiga cabbage and potato prices.

Stationarity test

To test the stationarity in monthly time series data for Kombolcha and Jigjiga markets from September 2010-December 2014, ADF test was performed with trend. ADF test is the most commonly used unit root test. This test assumes that errors are statistically independent and have a constant variance (Enders, 1995). Therefore, the stationarity tests for cabbage and potato prices are presented here under.

Table 11: Stationarity test of cabbage and potato prices at Kombolcha and Jigjiga markets at their first difference

Variable	Cabbage price	Potato price

Variable	Cabbage price		Potato price	
	Kombolcha market	Jigjiga	Kombolcha market	Jigjiga
ADF test statistic	-8.714 ***	-10.650***	-7.685***	-8.965***
Critical v. at 1%	-3.580	-3.594	-3.580	-3.580
Critical v. at 5%	-2.930	-2.936	-2.930	-2.930
Null hypothesis	Rejected	Rejected	Rejected	Rejected
Stationary status	Stationary	Stationary	Stationary	Stationary

Source: Own computation, 2015. Note: numbers in bracket indicate the significance level.

As verified in Table 11, after taking the first difference of Kombolcha and Jigjiga prices for both cabbage and potato market, they became stationary as confirmed by using ADF test. Therefore, for both variables the null hypothesis of the unit root is rejected at 1 percent and 5 percent level of significance at their first difference. It can be concluded that, the unit root test reveals that the variables used in Kombolcha and Jigjiga markets for both cabbage and potato prices are stationary. In order to continue with the co-integration analysis, all the variables in each model should be integrated of the same order which holds true in our case. That is, these variables are integrated of order 1. Due to this reason, the analysis will continue with the co-integration technique for studying the long-run relationship between prices of vegetables in the two markets.

4.8.2. Long-run relationships and the short-run dynamics

Engle-Granger (Residual based) test for co-integration
To test the presence or absence of long-run relationship between Kombolcha and Jigjiga markets regarding cabbage and potato prices in the time period selected, it

became compulsory to apply co-integration methods. In this study, Engel-Granger method was used in order to analyze the co-integration between Kombolcha and Jigjiga markets.

It has been already seen that Kombolcha and Jigjiga market cabbage and potato price series are stationary at 1 percent and 5 percent levels of significance at their first difference integrated of order one, now the long run equilibrium relationship test for both vegetables at Kombolcha and Jigjiga market cabbage are estimated by regressing the two market prices and save the residual. This residual is also tested whether it is stationary or not. If it is stationary, it would confirm the presence of integration between the two markets for cabbage and potato prices in the long-run, separately. However, before running the model, choosing the optimum number of lags that should be included in the model is the first task.

Lag length determination

Based on AIC (Akaike Information Criterion), FPE (Final Prediction Error), LIR (Sequential Modified LR test statistic) and HQ (Hannan Quinn) information criterion methods for determining the lag length presented in Tables 12 and 13, one lag I (I) is selected.

Table 12: Lag length determination for cabbage

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	34.68				0.00	-1.52	-1.49	-1.44
1	43.08	16.80*	4	0.00	0.00*	-1.72*	-1.63*	-1.48*
2	45.12	4.06	4	0.40	0.00	-1.63	-1.48	-1.22
3	45.68	1.14	4	0.89	0.00	-1.47	-1.26	-0.90
4	50.15	8.95	4	0.06	0.00	-1.50	-1.22	-0.76

Source: own computation, 2015

Table 13: Lag length determination for potato

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	47.04				0.00	-1.92	-1.89*	-1.84*
1	51.09	8.09	4	0.09	0.00	-1.92	-1.83	-1.68
2	56.22	10.25	4	0.04	0.00	-1.97	-1.82	-1.57
3	57.49	2.54	4	0.64	0.00	-1.85	-1.64	-1.30
4	66.31	17.64*	4	0.00	0.00*	-2.06*	-1.79	-1.35

Source: own computation, 2014

 *=recommended lag length by each criteria

Since the optimum lag is determined according to the above criterion in the Tables 12 and 13, we can run co-integration test accordingly. One of the conditions for testing co-integration for time series data is that the series must be non-stationary in nature and both series must be integrated of the same order.

Based on the above procedure, the regression of price series of vegetables of the source market over the terminal market are conducted as follow.

Table 14: The logarithmic regression of Kombolcha on Jigjiga cabbage price

DlnKCabage	Coef.	Std. Err	t-value	p>|t|
DlnJCabage	0.090	0.100	0.90	0.372
Contsant	0.008	0.019	0.42	0.678

Source: Computed from CSA monthly price data (September 2010 - December 2014).

Note: **DlnKcabage** which is a dependent variable is the logarithmic value of the price of cabbage for Kombolcha market over the given period of time after first differencing while **DlnJCabagge** is the logarithmic value of the price of cabbage for Jigjiga market.

Table 15: The logarithmic regression of Kombolcha on Jigjiga potato price

DlnKpotato	Coef.	Std. Err	T	p>|t|
DlnJpotato	0.159	0.107	1.49	0.144
Contsant	0.006	0.018	0.32	0.753

Source: Computed from CSA monthly price data (September 2010 - December 2014).

Note: **DlnKpotato** which is a dependent variable is the logarithmic value of the price of potato for Kombolcha market over the given period of time after first differencing while **DlnJpotato** is the logarithmic value of the price of potato for Jigjiga market.

After running the regression, for both vegetables, the next step is conducting stationarity test for the predicted residuals by using ADF test.

Table 16: ADF test result of the residuals for cabbage and potato

Variable	ADF test statistic	C.V at 1%	C.V at 5%	Null hypothesis	Stationarity status
Residual for cabbage	-10.650***	-3.594	-2.936	Rejected	Stationary
Residual for potato	-8.965***	-3.580	-2.930	Rejected	Stationary

As can be seen from Table 16, the prices of cabbage and potato for both markets have been found significant at 1 percent significance level and residuals are stationary. This situation tells us that the two markets have long-run relationship or in the long-run they move together. Hence, it can be concluded that the two variables for both vegetables are co-integrated and therefore a valid and positive long-run relationship exist between Jigjiga and Kombolcha markets for cabbage and potato price. Therefore, the result shows that the two vegetable markets have long-term equilibrium relationship and Jigjiga market price has very strong causal effect on Kombolcha cabbage and potato prices.

4.8.3. Short run price transmission and speed of adjustment

Following the stationarity of the residuals, the short-run analysis which is the Error Correction Model (ECM) was estimated for both vegetables. Results are presented in Tables 17 and 18

Table 17: Error-correction model result for Cabbage

Dependent Variable: DlnKcabbage

Method: Ordinary Least Squares

Number of observation: 46 after adjustment

DlnKcabbage	Coef.	Std. Err.	t-statistic	P>|t|
Constant	-0.011	0.020	-0.540	0.590
DlnKcabbage_01	0.220	0.103	2.140	0.038
lnJJPOPrc	-0.276	0.135	.-2.040	0.047
ECM	-0.781	1.156	2.410	0.020

R-squared = 0.181
Adjusted R-squared = 0.125
Prob. (F stat) = 0.031
Durbin-Watson Stat   2.134

Where: DlnKcabbage is the logarithmic value of cabbage price at Kombolcha market after first difference; DlnJcabagge is the logarithmic value of cabbage price at Jigjiga market after first difference; DlnKcabbage_01   is the one lag logarithmic value of cabbage price at Kombolcha market after first difference and resid_01Cabbage is the one lag value of the residual which is ECM.

Table 18: Error-correction model result for potato

Dependent Variable: DlnKpotato

Method: Ordinary Least Squares

Number of observation: 50 after adjustment

DlnKpotato	Coef.	Std. Err.	t-statistic	P>|t|
Constant	0.072	0.204	0.350	0.728
DlnKpotato_01	-0.131	0.149	-0.880	0.384
lnJJPOPrc	-0.358	0.108	.-0.330	0.741
ECM	0.733	0.419	1.760	0.045

R-squared = 0.033
Adjusted R-squared = 0.030
Prob. (F stat) = 0.053
Durbin-Watson Stat   2.174

Since long-run relationship was detected for Jigjiga and Kombolcha vegetable markets, Error Correction Model (ECM) was estimated for these markets' price. As indicated in Table 20, short-term price transmission of potato for Jigjiga market was found to be significant at 5% probability level for Kombolcha market. Here, the degree of short-term price transmission is 1 Birr increase in the Jigjiga price causes an increase of 22% at Kombolcha market. In addition, the speed of price adjustment is 78.1% per month.

Similarly, Short-term price transmission of potato for Jigjiga market was found significant at10% for Kombolcha market. Here degree of short- term price transmission of potato market is 1 Birr increase in the Jigjiga price causes an increase of 3.5% at Kombolcha market. In addition its speed of price adjustment is 73.25% per month.

- **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

5.1. Summary and Conclusion

In this study, both descriptive statistics and econometric model were employed to analyze the vegetables marketing system in Kombolcha district of eastern Hararghe zone. Primary data were collected from 123 farm households and 23 vegetable traders during 2014 production season for the analysis. The study also used time series monthly secondary data that elapses the period from September 2010 up to January 2014 (52 months) to analyze the relationship between Kombolcha and Jigjiga cabbage and potato prices to identify the long-run and short-run market integration of the primary and secondary markets.

Descriptive analysis result shows that vegetable trade is highly concentrated with 54% concentration ratio in the study area. In terms of market transparency, 60%, 24%, 12% and 4% of the sample potato traders got price information through personal observation, telephone, other traders and brokers.

Subsequently, the result demonstrated that 60% of purchasing price was set by negotiation while 28% was set by the market and 12% was set by the sellers. According to the survey result, 36%, 32%, 16% and 16% of the sample traders purchased potato from farmers, farmers and urban wholesalers, farmers, retailers, wholesalers and urban assemblers and wholesalers respectively, and 60%, 24%, 12% and 4% traders purchased cabbage from farmers, farmers and wholesalers, farmers, retailers, wholesalers and urban assemblers and wholesalers respectively. While 36%, 32%, 24% and 8% of the sampled potato traders sell to wholesalers, retailers, urban assemblers and consumers, consumers and urban assemblers respectively, 52%, 24%, 16% and 8% of the cabbage traders sell to wholesalers, consumers, retailers and urban assemblers respectively. Similarly, 36%, 32%, 20% and 12% traders set selling price one day before the market day, at the time of sell, at the evening of the market day and early in the morning of the market day respectively.

The Heckman two-stage estimation result shows that age, total land owned, frequency of irrigation and frequency of extension contact and family size are important variables that significantly and positively influence the decision to

participate in potato and cabbage market. However, contrary to the hypothesis, education and off/non-farm income affected potato and cabbage market participation adversely.

Moreover, family size and total land holding are the significant factors affecting the quantity of cabbage supplied to the market positively. However, market distance is the significant factors affecting the quantity of cabbage and potato supplied to the market negatively. Frequency of irrigation is the significant factor affecting the quantity of potato supplied to the market. The coefficient associated with the inverse Mill's ratio was significant for the potato market, indicating that the influence of unobservable factors in the farmers' decisions to participate was significant justifying the appropriateness of the model used.

Finally, Augmented Dickey Fuller result indicate that in general cabbage price in Kombolcha and Jigjiga markets have been seen as the upward movement trend in the study periods. Moreover, the ADF stationarity test confirmed that the prices were not stationary at level. However, at first difference prices became stationary and leading to the Granger causality and Error Correction Model (ECM) tests that was performed accordingly.

5.2. Recommendations

From the result of this study, it is recommended that to farm size, frequency of irrigation and frequency of extension contact must be promoted in order to increase the amount of vegetable production and also marked supply because they are found to be the factors that positively and significantly affecting both potato and cabbage marketing performance.

Increasing the production and productivity of vegetables per unit area of land is better alternative to increase marketed surplus of vegetables. Introduction of modern technologies for the efficient use of the irrigation water, controlling disease and pest practices should be promoted to increase production. Strengthening the supportive activities such as information centers and input supply systems would also boost

vegetable supply.

Market surplus should be strengthened for efficient and area specific extension systems by supporting DAs by giving continuous capacity building trainings and separating DAs extension work from other administrative activities increases vegetable supply to the market

The result of the study suggests that proper method of handling, storing, transporting can keep quality of vegetables. Therefore, it is recommended to assign efficient extension system, updating the producer's knowledge and skill with improved production, handling, storing and marketing system that enables to increase benefits of producers.

 Finally, further research is needed on determinants of the speed of price adjustment between different cabbage markets when there exist the price shocks.

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- **APPENDIX**

Appendix table

1.Conversion factors used to compute tropical livestock units

Animal category	TLU
Calf	0.25
Weaned calf	0.34
Heifer	0.75
Cow or Ox	1.00
Horse or Mule	1.10
Donkey Adult	0.70
Donkey Young	0.35
Camel	1.25
Sheep or Goat Adult	0.13
Sheep or Goat Young	0.06

Chicken	0.013
Bull	0.75

Source: Storcket al., 1991

2. Variance inflation factor for continuous independent explanatory variables

Variable	VIF	1/VIF
HH_AGE	1.07	0.93
HH_EDU	1.07	0.93
HH_SIZE	1.10	0.91
FAR_SIZE	1.06	0.94
LIV_HOLD	1.05	0.94
FRQ_IRR	1.20	0.83
EXT_CONT	1.12	0.89
MKT_DIST	1.11	0.90
OFF_INCOME	1.20	0.83
Mean	1.10	

3. Producers and Traders Questionnaire

Producers' Questionnaire

Title: Performance and Challenges of Vegetable Marketing:The Case of Kombolcha District of East Hararghe Zone, Ethiopia

Instructions for Enumerators:

- Make brief introduction before starting any question, introduce yourself to the farmers, greet them in local ways and make clear the objective of the study.

- Please fill the interview schedule according to the farmers reply (do not put your own feeling).

- Please ask each question clearly and patiently until the farmer gets your points.

- Please do not use technical terms and do not forget local units.

- During the process write answers on the space provided.

- Prove that all the questions are asked and the interview schedule format is properly completed

1. Household Characteristics

- Name of household head _____

- Sex of household head   1. Male   0. Female

- Age of household head _____years.

- Religion of household head 1. Muslim   2. Orthodox Christian   3. Protestant
  4. Catholic   5. Other (specify) _____

- Marital status of household head 1. Married 2.Single   3. Divorced   4. Widowed

- Educational level of household head   1. Illiterate   2. Read & write
  3. _____years of formal education   4. Religious school

1.7. Family size. Male _____ Female _____ Total _____

2. Resource Ownership

2.1. Land holding

Land category	Cultivated land size (vegetables + annual + permanent crops)	Uncultivated land size (e.g. grazing, homestead etc)
Own land used		
Rented in land		
Rented out land		
Size of bought land during **2013/14** season		
Size of sold land during **2013/14** season		

- Livestock

Types of livestock	Number owned	Number sold	Cash income from livestock sold (Birr)
Cows			
Oxen			
Heifers			
Calves			
Bulls			
Sheep			
Goats			
Donkeys			
Camel			
Mules			
Poultry			
Other (specify)			

3. Production

- Which production method do you practice for potato and cabbage? 1. Irrigation 2. Rain fed

- If you use irrigation, what is the area under irrigation for vegetables in hectares/timad ? _____

- How many times did you irrigate your vegetable land last year? _____

- What is the estimated irrigation cost for potato and cabbage last year? _____Birr.

- Vegetable production and marketing in 2013/2014

Vegetable	Area in ha	Quantity produced(qt)(	Quantity consumed(qt)	Quantity sold (qt)(	Price per qt
Potato					
Cabbage					

- Your potato farming experience _____years

- Your cabbage farming experience _____years

- What were your inputs, cultivation and production cost for potato & cabbage and their source last year?

Vegetable	Labor	Type of inputs used	1.Improved 2. Fertilizer 3.Pesticidie/ Herbicides 4.Farm implements	Source	1.OoARD 2.Local market 3.Illegal markets 4. Cooperatives 5.NGOs 6.Research centers(specify) 7.Haramaya university 8. Fellow farmers	How	1.Through purchase 2.On credit basis 3. As gift 4.Through exchange 5.Other(specify)	Value(Birr)
1Potato								

Vegetable	Labor	Type of inputs used	1.Improved 2. Fertilizer 3.Pesticidie/ Herbicides 4.Farm implements	Source	1.OoARD 2.Local market 3.Illegal markets 4. Cooperatives 5.NGOs 6.Research centers(specify) 7.Haramaya university 8. Fellow farmers	How	1.Through purchase 2.On credit basis 3. As gift 4.Through exchange 5.Other(specify)	Value(Birr)
1 Potato								
2 Cabbage								

4. Access to Extension and Credit Services

- Did you have extension contact in relation to vegetable (potato & cabbage) production last year?   1. Yes   0. No

- If yes, how often did the extension agent contacted you last year? _____

- Did you need credit last year? 1. Yes 0. No

- Did you take credit last year? 1. Yes 0. No

- From whom did you get credit? 1. Relative 2. Bank   3. Micro finance institution
  4. Friends   5. Traders   6. NGO   7. Peasant association   8. Other
  (specify)_____

- If yes, how much did you borrow last year ?_____ Birr

- What is the interest rate? _____ %

5. Selling Practices

- Did you participate in vegetable (potato & cabbage) marketing last   ? 1. Yes 0.
  No

- Did you sell potato to the market last year? 1. Yes   0. No

- If yes, how many times did you sell potato last year? _____

- Did you sell cabbage to the market last year? 1. Yes   0. No

- . If yes, how many times did you sell cabbage last year? _____

- How far is the village market from your residence?_____ minutes (hrs) of walking

- How far is the nearest main market from your residence?_____ minutes(hrs) of
  walking

- On average how long did it take you to sale your potato? _____

- On average how long did it take you to sale your   cabbage? _____

- To which market did you sell potato in order of preference last year?

Market name	Average quantity/market	Average price/qt

- To which market did you sell cabbage in order of preference last year ?

Market name	Average quantity/market	Average price/qt

- To who (market agent) did you sell your vegetable last year?

Vegetable	Where did you sale	To whom did you sale	Share of buyers(qt)	Term of sale
Potato				
Cabbage				
To whom: 1. Farmer consumer 2. Wholesaler (urban) 3. Wholesaler (regional) 4. Retailer (urban) 5. Retailer (rural) 6. Consumer (rural) 7. Consumer (urban) 8. Urban assemblers 9. Service cooperatives 10. Farmer traders 11. Gov't organization 12. You do not know				
Relationship: 1. The same religion 2. The same ethnic 3.the same origin 4.close relative 5.no relationship 6. Meet socially				

- Why did you sale   your potato to these agents in above table?

  - Lesser transport cost 2. Giving high price 3. Scaling fair 4. Reduce transport cost 5. Other (specify)_____

- Why did you   sale your cabbage to these agents in above table?

  - Lesser transportcost 2. Giving high price 3. Scaling fair 4. Reduce transport cost 5. Other (specify)

- How did you sale your produce last year?

  - Direct to the purchaser 2. Through broker 3. Through commission man to

purchaser 4. Other (specify)_____

- Was a protection, to sell potato in market? 1. Yes 0. No

- If yes, what was the reason?

  - Lack of customers 2. No license to sell 3. Traders were not allow to enter 4. Other (specify)

- Was a protection, to sell cabbage in market? 1. Yes 0. No

- If yes, what was the reason?

  - Lack of customers 2. No license to sell 3. Traders were not allowed to enter 4. Other (specify)

- Did you face difficulty in finding buyers when you wanted to sell? 1. Yes 0. No

- If yes, in **Q.5.18.**it is due to: 1. In accessibility of market 2. Low price offer   3. Lack of information 4. Other (specify)_____

- What did you do, when the potato you offered to the market was not sold?

  - Took back home 2. Took to another market day   3. Sold at lower price 4. Sold on other market day

- What did you do, when the cabbage you offered to the market was not sold?

  - Took back home 2. Took to another market day   3. Sold at lower price 4. Sold on other market day

- Who set your selling price for potato last year?

  - Yourself 2. Buyers 3. Set by demand and supply 4. Negotiation 5. Other (specify)

- Who set your selling price for cabbage last year?

1. Yourself 2. Buyers 3. Set by demand and supply 4. Negotiation 5. Other (specify)

- If you decided on the selling price, how did you set the price?

  - Individually 2. Collude with other farmers 3. Other (specify)_____

- When did you get the money after sale? 1. As soon as you sold 2. After some hours 3. Other day after sale 4. Other (specify)_____

- How did you transport your produce from home to market?

  - Head/ back loading 2. Vehicle 3. Pack animal 4. Other (specify)_____

- Did you know the nearby market price before you sold your potato? 1. Yes 0. No

- Did you know the nearby market price before you sold your cabbage? 1. Yes 0. No

- How did you get information on supply, demand & price of vegetable in other market?

Vegetable	Information on	Use code	Source information
Potato	Supply		• Broker 7. TV
	Demand		• Radio 8. Other(specify)__
	Price		
Cabbage	Supply		• Telephone
	Demand		• Personal observation
	Price		• News paper
			• Other traders

6. Non-farm and Off-farm activities

- Do you purchase and sell vegetable products? 1. Yes 0. No
- Do you practice trading activities other than trading of vegetables products? 1. Yes 0. No

- How much do you earn from such trading per market day? _____birr

- Number of market days in a month? _____

- Did you perform other income generating activities? 1. Yes 0. No

- If your answer for **Q.6.5.** is yes, what are these sources of income? _____

- What amount of your household expenditure was covered by off farm activities? _____

- **Socioeconomic constraints of Vegetable production**

- What are the main Constraints of vegetable production during last production year?

No	List of constraints	Vegetable		Ranking of constraints	
				Season 1	
1	**Land**				
1.1	Insufficient land				
1.2	Land regime problem				
1.3	Availability of renting land				
2	**Climate constraint**				
2.1	Drought				
2.2	Flout				
3	**Credit**				
3.1	Difficult access to credit				
3.2	High interest rate				
3.3	Credit offered late				
4	**Post harvest constraint**	**Vegetables**			
		1.potato	**2.cabbage**		
4.1	Storage				
4.2	Transport				
5	**Product market**				
5.1	Market not available				
5.2	Lack of market information				

5.3	Low price			
5.4	Low quality of product			
5.5	Long distance to the market			
5.6	Low consumer demand			
5.7	Price setting			
5.8	Perishable nature			
5.9	Multiple taxation			
6	**Extension service**			
6.1	Non-availability of extension service			
6.2	Long distance from extension service			
7	**Other (specify)**			

Thank you!!!!!!!!!!

Traders' questionnaire

Tile: Performance and Challenges of Vegetable Marketing: The Case of Kombolcha District, East Hararghe Zone, Oromiya National Rigional State.

By Meron Yohanes

- **General Information**
- Name of market

      1. Village market   2. Kombolcha   3. Harar   4. Jigjiga

- Distance from residence to the market _____ Km/walking time in minutes

- Name of trader_____

- Age of trader _____year

- Sex of trader   1. Male   2. Female

- Religion of trader

    1. Muslim 2. Orthodox Christian 3. Protestant   4. Catholic 5.other (specify) _____

- Marital status of trader

    1. Single   2. Married   3. Divorced   4. Widowed

- Total family size _____

- Educational level of trader

    1. Illiterate   2. Read and write 3.Religious schools 4. _____years of formal education

    5. Other (specify)

- Major business (es) in 2012/13 in order of importance write 1st for the most important , 2nd for the next important etc.

    - Wholesaler 2. Retailer   3. Farmer trader (village collector) 4. Urban assembler 5. Broker (delala) 6. Commission man 7. Other (specify)_____

- How did you start potato trading? _____

- How did you start cabbage trading? _____

- For how long have you been in this business? _____years

- **Capital**

- **Fixed business capitals**

- Initial fixed capitals when you start this business

Asset		No	Average capacity of each (qt)	Total value	Asset
Store	Separate				Telephone
	Residence				Land line
Vehicle personal truck					Mobile telephone
Shop shed					Pack animal
Hand pool cart					Milling machine
Animal cart					Motor cycle
Weighing scale					Bicycle
Other (specify)					Other (specify)
If no fixed capital put "0"					

- Assets owned last year

Asset		No	Average capacity of each (qt)	Total value	Asset	No.	Total value
Store	Separate				Telephone Land line		
	Residence						
Vehicle personal truck					Mobile telephone		
Shop shed					Pack animal		
Hand pool cart					Milling machine		
Animal cart					Motor cycle		
Weighing scale					Bicycle		

Other (specify)				Other (specify)		
If no fixed capital put "0"						

- **Financial capitals**

- What was the amount of initial working capital when you star this business? ------------Birr

- What was the amount of your working capital in 2012/2013? ----------------Birr

- What was the source of the working capital in 2012/2013?(multiple answer is possible)

   1. Own   2. Loan   3. Gift   4. Share   5. Other (specify)

- If it was loan, from whom did you borrow?(multiple answer is possible)

   1. relative/family   2. Other traders   3. Private money lenders

   4. Microfinance institutions   5. NGO   6. Bank   7. Friends 8. Other(specify)

- How much was the rate of interest? _____B irr for formal--------------for informal

- What was the reason behind the loan? _
  - To build store 2. To purchase a car 3. For working capital 5 other (specify) -----
- Social capital
- How did you attract your suppliers?

  - By giving better price relate to others   3. By visiting them

  -   2. By fair scaling weighing   4. Other (specify)

- How did you attract you buyers?

1. By giving better price relate to others   3 by fair scaling   4 by visiting them

2 Quality of your product   5 by giving credit   6. Other (specify)

- From which market did you buy potato in order of preference last year?

  Market name   average quantity/market   average price/ qt

  _____   _____

  _____

  _____   _____

  _____

  _____   _____

  _____

- Why did you prefer this market(s)?

  1. Better quality   2. High supply 3. Short distance   4. Other (specify)_____

- How many regular suppliers do you have for Potato last year?

  1. Wholsalers (urban)___ 2. Wholesaler (rural)_____ 3. Retailer (urban)_____

  4. Retailer (rural)_____ 5. Urban assembler _____6. Farmer traders(village collectors)_____

  7. Farmers_____ 8. Other (specify)_____

- How many regular suppliers do you have for cabbage last year?

  1. Wholesalers (urban)___ 2. Wholesaler (rural)_____ 3. Retailer (urban)_____

  4. Retailer (rural)_____ 5. Urban assembler _____6. Farmer traders (village collectors)_____

  7. Farmers_____ 8. Other (specify)_____

- **Purchasing practice**

- From which market and suppliers did you buy vegetable last year?

Vegetable	Purchased form Sellers	Relation ship	Amount of seller share(qt)	Term of payment 1. Cash 2. Credit 3.advance payment

Potato				
Cabbage				

From sellers: 1. Farmers 2.Retailers (urban) 3. Retailers (rural) 4. Wholesalers (urban) 5. Wholesalers (rural) 6.urban assemblers 7. Farmer trader village (collectors) 8. You don't know

Relationship: 1. The same religion 2. The same ethnic 3. The same origin 4. Close relative 5. No relation 6. Meet socially

3.2. If purchasing price was set in advance, how did you agree?

1. Orally 2. Written agreement   3. Other (specify)

- who purchase potato for you in 2012/2013?

1. Myself 2. Through brokers   3. Family members'   4. Commission agent

- who purchase cabbage for you in 2012/2013

1. Myself 2. Through brokers   3. Family members'   4. Commission agent

- If others purchased for you how you did pay them?

1 ._____birr/quntal   2. Above the price you decide 3_____% on purchase price
4. Other (specify)_____

- Was the price of potato the same on the same day in marketing center in 2012/2013?

1. Yes 0. No

- Was the price of cabbage the same on the same day in a marketing center in 2012/2013?

1. Yes 0. No

- Is your usual purchasing price for potato higher than your competitors? 1. Yes   0. No

- If yes in Q.3.8. What was the reason?

  1. to attract more suppliers 2. To buy more quantity 3. To kick out your competitor from market 4. To get better quality 5. Other (specify)

- Is your usual purchasing price for cabbage higher than your competitors? 1. Yes 0. No

- If yes in Q. 3.10. what was the reason?

  - To attract more suppliers 2. To buy more quantity 3. To kick out your competitor from market 4. To get better quality 5. Other (specify)

- How did you measure your potato purchase?

  1. by plastic sack (luka) 2. By sisal sack (joniya) 3.by weighting (kg) 4. Other (specify)_____

- How did you measure your cabbage purchase?

  1. by plastic sack (luka) 2. By sisal sack (joniya) 3.by weighting (kg) 4. Other (specify)_____

- Who set your purchasing pricing last year?

  1. My self 2. The sellers 3. Negotiation between me and seller 4. By market   5. Other traders 6. Other (specify)

- If you decided on the purchasing price, how did you set the price?

  - Individually 2. Collude consultation with other traders 3. Other (specify)_____

- When did you set purchasing price?

1.early in the morning of the market day 2. At midday of the market day 3. At the time of purchase 4. On day before the market day 5. At the evening of the market day 6. After you sell the produce in other market 7. Other (specify)_____

- **Selling practices**

- From which market did you buy potato in order of preference last year ?

  Market name   Average quantity/ market   Average price/ qt

  _____   _____
      _____

  _____   _____
      _____

  _____   _____
      _____

- From which market did you buy cabbage in order of preference last year ?

  Market name   Average quantity/ market   Average price/ qt

  _____   _____
      _____

  _____   _____
      _____

  _____   _____
      _____

- To whom did you sell vegetable last year?

Vegetable	To whom did you sell	Relation ship	Amount of seller share(qt)	Term of payment 1.Cash 2.Credit 3.Advance receive

Potato				
Cabbage				

To buyer: 1. Farmers 2.Retailers (urban) 3. Retailers (rural) 4. Wholesalers (urban) 5. Wholesalers (rural) 6.urban assemblers 7. Farmer trader village(collectors) 8. You don't know

Relationship: 1. The same religion 2. The same ethnic 3. The same origin 4. Close relative 5. No relation 6. Meet socially

- If you decided on the selling price , how did you set the price?

  - Individually 2.consulting with other traders 3. Other (specify)_____

- When did you set selling price?

  1. Early in the morning of the market day 2. At midday of the market day 3. At the time of selling 4. On the day before the market day 5. At the evening of the market day 6. Other (specify) _____

- Who sold potato for you last year?

  - Myself 2. Through broker 3. Family 4. Commission men 5. Other (specify)

- If others sold for you, how you did pay them?

  - ___birr/quintal 2. Above the price you decide 3. % on sale price 4. Other (specify)_____

- **Marketing service**

- Did you pay tax for the potato you purchase last year? 1. Yes 0. No

- Did you pay tax for the cabbage you purchase last year? 1. Yes 0. No

- Did you pay tax for the potato you sell? 1. Yes 0. No

- Did you pay tax for the cabbage you sell? 1. Yes 0. N o

- What was the base of tax?

  1. Per sack-------Birr   2. Per quintal ------------Birr   3. Fixed payment -----------Birr

  4. Per kg ---------Birr   5. Other (specify)

- Is potato trading in your locality needs a trading license?

  1. Yes   2. No   3. Not mandatory

- Is cabbage trading in your locality needs a trading license?

  1. Yes   2. No   3. Not mandatory

- If yes, how do you see the procedure to get the license?

  1. complicated   0. Easy

- Did you have potato trading license? 1. Yes 0. No

- Did you have cabbage trading license? 1. Yes 0. No

- Indicate

Marketing cost components	Vegetables		For purchasing in birr		For selling in birr	
	Potato	Cabbage	Potato	Cabbage	Potato	C ab ba ge
Purchasing price of quality --- per quintal						
Packaging material						

Labor employed to fill the bag &stitch					
Load					
Unload					
Brokerage					
Transportation vehicle					
Head/back load					
Storing					
License fee					
Taxes & fee					
Wage for permanent employee					
Storage cost					
Storage loss					
Telephone expense					
Watching &warding					
Information cost					
Personal travel & other expense					
Total costs					
Selling price of quality ---------					
Total costs					

- Information and transportation

- How did you get information on supply, demand& price of vegetable in other market?

Information	Vegetable (use code)		Source of information
	Potato	Cabbage	
Supply			1.Other traders 2. Radio 3. Telephone 4. Personal observation 5. Broker 6. Newspaper 7. Tv 8. Other (specify)_____
Demand			
Price			

- Are you willing to pay for the market information? 1. Yes 0. No

- What mode of transportion did you use?

  - Head/back load 2. Trucking/ vehicle 3. Pack animal 4. Other(specify)_____

- **Problems on vegetable marketing**

- Are there problems on vegetable marketing? 1. Yes 0. No

- If yes, what are the problems?

No	Problems	Vegetables	
		Potato	Cabbage
1.	Infrastructure : Road , transportation		
2	Administrative measure (multiple taxation & other fees)		
3	Shortage of supply		
4	Storage problem		
5	Theft		
6	Natural quality problem		
7	Information flow		
8	Capital shortage		
9	Access to credit		
10	Technical trading		
11	Business management(financial accounting training)		
12	Absence of government support to improve _____marketing		
13	Too much competition with licensed traders		
14	Too much competition with unlicensed traders		
15	Framers reluctance to sell due to lower price		
16	Other (specify)		

- What is your opinion on marketing?

_____

_____

_____

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Thank you!!!!!!!!!!