POTATO VALUE CHAIN ANALYSIS: THE CASE OF JELDU DISTRICT, WEST SHEWA ZONE OF OROMIA NATIONAL REGIONAL STATE, ETHIOPIA

MSc THESIS

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DEDICATION

I dedicated this thesis to my mother ***Faneye Lemma*** *and my father* ***Wegi Feyisa*** *for their unreserved support and encouragement in my academic career and my life.*

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 completion of this Thesis. Any scholarly matter that is included in the Thesis has been given recognition through citation.

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BIOGRAPHICAL SKETCH

The author was born on March 31, 1991 in Jeldu district, West Shewa zone, Oromia National Regional State, Ethiopia. The author attended his primary education at Teso and Goro Elementary Schools. Then after, he started his secondary education at the then Shukute Secondary School (now Regassa Bulto Secondary School) and transferred to Jeldu Secondary and Preparatory School after five months. He completed his preparatory education in June 2012 at Jeldu Preparatory School.

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LIST OF ACRONYMS AND ABBREVIATIONS

ARARI	Amhara Region Agricultural Research Institute
BLUE	Best Linear Unbiased Estimator
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CSA	Central Statistics Agency of Ethiopia
EHDA	Ethiopian Horticultural Development Agency
EIAR	Ethiopian Institute of Agricultural Research
Ha	Hectare
HARC	Holeta Agricultural Research Center
ILRI	International Livestock Research Institute
JDOA	Jeldu District Office of Agriculture
m a.s.l.	Meters above sea level
M4P	Making Markets Work Better for the Poor
MSAP	Mauritius Sugar Producers' Association
OCSSC	Oromia Credit and Saving Share Company
OLS	Ordinary Least Squares
PZCT	Profit Zone Consultant Trainers
SNNPR	Southern Nations, Nationalities and Peoples' Region
2SLS	Two Stage Least Squares
TLU	Tropical Livestock Unit
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
USAID	United States of America Agency for International Development
VIF	Variance Inflation Factor

TABLE OF CONTENTS

DEDICATION iii

STATEMENT OF THE AUTHOR iv

BIOGRAPHICAL SKETCH v

ACKNOWLEDGEMENTS vi

LIST OF ACRONYMS AND ABBREVIATIONS vii

TABLE OF CONTENTS viii

LIST OF TABLES xi

LIST OF FIGURES xii

LIST OF TABLES IN THE APPENDIX xiii

ABSTRACT xiv

1. INTRODUCTION 1

1.1. Background of the Study 1

1.2. Statement of the Problem 3

1.3. Objectives of the Study 5

1.4. Significances of the Study 5

1.5. Scope and Limitations of the Study 5

1.6. Organization of the Thesis 6

2. LITERATURE REVIEW 7

2.1. Definitions of Basic Terms and Value Chain 7

2.2. Value Chain Analysis 11

2.2.1. Major Concepts Guiding Value Chain Analysis 12

2.2.1.1. Effective demand 12

2.2.1.2. Production 12

2.2.1.3. Governance 13

2.2.1.4. Value chain upgrading 14

2.2.2. The Need for Value Chain Analysis 15

2.2.3. Approaches of Value Chain Analysis 16

2.3. Approaches to the Study of Agricultural Marketing 18

2.3.1. Functional Approach 19

2.3.2. Institutional Approach 19

2.3.3. Commodity Approach 19

2.4. The Structure-Conduct-Performance (S-C-P) Approach 20

2.4.1. Market Structure 20

TABLE OF CONTENTS (CONTINUED)

2.4.2. Market Conduct 20
2.4.3. Market Performance 21
2.5. Potato Production in Ethiopia: An Overview 21
2.6. Review of Empirical Studies 23
2.6.1. Value Chain Approach 23
2.6.2. Determinants of Quantity Supplied to the Market by Farmers 25
2.7. Conceptual Framework 26
3. RESEARCH METHODOLOGY 28
3.1. Description of the Study Area 28
3.2. Types and Sources of Data and Methods of Data Collection 29
3.3. Sampling Method and Sample Size 30
3.4. Methods of Data Analysis 32
3.4.1. Descriptive Analysis 32
3.4.2. Value Chain Analysis 32
3.4.3. Econometric Analysis 34
3.5. Variables Selection, Definitions, Measurements and Working Hypotheses 37
4. RESULTS AND DISCUSSION 42
4.1. Socio-economic, Demographic and Institutional Characteristics of the Sample Producers 42
4.1.1. Demographic Characteristics of Sample Households 42
4.1.2. Land Use Patterns and Inputs of Production 43
4.1.3. Access to Services 44
4.2. Value Chain Analysis 45
4.2.1. Potato Value Chain Actors and Their Roles 45
4.2.2. Mapping Potato Value Chain 47
4.2.3. Value Chain Governance 49
4.2.4. Potato Marketing Channels 49
4.2.5. Structure, Conduct and Performance of Potato Marketing 50
4.2.5.1. Market structure 50
4.2.5.2. Market conduct 52
4.2.5.3. Market performance analysis 53
4.2.6. Constraints and Opportunities of Potato Value Chain in Jeldu District 56
4.2.6.1. Constraints hindering potato value chain development 56

TABLE OF CONTENTS (CONTINUED)

4.2.6.2. Opportunities of potato value chain 58

4.3. Econometric Results 58

4.3.1. Specification Tests 59

4.3.2. Determinants of Quantity of Potato Supplied to the Market 60

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS 63

5.1. Summary 63

5.2. Conclusions and Recommendations 65

6. REFERENCES 67

7. APPENDICES 76

LIST OF TABLES

Tables	Page
1: Distribution of sample potato producer households in the selected kebeles	31
2: Distribution of traders and consumers included in the study	31
3: Summary of variables measurements and the expected signs	41
4: Demographic characteristics of the sampled households	43
5: A summary of production inputs employed by the sample households	44
6: Sample households' access to extension service, membership to cooperative and access to credit service	45
7: Sources of potato seed for sample households	46
8: Traders' price setting strategy	52
9: Average cost of production and profitability of potato (Birr/ha)	54
10: Estimated marketing margin and profit share of major potato value chain actors	55
11: Major production constraints of potato producers	57
12: Marketing constraints of potato producers	58
13: Determinants of quantity of potato supplied to the market (2SLS result)	61

LIST OF FIGURES

Figure	Page
1: Typical agricultural value chain and associated business development services	9
2: Conceptual framework of the study	27
3: Geographical location of the study area	29
4: Map of potato value chain in the study area	48
5: Potato marketing channels	50

LIST OF TABLES IN THE APPENDIX

Table	Page
1: Distance from market, road and development station	77
2: Means of income generating activities of sample consumers	77
3: Sample traders' barriers to entry and potato trading license	77
4: Traders' purchasing and selling strategies	77
5: Marketing constraints of traders	78
6: Test for multicollinearity	78
7: Endogeneity and over identification tests of quantity of potato produced	78
8: The first stage of 2SLS method (determinants of quantity of potato produced)	79
9: Conversion for adult equivalent	79
10: Conversion factors used to compute tropical livestock unit	80
11: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	80

Potato Value Chain Analysis: The Case of Jeldu District, West Shewa Zone of Oromia National Regional State, Ethiopia

ABSTRACT

Jeldu district is known for potato production. However, lower production and productivity, low output price, high input prices and lack of value chain development were the major problems constraining the potential benefit from the sector. The purpose of this study was, therefore, to analyze potato value chain in Jeldu district. The specific objectives of the study were mapping potato value chain actors, analyze their roles and linkages; identifying factors affecting quantity of potato supplied to the market; assessing profit margin of major actors under various marketing channels and assessing constraints and opportunities of potato value chain. Both primary and secondary data were used. Primary data were collected from 122 producers, 32 traders and 25 consumers using a pre-tested questionnaire for each group. Descriptive statistics, value chain analysis and econometric model were used to analyze the data. The major actors of potato value chain identified were input suppliers, producers, local collectors, wholesalers, retailers and supportive actors. Wholesalers play governance role in the study area. Market concentration ratio and barriers to entry were used to analyze the structure of the market. The conduct of the market was evaluated by traders' price setting strategies, purchasing and selling strategies. Five potato marketing channels were identified in the study area. Total Gross Marketing Margin was highest (57.14%) in channel IV and lowest (22.22%) in channel II. Producers' share (GMMp) was highest (77.78%) in channel II and lowest (42.86%) in channel IV. From traders, wholesalers received the highest (52.86%) marketing margin in channel III and 47.14% in channel IV. Local collectors received the lowest marketing margin which was 11.11% and 10% in channels V and IV, respectively. Lack of irrigation facility, disease and pests, high input cost, weak extension services, delay of fertilizer distributions, poor quality seed and adverse weather condition are production constraints identified in the study area. Low output price, poor road infrastructure, limited credit services, shortage of capital, lack of continuous supply throughout the year, and high transportation costs are marketing constraints hindering potato value chain development in the study area. Results of the two-stage least squares (2SLS) regression confirmed that four variables namely education level, quantity of potato produced, membership to cooperatives and area allocated to potato production affected quantity of potato supplied to the market significantly and positively. Contrary to this, livestock holding affected quantity of potato supplied to the market significantly and negatively. Based on the findings, the study suggests that the government and stakeholders should focus on developing irrigation facility, distributing quality inputs, fertilizers and chemicals timely, assisting and encouraging establishments of cooperatives and memberships, identifying and disseminating high yielding and disease resistant potato seed varieties, strengthening the provision of formal and informal education, improving rural infrastructure and promoting coordination among value chain actors.

Keywords: Value chain; Potato; Endogeneity; Two-stage least squares regression; Jeldu

1. INTRODUCTION

1.1. Background of the Study

Agriculture is main economic pillar of the Ethiopian economy and the overall economic growth of the country is highly dependent on the success of the agriculture sector. The sector represents 42% of the GDP of the country and about 85% of the population gains their livelihood directly or indirectly from agricultural production (CSA, 2015).

In developing countries including Africa, major changes are happening in agricultural and food markets due to globalization, economic liberalization and urbanization (Tsakok, 2011). In Africa, there is a large potential for improvements in agricultural production and market development since Africa has more than half of the world's uncultivated but agriculturally suitable land and has scarcely used its extensive water resources (World Bank, 2013).

Despite the large potential for improvements in agricultural productivity and market performance in Africa, especially given rapid overall economic growth, evidence on changes in domestic food value chains is still limited, possibly due to a lack of accurate and reliable data (Jerven, 2013).

An agricultural value chain can be considered as an economic unit of analysis of a particular commodity or group of commodities that encompasses a meaningful grouping of economic activities that are linked vertically by market relationships. The emphasis is on the relationships between networks of input suppliers, producers, traders, processors and distributors (UNCTAD, 2010).

The application of value chain analysis in agriculture is growing due to market failure and non competitive setting of small scale agricultural production. Value chain and innovations are also interlinked. Improvement in productivity and competitiveness of the value chain is the litmus test for value chain innovation (Anandajayasekeram and Gebremedhin, 2009).

Agricultural value chains link urban consumption with rural production. Changing demand, as a consequence of urbanization, emergence of modern consumption patterns or new trends in international trade, impacts on rural areas along value chains and spills over to marketing and production systems. These rural urban linkages bear challenges but also

mutual benefits for producers and consumers and can be promising entry points for development interventions (Hoffer and Maingi, 2006). Many individuals have applied value chain approach on potato in Sub-saharan Africa in general and in Ethiopia in particular (for example, Addisu, 2016; Habtamu, 2015; Getachew, 2015; Abraham, 2013; Bezabih and Mengistu, 2011).

Potatoes are increasing in importance worldwide owing to their potential to boost the household food economy and income earning capabilities of producers (CIP, 2010). In most of the developing countries, potato is considered the fourth most important food crop after rice, wheat and maize. Since the second half of the 20th century, the relative importance of potato has slowly shifted from developed to developing countries although more potato is still being produced in the former than the latter countries (FAO, 2008).

Improvements in the potato production system can be a pathway out of poverty in Sub Saharan Africa, including Ethiopia. It is an excellent smallholder farmer crop in the highlands, with a short cropping cycle, potential for large yield per hectare, and serves as both a cash and food security crop. In Ethiopia, potato production can fill a gap in food supply during the hungry months of October to December before the grain crops are being harvested (CIP, 2013). In addition, potato is regarded as a high-potential food security crop because of its ability to provide a high yield of high-quality product per unit input with a shorter crop cycle than major cereal crops like maize (Adane *et al*., 2010).

Potato has been considered as a strategic crop by the Ethiopian government aiming at enhancing food security and economic benefits to the country. As the population grows rapidly, increased productivity of potatoes can improve the livelihood of smallholder potato producers and is required to meet the growing demand (Gildemacher, 2012). About 70% of the country's available agricultural land is located at an altitude of 1800-2500 m which is suitable for potato production (Bezabih and Mengistu, 2011).

Jeldu district is one of the districts of West Shewa zone of Oromia National Regional State. Potato is produced by almost all farmers of Jeldu highlands. Potato is grown for both food and source of cash in the study area. The sector faces different problems in the study area. Market prices are volatile, input prices are high but output prices are low, no value addition and/or value chain is developed, and farmers are not benefiting. Therefore, this study aims to analyze the whole potato value chain in the study area and anybody interested in the

study area can use this research as a basis for development intervention or for further research.

1.2. Statement of the Problem

Ethiopia suffers from weak market linkages on both the input and output sides. Farmers either cannot afford improved inputs or lack the knowledge to use them. Weak systems connect agricultural outputs to processors and numerous barriers exist that prevent quality products from reaching end users, such as insufficient packaging and storing, inability of Ethiopian products to meet international market standards, and restrictive trade regulations (USAID, 2011).

According to Bonabana (2013), market-oriented farmers play a significant role in the rural agricultural sector. However, these farmers are often disadvantaged by limited access to information, services, appropriate technology and capital. These factors restrict their capacity to effectively participate in the marketing of their produce. Therefore, they end up earning little margins while giant chain actors along the chain like middlemen have the power to determine prices paid by the final consumer and thus extract huge marketing margins.

Vegetables value chain study conducted in Habro and Kombolcha districts by Abraham (2013) identified different problems on the chain. The major constraints hindering the development of vegetable value chain are lack of modern input supply, high postharvest losses, the limited power of price setting, the problem of supply shortage, lack of storage facility, problem in information flow, low product quality, lack of support from concerned bodies, high monopolistic power of wholesalers, high travel distance, lack of processing and long chain condition of the market.

The study conducted in Uganda by Christopher *et al*. (2014) provided that failure of farmers to access information and lack of access to village market arrangements seemed to crowd out many of them from making decisions to enter the potato market to sell. Results also revealed that once a smallholder farmer decides to enter the market to sell, household characteristics and farmer endowments are the key factors that influence how much will be supplied to the market.

A number of studies carried out in different regions of the country on potato value chain regarding mapping of actors, marketing margins, gender role, opportunities and constraints, factors affecting participation, and extent of participation of farmers in the value chain, and the likes (for example, Bezabih, 2008; Addisu, 2016; Habtamu, 2015; Getachew, 2015; Abraham, 2013; Bezabih and Mengistu, 2011). However, unavailability of location specific prior study on potato value chain hinders the potential gain that could have been attained from the existing opportunities. In the study area also there is a limited research on potato value chain with the exception of the research conducted by Getachew (2015) on potato seed tuber value chain. In this regard, ware potato value chain analysis has become an interesting process that has not been undertaken as well in the study area.

Therefore, this study aims to bridge the prevailing knowledge gap in the study area through mapping the value chain of potato, assessing constraints and opportunities of potato value chain, assessing the profit margin of the major actors under various marketing channels, and identifying factors determining the quantity of potato supplied to the market by potato producers.

So, this study intends to answer the following key research questions:

1. What does potato value chain map look like in the study area?
2. What are the alternative potato market channels in the study area?
3. What are the factors affecting the quantity of potato supplied to the market by the farmers in the study area?
4. Who are the actors in potato value chain? What are their roles along different marketing channels?
5. What are the constraints and opportunities of potato value chain in the study area?

1.3. Objectives of the Study

The overall objective of this study is to undertake potato value chain analysis in Jeldu district.

The specific objectives are the following:

1. To map potato value chain actors, their roles and linkages among them;
2. To analyze factors affecting the quantity of potato supplied to the market by farmers in the study area;
3. To assess the profit margin of the major actors under various marketing channels; and
4. To assess the constraints and opportunities of potato value chain in the study area.

1.4. Significances of the Study

The study analyzed the entire potato value chain from input suppliers to the end consumers. The study generated valuable information regarding factors determining the variability of the quantity sales among potato producers households, constraints hindering potato value chain development and opportunities exist, potato market structure, market conduct and performance. The findings of the study are useful to government and non-governmental organizations, input suppliers, farmers, traders, consumers, and marketing agents to make their respective decisions. The findings of the study also help development practitioners to develop appropriate interventions which help smallholder farmers. Furthermore, it may also serve as a reference material for further research on similar topics.

1.5. Scope and Limitations of the Study

This study was undertaken in Jeldu district of West Shewa zone of Oromia, Ethiopia. The study focused on mapping potato value chain, identifying actors and their roles, assessing marketing margins and profit shares of major actors under various marketing channels, identifying constraints and opportunities of potato value chain, analyze factors affecting the quantity of potato supplied to the market by farmers. Important data was collected from 179 sample respondents (potato producers, traders and consumers) and other actors in the chain.

Due to financial, time and other resource limitations the study is limited to only one district. The study is also limited to cross-sectional data. The study did not also included regional markets. Despite, these limitations the study provides valuable information to government and NGOs interested in the study area.

1.6. Organization of the Thesis

The Thesis is divided into five chapters. The remaining part is organized as follows: The second chapter presents review of theoretical and empirical evidences related to the study. In the third chapter, research methodology (description of the study area, data types and sources, methods of data collection, sampling techniques and methods of data analysis) are discussed. The fourth chapter discussed the main findings of the study (descriptive, value chain analysis and econometric results) in detail. Chapter five summarizes the main findings of the study and draws conclusions and policy implications.

2. LITERATURE REVIEW

This chapter presents review of literature on definition of basic terms, value chain, value chain analysis, the need for value chain analysis, approaches of value chain analysis, approaches to study agricultural marketing problems, and history of potato production in Ethiopia. It also reviews empirical studies on value chain approach and the determinants of quantity supplied to the market by producers. Finally it presents the conceptual framework of the study.

2.1. Definitions of Basic Terms and Value Chain

Chain: It is a linked set of value-added activities and also it represents the entire input-output process that brings a product or service from initial conception to the consumers' hand. The main segments in the chain vary according to the industry, but typically these include: research and design, inputs, production, distribution and marketing, sales, and in some cases the recycling of products after use. A typical chain includes all of a product's stages of development, from its design to its sourced raw materials and intermediate inputs, its distribution, and its support to the final consumer (McCormick and Schmitz, 2002).

S**upply chain:** It is taken to mean the physical flow of goods that are required for raw materials to be transformed into finished products. Supply chain management is about making the chain as efficient as possible through better flow scheduling and resource use, improving quality control throughout the chain, reducing the risk associated with food safety and contamination, and decreasing the agricultural industry's response to changes in consumer demand for food attributes (Dunne, 2001).

Market chain: It is the term used to describe the various links that connect all the actors and transactions involved in the movement of agricultural goods from the producer to the consumer (CIAT, 2004 cited by Addisu 2016).

Value chain: The idea of a value chain was first suggested by Michael (1985) to depict how customer value accumulates along a chain of activities that lead to an end product or service. A value chain is considered to be a whole set of value-adding activities through which a product passes from its initial production to the eventual delivery of the final product to the consumer (Kanji *et al*., 2005). Kaplinsky and Morris (2000) put emphasis on

the aspect that a value chain incorporates business-related functions or activities such as production, transportation, transformation, processing, marketing, trading, retailing and consumption of a given product or service.

Dempsey (2006) explains value-chain as: "A value chain is a supply chain consisting of the input suppliers, producers, processors and buyers that bring a product from its conception to its end use. A value-chain approach to development seeks to address the major constraints at each level of the supply chain rather than concentrating on just one group (e.g. producers). Constraints often include lack of information about or weak connections to end markets, and/or inadequate coordination between actors. Taking a value chain approach is often essential to successful economic development since micro and small enterprises and smallholder farmers will only benefit over the long term if the industry as a whole is competitive".

Globalvaluechains.org, (2011) defined value chain as: "The full range of activities that firms and workers perform to bring a product from its conception to end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms".

Raikes *et al.* (2000) defined value chain as: the concept used to gain a more structured understanding of economic processes within production and distribution systems for agricultural commodities. An agricultural value chain can, therefore, be considered as an economic unit of analysis of a particular commodity (e.g. Potato) or group of commodities (e.g. vegetables) that encompasses a meaningful grouping of economic activities that are linked vertically by market relationships. The emphasis is on the relationships between networks of input suppliers, producers, traders, processors and distributors (UNCTAD, 2010).

"The value chain concept entails the addition of value as the product progresses from input suppliers to producers and consumers. A value chain, therefore, incorporates productive transformation and value addition at each stage of the value chain. At each stage in the value chain, the product changes hands through chain actors, transaction costs are incurred, and generally, some form of value is added. Value addition results from diverse activities including bulking, cleaning, grading, and packaging, transporting, storing and processing"

(Anandajayasekeram and Berhanu, 2009) as shown in Figure 1 for the case of a typical agricultural value chain.

Figure 1: Typical agricultural value chain and associated business development services

Source: Adapted from Anandajayasekeram and Berhanu (2009)

Value chain actors: These are those involved in producing, processing, trading or consuming a particular agricultural product. They include direct chain actors which are commercially in the chain; producers, traders, retailers, consumers and indirect actors which provide financial or non financial support service, such as bank and credit agencies, business service providers, government, researchers and extensions (Kit *et al.,* 2006).

Value addition: Value addition is simply the act of adding value to a product, whether you have grown the initial product or not. It involves taking any product from one level to the next (Fleming, 2005). It refers to increasing the customer value offered by a product or service. It is an innovation that enhances or improves (in the opinion of the consumer) an existing product or introduces new products or new product uses. Adding value does not necessarily involve altering product; it can be the adoption of new production or handling methods that increase a farmer's capacity and reliability in meeting market demand. For farmers, value addition has a particular importance in that it offers a strategy for transforming an unprofitable enterprise into a profitable one. The farmer is not only involved in production of a raw commodity but also takes part in value addition and distribution. This allows the farmer to create new markets or differentiate a product from others and thus gain advantage over competitors.

Value added: Value is added to the product as it passes through the chain by value-adding activities, which creates this benefit. Value-added is determined by the difference between the cost of the inputs and outputs at each stage of the chain.

Marketable surplus: It is the quantity of the produce left out after meeting the farmers' consumption and utilization requirements for kind payments and other obligations such as gifts, donation, charity, etc. Thus, marketable surplus shows the quantity left out for sale.

Marketed surplus: It shows the quantity actually sold after accounting for losses and retention by the farmers, if any and adding the previous stock left out for sale. Thus, marketed surplus may be equal to marketable surplus, it may be less if the entire marketable surplus is not sold out and the farmers retain some stock and if losses are incurred at the farm or during transit (Thakur *et al.,* 1997*)*.

Marketing channels: It is a business structure of interdependent organizations that reach from the point of product or origin to the consumer with the purpose of moving products to their final consumption or destination (Kotler and Armstong, 2003). This channel may be short or long depending on kind and quality of the product marketed, available marketing services, and prevailing social and physical environment (Islam *et al*., 2001).

Marketing costs: Marketing costs are the embodiment of barriers to access to market participation by resource poor smallholders. It refers to those costs, which are incurred to perform various processes along different channels. Further, marketing costs like handling cost (labour, loading and unloading, costs of damage, transportation and etc.) to reach an agreement, transferring the product, monitoring the agreement to see that its conditions are fulfilled, and enforcing the exchange agreement (Holloway *et al.,* 2002).

Marketing margins: Marketing margin is defined as the difference between the price the consumer pays and the price that is obtained by producers, or as the price of a collection of marketing services, which is the outcome of the demand for and supply of such services (Cramers and Jensen, 1982). The size of marketing margin is largely dependent upon a combination of the quality and quantity of marketing services provided the cost of providing such services, and the efficiency with which they are undertaken and priced. For instance, a big margin may result in little or no profit or even a loss for the seller involved

depending upon the marketing costs as well as on the selling and buying prices (Mendoza, 1995).

Analyzing market margins is an important means of assessing the efficiency of price formation in and transmission through the system. There are three methods generally used in estimating marketing margin: (1) detailed analyses of the accounts of trading firms at each stage of the marketing channel (time lag method); (2) computations of share of the consumer's price obtained by producers and traders at each stage of the marketing chain; and (3) concurrent method: comparison of prices at different levels of marketing over the same period of time (Mendoza, 1995; Scarborough and Kydd, 1992).

2.2. Value Chain Analysis

According to PZCT (2010), value chain analysis involves critical examination of a value chain to determine the value added, the stage it is added and at what cost with the aim of improving the chain to create more value hence more benefits to the value chain participants. The goal of value chain analysis is to improve efficiency and profitability in the chain by tackling challenges and taking advantage of opportunities. Ultimately, value is added or created through innovation and intervention in production, processing and marketing. Practitioners contend that detailed analysis helps to challenge the assumptions that often underpin development interventions. Jensen (2009) argues that the analysis should be market driven to ensure the proper amount of investment is done.

Value chain analysis is used to analyze, coordinate and optimize linkages between activities in the value chain, by focusing on the interdependence between these activities (Abele *et al.,* 2011). Value chain analysis gives us a framework of activities those inside and outside a firm, and makes the competitive strength of the firm combine together. So, it assesses the value of each activity which increases the products and services to a firm. The ability to perform particular activities and to manage the linkages between these activities is a source of competitive advantage. Value chain analysis forms an important tool to examine structural change.

Value chain analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationships; determining the chain

governance, or leadership, to facilitate chain formation and strengthening; and identifying value adding activities in the chain and assigning costs and added value to each of those activities. The flows of goods, information and finance through the various stages of the chain are evaluated in order to detect problems or identify opportunities to improve the contribution of specific actors and the overall performance of the chain.

Furthermore, value chain analysis looks at all activities related to the production, transformation, processing and trading activities until the final consumption of a product, and the external factors which influence the market chain of a product (Kusters *et al*., 2006; Belcher, 2005).

2.2.1. Major Concepts Guiding Value Chain Analysis

There are four major key concepts guiding agricultural value chain analysis (Anandajayasekeram and Berhanu, 2009; Kaplinsky and Morris, 2000). These are effective demand, production, value chain governance and upgrading:

2.2.1.1. Effective demand

Agricultural value chain analysis views effective demand as the force that pulls goods and services through the vertical system. Hence, value chain analysis need to understand the dynamics of how demand is changing at both domestic and international markets, and the implications for value chain organization and performance. Value chain analysis also needs to examine barriers to the transmission of information in the changing nature of demand and incentives back to producers at various levels of the value chain (MSPA, 2010).

2.2.1.2. Production

In agricultural value chain analysis, a stage of production can be referred to as any operating stage capable of producing a saleable product serving as an input to the next stage in the chain or for final consumption or use. Typical value chain linkages include input supply, production, assembly, transport, storage, processing, wholesaling, retailing, and utilization, with exportation included as a major stage for products destined for international markets. A stage of production in a value chain performs a function that makes significant contribution to the effective operation of the value chain and in the process adds value (Anandajayasekeram and Berhanu, 2009).

For a long time, sector analyses have been used to measure the different economic aspects of production. However, sector analyses have not been without weaknesses. In particular, sector analysis tends to be static and suffers from the weakness of its own bounded parameters. Such analysis struggles to deal with dynamic linkages between productive activities that go beyond that particular sector (Kaplinsky and Morris, 2000). By going beyond the traditional narrow focus on production, value chain analysis scrutinizes interactions and synergies among actors. Thus, it overcomes several limitations of traditional sector assessments.

2.2.1.3. Governance

Governance is a central concept to value chain analysis, and can be defined as non- market coordination of economic activity. Governance ensures that interaction between firms along a value chain exhibit some reflection of organization rather than being simply random (Rounder, 2004). Another important feature of governance is that it involves the ability of one firm in the chain to influence or determine the activities of other firms in the chain. This influence can extend to defining the products to be produced by suppliers. This power is exercised through the lead firms control over key resources needed in the chain, decisions about entry to and exit from the chain and monitoring of suppliers. Humphrey and Schmitz (2000) argue that the issue of governance in value chain is important for market access, fast track to acquisition of production possibilities, distribution of gains, leverage points for policy initiatives, and channel for technical assistance.

Chain governance should also be viewed in terms of 'richness' and 'reach', *i.e.,* in terms of its depth and pervasiveness (Evans and Wurster, 2000). Richness or depth of value chain governance refers to the extent to which governance affects the core activities of individual actors in the chain. Reach or pervasiveness refers to how widely the governance is applied and whether or not competing bases of power exists. In the real world, value chains may be subject to multiplicity of governance structure, often laying down conflicting rules to the poor producers (MSPA, 2010).

Value chains can be classified into two based on the governance structures, governance was described broadly in terms of "buyer-driven" or "producer-driven" chains (Gereffi, 1994). Analysis of buyer-driven chains highlights the powerful role of large retailers, as well as highly successfully branded merchandisers, in dictating the way the chains are

operated by requiring suppliers to meet certain standards and protocols, despite limited or no production capabilities. Moreover, buyer-driven chains are usually labor intensive industries, and so more important in international development and agriculture. In such industries, buyers undertake the lead coordination activities and influence product specification.

Producer-driven chains are more vertically integrated along all segments of the supply chain and leverage the technological or scale advantages of integrated suppliers. In producer-driven value chains which are more capital intensive, key producers in the chain, usually controlling key technologies, influence product specifications and play the lead role in coordinating the various links. Some chains may involve both producer and buyer driven governance. Yet in further works (Humphrey and Schmitz, 2002; Gibbon and Ponte, 2005) it is argued that governance, in the sense of a clear dominance structure, is not necessary a constitutive element of value chains. Some value chains may exhibit no governance at all, or very thin governance. In most value chains, there may be multiple points of governance, involved in setting rules, monitoring performance and/or assisting producers.

2.2.1.4. Value chain upgrading

Upgrading refers to the acquisition of technological capabilities and market linkages that enable firms to improve their competitiveness and move into higher-value activities (Kaplinsky and Morris, 2000). Upgrading entails not only improvements in products, but also investments in people, knowhow, processes, equipment and favorable work conditions. Four types of upgrading have been identified (Humphrey and Schmitz, 2002):

Process upgrading: Increasing the efficiency of internal processes such that these are significantly better than those of rivals, both within individual links in the chain, and between the links in the chain.

Product upgrading: Introducing new products or improving old products faster than rivals. This involves changing new product development processes both within individual links in the value chain and in the relationship between different chain links.

Functional upgrading: Increasing value added by changing the mix of activities conducted within the firm or moving the locus of activities to different links in the value chain.

Chain upgrading: Moving to a new value chain. For example, Taiwanese firms moved from the manufacture of transistor radios to calculators, to TVs, to computer monitors, and to laptops.

2.2.2. The Need for Value Chain Analysis

Many studies have been conducted on agricultural value analysis. Value chain analysis is conducted for many purposes; some of the importances of value chain analysis are the following:

Anandajayasekeram and Berhanu (2009) pointed out that, the primary purpose of value chain analysis is to understand the reasons for inefficiencies in the chain and identify potential leverage points for improving the performance of the chain, using both qualitative and quantitative data.

Value chain is useful as a poverty-reduction tool if it leads to increase on and off farm rural employment and income. Increased agricultural productivity alone is not a sufficient route out of poverty within a context of globalization and increasing natural resource degradation. A focus on post-harvest activities, differentiated value added products and increasing links with access to markets for goods produced by low-income producers would appear to be the strategy open to smallholders (Lundy *et al*., 2002).

Value chain analysis is a useful analytical tool that helps to understand overall trends of industrial reorganization and identify change agents and leverage points for policy and technical interventions. It is increasingly used by donors and development assistance agencies, to better target their support and investments in various areas such as trade capacity, enterprise competitiveness, income distribution and equity among value chain participants (UNIDO, 2009).

Traditionally, little attention has been paid to the value chains by which agricultural products reach final consumers and to the intrinsic potential of such chains to generate

value added and employment opportunities. While high-income countries add nearly US$185 of value by processing one tone of agricultural products, developing countries add approximately US$40. Furthermore, while 98 percent of agricultural production in high-income countries undergoes industrial processing, barely 38 percent is processed in developing countries. These indicate that well developed agro-value chains can utilize the full potential of the agricultural sector (UNIDO, 2009).

Therefore, by going beyond the traditional narrow focus on production, value chain analysis scrutinizes interactions and synergies among actors and between them and the business and policy environment. Thus, it overcomes several important limitations of traditional sector assessments which tend to ignore the dynamic linkages with and among productive activities that occur outside the particular sector under assessment or involve informal operations.

2.2.3. Approaches of Value Chain Analysis

The global agro-industry business is increasingly dominated by value chain relationships in which lead firms exercise vertical coordination (Humphrey and Memedovic, 2006). For instance, in various food industry operations, lead firms have taken on the attributes associated with modern manufacturing, including driving product differentiation and innovation, a shift from quality control, based on inspection and testing, towards quality assurance, based on risk management and process control, and just-in-time delivery.

These changing environments associated with evolving markets highlight a number of constraints and opportunities for various actors involved in value chain development. Most important is the need for a careful review of policy issues that may have an impact on the structure and development of value chains, especially policies that support pro-poor value chains. This is particularly relevant for agro-value chains in developing countries, often characterized by the prevalence of traditional social norms and ties in which the poor may be negatively affected by chain actors and/or promoted activities. In addition, value chain structures can be used to draw conclusions on the participation of the poor and the potential impact that value chain promotion can have on poverty reduction.

Humphrey and Memedovic (2006) grouped such promotion policies in three broad areas of focus: (i) ensuring the continued access of agro-producers to global markets and supporting

the competitiveness of the sector; (ii) increasing revenues from the agro-industrial sector, particularly through adding value both for local and export markets; and (iii) enhancing the poverty alleviation impact of export-oriented businesses.

Agro-value chains encompass activities that take place at various levels (farm, rural and urban), starting with input supply and continuing through product handling, processing, distribution and recycling. As products move successively through the various stages, transactions take place between multiple chain actors, money and information are exchanged and value is progressively added (Da Silva and De Suza Filho, 2007). The analysis of such value chains highlights the need for enterprise development, enhancement of product quality and safety, quantitative measurement of value addition along the chain, promotion of coordinated linkages among producers, processors and retailers, and improvement of the competitive position of individual enterprises in the marketplace.

This approach goes beyond looking at agro-industrial production in isolation to scrutinize interactions and synergies with other actors and the business and policy environment. By revealing strengths and weaknesses, value chain analysis helps identify possible corrective measures. Stakeholders and policy-makers develop a shared vision of how the value chain should develop and forge collaborative relationships which will improve coordination and performance in the future. In addition, this approach brings together the various levels and components of potentially upgrading chain interventions.

While there are a number of published handbooks on value chain research, Kaplinsky and Morris (2000) stress that there is no “definite” method to carry out a value chain analysis. Basically, the methodology to be applied relies on the research questions that are to be answered. This fact is due to the complexity of value chains, especially in the middle tiers. Moreover, individual enterprises may feed into numerous chains; hence, which chain (or chains) is/are to be targeted depends largely on the point of entry for the research inquiry.

Nonetheless, the following four steps of value chain analysis, summarized by M4P (2008), are essential when applied to the agricultural/agro-industrial sector:

1. Mapping the value chain to understand the characteristics of the chain actors and the relationships among them, including the study of all actors in the chain, of the flow of goods through the chain, of employment features, and of the destination and volumes of

domestic and foreign sales. This information can be obtained by conducting surveys, interviews and participatory workshops as well as by collecting secondary data from various sources.

2. Identifying the distribution of actors' benefits in the chain. This involves analyzing the margins and profits within the chain and therefore determining who benefits from participating in the chain and who would need support to improve performance and gains. In the prevailing context of market liberalization, this step is particularly important, since the poor involved in value chain promotion projects are the most vulnerable.

3. Defining upgrading needs within the chain. By assessing profitability within the chain and identifying chain constraints, upgrading solutions can be defined. These may include interventions to: (i) improve product design and quality and move into more sophisticated product lines to gain higher value and/or diversify production; (ii) reorganize the production system or invest in new technology to upgrade the process and enhance chain efficiencies; (iii) introduce new functions in the chain to increase the overall skill content of activities; and (iv) adopt the knowledge gained in particular chain functions in order to redeploy it in other sectors.

4. Emphasizing the governance role. Within the concept of value chain, governance defines the structure of relationships and coordination mechanisms that exist among chain actors. By focusing on governance, the analysis identifies institutional actors that may require support to improve capabilities in the value chain, increase value added in the sector and correct distributional distortions. Thus, governance constitutes a key factor in defining how the upgrading objectives can be achieved.

2.3. Approaches to the Study of Agricultural Marketing

Agricultural marketing problems vary from commodity to commodity largely due to the seasonality of production, the variations in its handling, storage, processing and the number of intermediaries involved in them. Marketing economists have developed various approaches to study agricultural marketing. The most commonly used approaches are functional, institutional, commodity and the structure-conduct-performance approaches.

2.3.1. 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 functional approach study the different activities performed in changing the farm product into the product desired by the consumers. These activities are called functions (Cramers and Jensen, 1982). There are three general types of functions performed in any marketing system. These are the exchange functions (buying and selling), physical functions (assembling, storing, transporting, processing, grading, handling and packing) and facilitating functions (standardization, financing, risk bearing and market intelligence).

2.3.2. Institutional Approach

The institutional approach examines agencies and institutions which performs various functions in the marketing process. It focuses on the study of the various institutions, middlemen and other agencies which add utility to the product. These organizations or market participants are those who perform the activities necessary to transfer goods from the producer to consumer, because of the benefit of specialization and scale that exist in marketing (Cramers and Jensen, 1982).

It is classified into five: Merchant middlemen, agent middlemen, facilitative organizations, processors and manufacturers (millers) and speculative middlemen. The question is that why the institutional approach? We are interested in the institutional approach because middlemen's specialization in performing a specific marketing functions leads to improvement in productivity and hence a decreased cost. This in turn results in price fall adding to the overall efficiency of the market. The second reason is the gains from specialization. Marketing functions are marked by economies of scale. Hence specialization reduces cost and hence improves efficiency. Average cost of performing marketing functions falls as the volume of products handled rises. Finally middlemen reduces market search and transaction costs.

2.3.3. 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. This

approach focuses on what is being done to the product after its transfer from its original production place to the consumer (Kohls and Uhl, 1985). It helps to pinpoint the specific marketing problems of each commodity as well as 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. It combines both functional and institutional approaches.

2.4. The Structure-Conduct-Performance (S-C-P) Approach

The Structure-Conduct-Performance (S-C-P) approach sometimes called the traditional industrial organization was a principal approach to study the industrial organization (IO) during the second half of the 20th century. It was recognized as one of the most efficient and reliable means to analyze an industry or more specifically, the market power-profitability relationship in an industry. By industrial organization we mean a body of economic research which studies how firms and markets are organized, their interaction, and how this interaction affects market outcomes, and ultimately society's welfare. It is an analytical approach used to study how the structure of the market and the behavior of sellers affect the performance of markets.

2.4.1. Market Structure

The term market structure refers to the number of buyers and sellers, their size, distribution, the degree of product differentiation, and the ease of entry of new firms into an industry (Cramer and Jensen, 1982). Market structure can also be defined as characteristics of the organization of a market, which seem to strategically influence the nature of competition and pricing behavior within the market. Structural characteristics may be used as a basis for classifying markets. Accordingly, markets may be perfectly competitive, monopolistic, monopolistic competitive or oligopolistic (Scott, 1995).

2.4.2. Market Conduct

Market conduct refers to the patterns of behavior that traders and other market participants adopt to affect or adjust to the markets in which they sell or buy. These include price setting behavior, buying and selling practices. The variables used to capture firm behavior include pricing strategies, collusion, advertising, research and development and capacity investment (USAID, 2008a).

2.4.3. Market Performance

Market performance refers to the extent to which markets result in outcomes that are deemed good or preferred by society. Market performance refers to how well the market fulfills certain social and private objectives. For example, regular and predictable availability of basic commodities at affordable prices is generally considered a desirable outcome. Other desirable outcomes would be that traders do not obtain excessive profits, and that commodities meet certain sanitary standards. In addition, prices paid by consumers should not be excessively above the cost of marketing, processing and transaction costs for a given commodity, and the prices received by producers should cover their costs of production (USAID, 2008b). A commonly used measure of market performance is the marketing margin or price spread. Margin or price spread can be useful descriptive statistics if it is used to show how the consumer's food price is divided among the participants at different levels of marketing system.

2.5. Potato Production in Ethiopia: An Overview

Following the introduction of potato to Ethiopia in 1858 by a German immigrant, Wilhelm Schimper, adoption by Ethiopian farmers occurred very gradually for several decades (Kidane, 1980). The first available potatoes were probably of a very limited genetic base, hence vulnerable to diseases and pests. Cultivation was limited to potatoes growing voluntarily in fields in the colder highlands until wider adoption of the potato occurred at the end of the nineteenth century in response to a prolonged famine (Medhin *et al.,* 2001 cited by Habtamu 2015).

In 2014/15 cropping season in Ethiopia, approximately 1,288,146 farmers grew potato in mid and highland of the country in which potato covered more than 0.45% of the area under all crops and contributed 2.24% to the total volume produced of all crops in the country. Nevertheless, potato account for 31.05% of the total area of the root crop and 16.88% of the total root crop production (CSA, 2015).

In Ethiopia, the main production season for potato, at altitudes higher than 2,500 m a.s.l. is June to September (*Meher*). The off-season production for Ethiopia at higher elevations is February to May (*Belg*). The average potato production throughout Ethiopia is 8–10 t/ha.

This is a relatively low average, especially when considering the potential of Ethiopia, with its favorable climate at higher elevations, soils and irrigation potential (EHDA, 2011).

In Ethiopia, potato is grown in four major areas: the Central, the Eastern, the North-Western and the Southern regions, which together constitute approximately 83% of the potato farmers in the country (CSA, 2009).

In the central area, potato production includes high areas surrounding Addis Ababa. In this area the major potato growing zones are west Shewa and north Shewa where about 10% of the potato farmers are located in this area (CSA, 2009). Average productivity of a potato crop in the central area ranges from 8 to 10 ton per hectare which is higher than the productivity in the North-western and Southern areas. This higher productivity might be due to the use of improved varieties and practices obtained from Holota Agricultural Research Centre in the central area.

In the central area potato is produced mainly in the *Belg* (short rainy season February to May) and *Meher* (long rainy season June to October) periods. Potato is also grown off-season under irrigation (October to January). Because of the cool climate and access to improved varieties, farmers in this area of the country also produce seed potatoes which are sold to other farmers in the vicinity or to NGOs and Agricultural Bureaus to be disseminated to distant farmers. In the central area, farmers grow about seven local varieties and six clones (i.e. genetic material which is not officially released) (Adane *et al*., 2010).

The eastern area of potato production mainly covers the eastern highlands of Ethiopia, especially the Hararghe Zone. Only about 3% of the total number of smallholder potato producing farmers in Ethiopia live in this area (CSA, 2009). However, majority of farmers in this area produce potato for the market and also farmers have also access to export markets in Djibouti and Somalia. Potato is mainly grown under irrigation in the dry season (December to April).

The North-west area of potato production is situated in the Amhara region. South Gonder, North Gonder, East Gojam, West Gojam and Agew Awi are the major potato production zones in the region. Productivity ranges from 7 to 8 ton per hectare.

The Southern area, in which potato is grown, is mainly located in the Southern Nation, Nationalities and Peoples Regional State (SNNPRS) and partly in the Oromia Region which comprises all processes and activities (land preparation through harvesting) undertaken to produce ware or seed potatoes.

The potato producing zones in Southern area are; Hadiya, Gurage, Gamogoffa, Wolaita, Kembata, Siltie, and Sidama in SNNPRS and West Arsi zone in Oromia. More than 30% of the total potato farmers in the country are located in this area (CSA, 2009). Productivity usually ranges from 7 to 8 ton per hectare. In SNNPRS about six varieties are grown, of which four are local and two are improved (Endale *et al.,* 2008).

2.6. Review of Empirical Studies

2.6.1. Value Chain Approach

Most poverty reduction strategies in developing countries are predicated on improving agricultural production and promoting market access and integration of smallholder producers in formal market exchange. Research has shown at both conceptual and empirical levels the potential benefits of such a market-driven perspective (Barrett, 2007). Development practitioners make extensive use of the value chain concept for the design of market-driven rural development projects and strategies. It is also widely used by researchers, as shown by the increasing number of publications (Fasse *et al*., 2009).

There are a number of studies that have employed the value chain approach to agricultural commodities. Fitter and Kaplinsky (2001) used a value chain analysis to examine inter-country distributional outcomes of the global coffee sector by mapping input-output relations and identifying power asymmetries along the coffee value chain. Their study showed that returns to product differentiation taking place in the face of globalization do not accrue to the coffee producers. They also found that power in the coffee value chain was asymmetrical. At the importing end of the chain, importers, roasters and retailers compete with each other for a share of value chain rents but combine to ensure that few of the rents return to the farmer or the producer country.

Addisu (2016) conducted a value chain analysis of potato and onion in Ejere district of West Shewa zone, Oromia. He identified different constraints hindering value chain

development at various stages. These include: input supply constraints such as shortage of good quality seed, herbicides/pesticides, farm implements and high cost of inputs; production constraints such as low irrigation facility, diseases and pest attacks, lack of storage and high post-harvest loss; marketing constraints such as poor transport facility, price setting problem, presence of unlicensed traders, low price of the product, limited market research and credit services; lack of processing facility (at processing stage) and income shortage, lack of consumers' cooperatives and high price of the product at consumption stage.

Habtamu (2015) conducted value chain on potato in Hadiya zone, Ethiopia. He identified different constraints that hinder potato value chain development at each stage of the chain. He found that; shortage of quality seed, fertilizer, chemicals, limited production and irrigation access to utilize family labour, and lack of capital are the main factors which affect production of potato. He also found that lack of improved storage facility, poor road and transport facilities, low skill in post harvest technology, lack of market information, high market price instability, and lack of interaction among chain actors hinders the development of potato value chain.

Bezabeh and Mengistu (2011) have also undertaken potato value chain analysis in SNNPR and Tigray regions. They identified the major constraints in potato value chain: shortage of improved seed variety, damaged and spoiled seed due to poor transporting and handling, low yield, low irrigation facilities, poor disease control, perishability, low skill in post-harvest, etc.

Horticulture value chain study conducted in Eastern parts of Ethiopia identified different problems on the chain (Bezabih, 2008). The major constraints of marketing identified by the same study include lack of markets to absorb the production, low price for the products, large number of middlemen in the marketing system, lack of marketing institutions safeguarding farmers' interest and rights over their marketable produces (e.g. cooperatives), lack of coordination among producers to increase their bargaining power, poor product handling and packaging, imperfect pricing system and lack of transparency in market information communications.

The study conducted by Takemore *et al.* (2014) in Malawi and Mozambique on value chain analysis of vegetables found out lack of contract arrangements, lack of capital, poor

infrastructure, lack of processing services, poor packaging materials and services, and poor seed quality were factors that future interventions should address for the entire value chain and analysis of value chain constraints. According to EIAR and ARARI (2013) another constraint in the value chain is that farmers are, for various reasons, not applying the recommended good agricultural practices.

2.6.2. Determinants of Quantity Supplied to the Market by Farmers

Christopher *et al.* (2014) found that membership to a farmer group or cooperative is key factor in enhancing the volumes of potato sold. Abraham (2013) also argued that vegetable producers sold different amount of vegetables in the market depending on different demographic and socio-economic characteristics of the household.

According to Mebrat (2014) the ordinary least squares regressions (OLS) results indicated that tomato marketed surplus was significantly affected by current price of potato, farm size of the households, access to market information and distance to the nearest market.

Debela (2013) had used Tobit model to identify factors determine the quantity of onion supplied to the market by smallholder farmers in Fantalle district, East Shewa zone of Oromia. The results of the study indicated non-farm income of the households, total land size of the households, total quantity of onion produced and access to credit services affected positively and significantly the quantity of onion supplied to the market while total family size showed significant and negative relation with quantity of onion supplied to the market.

Mahilet (2013) applied two-stage least squares (2SLS) regression to analyze the determinants of marketable surplus of malt barley. Accordingly, the study found that marketable supply of malt barley were significantly affected by output of malt barley, selling price, market information and distance to the market. Berhanu *et al.* (2014) conducted study on factors affecting milk market participation and volume of supply in Ethiopia adopted Heckman two-stage selection model. This study pointed out that milk yield per day, dairy farming experiences and numbers of members in household significantly affected volume of milk supply.

Addisu (2016) had also used two-stage least squares (2SLS) regression to identify factors affecting the quantity of vegetables (potato and onion) supplied to the market. The results indicated that productivity of potato, sex of the household head, distance from the nearest market, off/non-farm income and land allocated for potato had significantly influenced quantity sales of potato. The result also indicated quantity of onion sales was significantly affected by yield of onion, education status of the household head, farming experience and area allocated for onion production.

Yeshitila (2012) used Heckman two step model to identify factors affecting market participation decision and level of participation by vegetables producing smallholder farmers of Kombolcha district, Hararge zone of Oromia Natioanl Regional State. The result of the study revealed that once the farmers decide to sale, variables like extension contact, access to irrigation, education level of the households, land holding and quantity of fertilizer applied had significantly affected quantity of vegetables (potato and cabbage) supplied to the market.

2.7. Conceptual Framework

The promotion of value chains in any business aims to improve the competitiveness of agriculture in national and international markets and to generate greater value added within the country or region. The key criterion in this context is broad impact, that means, growth that benefits the rural poor to the greatest possible extent, or at least, does not worsen their position relative to other groups.

In order to reduce unfair market and improve benefit share in the value chain, there is a need to identify major factors affecting quantity of potato supplied to the market, constraints and opportunities to help smallholder producers and other value chain actors. With this ground, the systematic representation of the conceptual framework applied for this study is represented below.

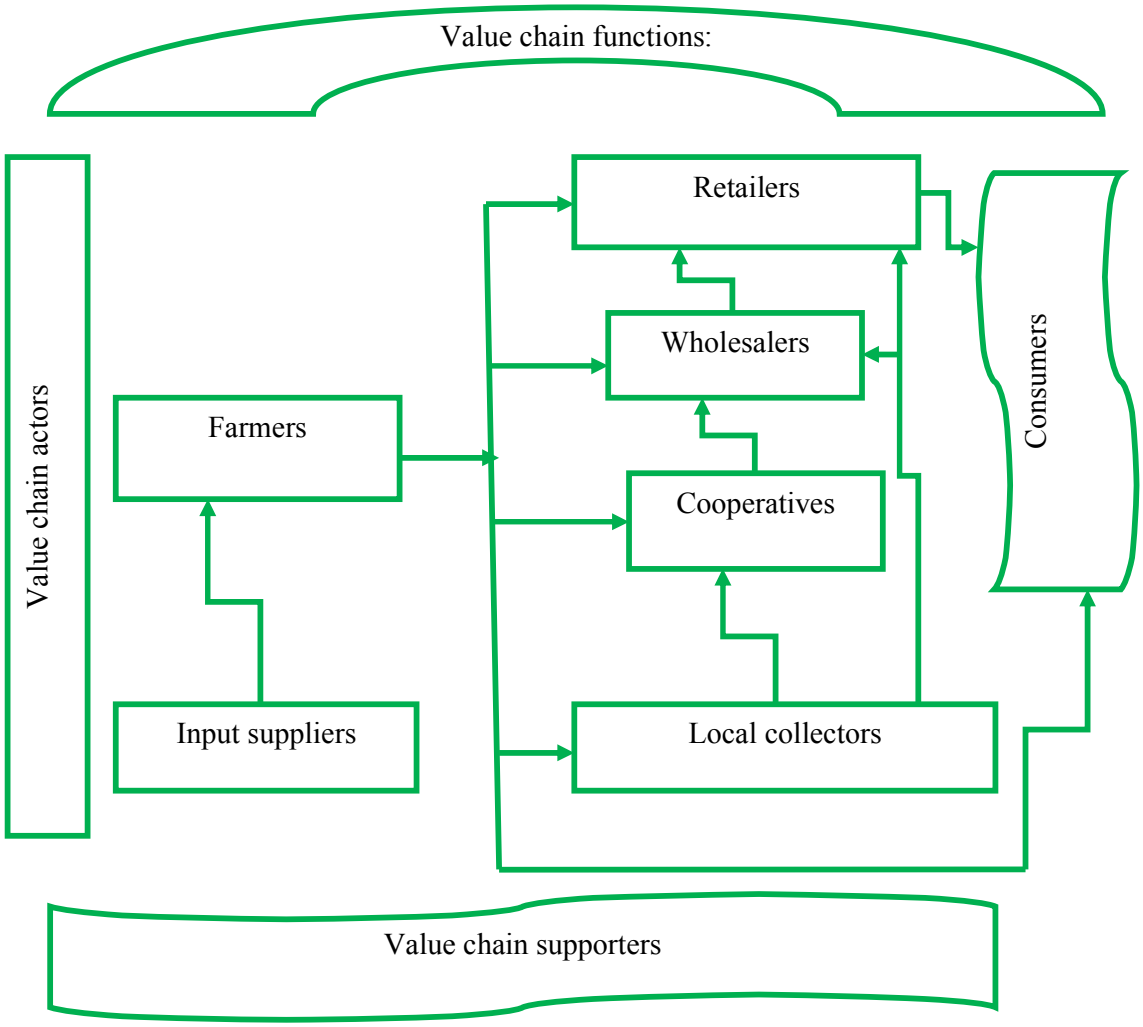

Figure 2: Conceptual framework of the study

Source: Own construction, 2016

3. RESEARCH METHODOLOGY

In this chapter, description of the study area, types and sources of data and methods of data collection, sampling method and sample size, methods of data analysis (descriptive statistics, value chain analysis and econometric analysis) are presented.

3.1. Description of the Study Area

This study was undertaken in central Ethiopian highland in one of the major potato growing districts, Jeldu district of West Shewa zone, Oromia National Regional State. The description of the district is given below.

Among the West Shewa zone districts, Jeldu is one district located at 72 km to the east of Ambo (zonal town) and 115 Km west of Addis Ababa. Jeldu district has 38 rural *kebeles* and four towns. The data obtained from district office of agriculture indicates that out of 38 rural *kebeles* of the district, potato is produced in 22 *kebeles*.

The topography of Jeldu district is mountain, plateau, hills and have three types of soil type such as nitosol, vertisol and sandy soil. Nitosol is the one which accounts for about 36.83% of the district's area coverage and got second place next to vertisol (42.1%). Therefore, most of the district's soil is vertisol which is suitable for production of various crops especially, potato. According to the data from Agriculture and Rural Development Office, the elevation of Jeldu district on average is 2800 m a.s.l. and receives the highest rainfall of 2000 mm and the lowest 900 mm annually. Currently, the major types of natural vegetation found in the district are woodland, shrub and bush and savanna.

According to the 2007 cencus, the total population of Jeldu district was 202655 people (CSA, 2008). Out of the total population, about 190,260 (93.88%) live in the rural areas while the remaining 12,395 (6.12%) live in the urban centers. Regarding the sex composition of the population of the district, about 102,796 (50.70%) were females and the remaining 99,859 (49.30%) were males.

In Jeldu district, agriculture contributes much to meet the major objectives of farmers such as food supplies and cash needs. The sector is characterized by its rain-fed and subsistence and small scale agriculture that is dependent on rainfall. The study area comprises mixed

farming where crops are grown for food and cash, and livestock are kept for complementary purpose, as a means of security during food shortage, and to meet farmers' cash needs. The dominant crops grown in the district are wheat, barley, teff, sorghum, maize, field beans, peas, chickpeas, potato, sweet potato, onion, garlic, enset, etc (Getachew, 2015).

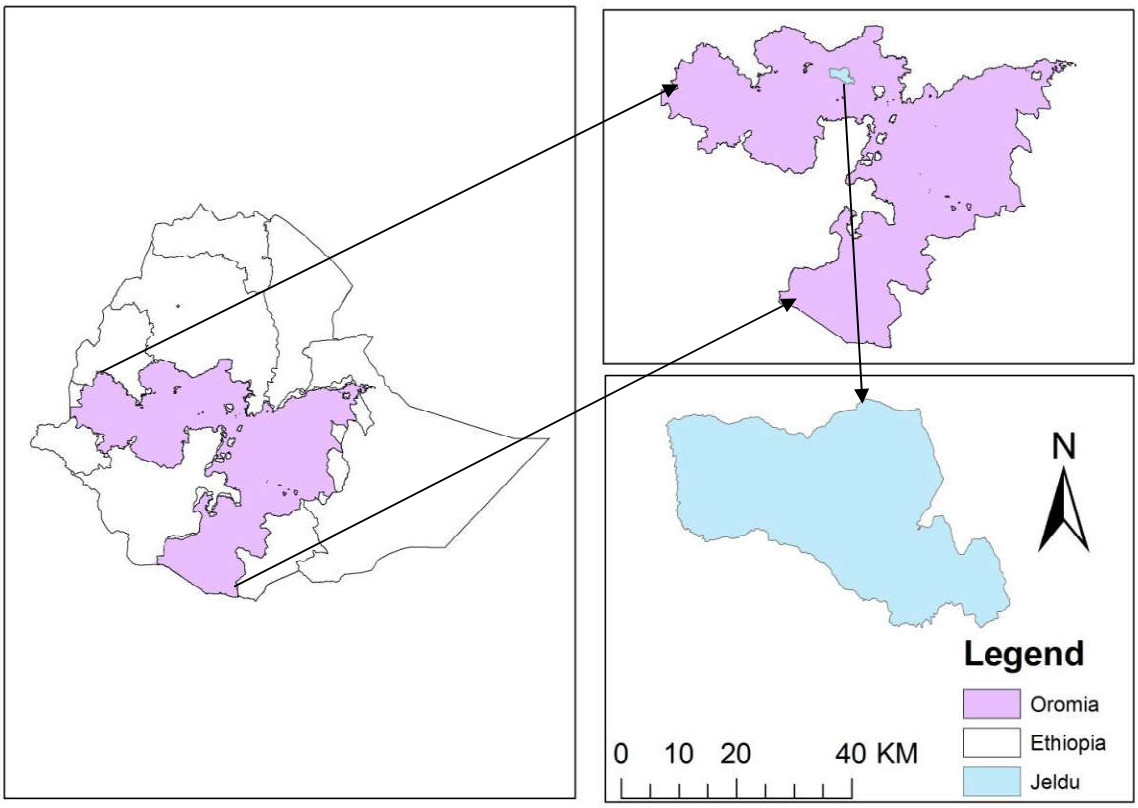

Figure 3: Geographical location of the study area

Source: Adapted from the Ethiopian map (Ethio-GIS)

3.2. Types and Sources of Data and Methods of Data Collection

In this study both primary and secondary data were used in order to address the research questions and objectives of the study. The sources of primary data were potato producer households, traders and consumers. Primary data were collected through surveys. The survey was undertaken through formal interview with randomly selected households, traders and consumers using a pre-tested structured and semi-structured questionnaire for each group.

Enumerators who have an accumulated experience in data collection were recruited and trained. Before data collection, the questionnaire was pre-tested on non-sample potato producer households and traders to evaluate the appropriateness of the design, clarity and relevance of the questions. After appropriate corrections were made on the questionnaire, data were collected under continuous supervision of the researcher. Secondary data sources were the Central Statistics Agency (CSA), District Office of Agriculture and Rural Development, District Revenue and Custom Authority Office, *kebele* administrations, published and unpublished journals, websites, internet, etc.

3.3. Sampling Method and Sample Size

In order to select a representative sample that represent the population, a two-stage sampling technique was used. In the first stage, in consultation with agriculture and rural development office of the district, out of 22 potato producing *kebeles* of the district, four *kebeles* namely Edensa Gelan, Tulu Bultuma, Chilanko and Kolu Gelan were selected randomly.

In the second stage, using the population list of the sample *kebeles*, 122 potato producer households were selected randomly using probability proportional to number of potato producer households from each sample *kebeles* (Table 1). The number of sample households was determined by using the following formula given by Yamane (1967). To determine the required sample size at 95% confidence level, with a 0.5 degree of variability and a 9% level of precision:

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

Where: n = is the desired sample size, N = is the total population of potato producer households in the district (14,234), and e = is the level of precision (9%).

Table 1: Distribution of sample potato producer households in the selected *kebeles*

Name of kebele	Number of households	Sample
Edensa Gelan	725	43
Tulu Bultuma	557	33
Chilanko	478	28
Kolu Gelan	310	18
Total	2070	122

Source: District Office of Agriculture and *kebeles'* administration, 2016 and own computation

In addition to farm households, sample respondents were also selected from the other value chain actors on the basis of their size and interviewed based on their respective functions in the chain. They include traders (local collectors, wholesalers and retailers) and consumers. The sites of traders were market towns available in Jeldu highlands in which good sample potato traders existed. Accordingly, two market sites (Gojjo and Shukute) were selected as the major marketing sites for the study area. Here, sampling was a very difficult task because of the absence of recorded information about the population of the traders. Based on information obtained from District Revenue and Custom Authority Office and informal survey, purposive sampling method was used to select rural collectors, retailers and wholesalers from the specified markets. As a result, 32 potato traders were selected and interviewed. Furthermore, 25 consumers (10 from Shukute and 15 from Gojjo) were selected and interviewed to obtain information related to consumers (Table 2).

Table 2: Distribution of traders and consumers included in the study

Traders	Shukute		Gojjo		Total	
	Available households	Sample	Available households	Sample	Available in both town	Sample
Collectors	4	4	10	7	14	11
Retailers	4	4	9	8	13	12
Wholesalers	0	0	10	9	10	9
Consumers	-	10	-	15	-	25

Source: District Revenue and Custom Authority Office, and own survey, 2016

3.4. Methods of Data Analysis

Three types of analysis, namely, descriptive, value chain analysis and econometric analysis were undertaken to address the research questions and objectives of the study.

3.4.1. Descriptive Analysis

This method of data analysis refers to the use of proportion, percentages, means, variances and standard deviations, ranking, etc. It was employed in the process of examining and describing marketing performance, farm household characteristics, traders' and consumers' characteristics.

3.4.2. Value Chain Analysis

Value chain analysis was used to identify and analyze roles and linkages among input suppliers, producers, traders, consumers and supporters. It is also used to map potato value chain, figure out marketing channels, constraints hindering potato value chain development and opportunities. Analyzing the performance of the market is necessary in agricultural value chain analysis. Market concentration and barriers to entry and exit were used to analyze the structure of the market. The conduct of the market was also analyzed by using traders' pricing strategies, traders' purchasing and selling strategies. Finally, the performance of potato market was evaluated by calculating marketing costs, margins and profit shares of the major actors under various marketing channels.

Market concentration

Concentration Ratio (CR)

The concentration ratio is a way of measuring the concentration of market share held by particular suppliers in a market. It is the percentage of total market sales accounted for by a given number of leading firms. Thus, a four-firm concentration ratio is the total market share of the four firms with the largest market shares. The greater degree of concentration is the greater the possibility of non-competitive behavior existing in the market. For an efficient market, there should be sufficient number of firms (buyers and sellers). It is calculated as:

$$\mathbf{CR} = \sum_{\mathbf{i=1}}^{\mathbf{m}} \mathbf{S_i} \qquad \boldsymbol{i = 1, 2, \dots, m} \qquad (\mathbf{1})$$

Where S_i represents market share of i^{th} firm and m is number of largest firms for which the ratio is going to be calculated.

Hirschman Herfindahl Index (HHI)

The other method of measuring market concentration is Hirschman Herfindahl Index designated by the formula:

$$\boldsymbol{HHI} = \sum_{\boldsymbol{i}}^{\boldsymbol{n}} \boldsymbol{S_i^2} \qquad \boldsymbol{i = 1, 2, \dots, n} \qquad (\mathbf{2})$$

Where: S_i = the percentage market share of i^{th} firm, and n = the total number of firms.

It considers the number and size distribution of all firms. In addition, squaring the individual market share gives more weight for the larger firms. A very small index indicates the presence of many firms of comparable size, while one or near one, suggests that the number of firms is small and/or that they have unequal shares in the market (Scarborough and Kydd, 1992).

In this study a four firm concentration ratio was used to analyze the concentration of the market. Moreover, district level concentration ratio has been computed as the numbers of traders were small in their respective villages.

Analysis of potato market performance

Estimates of the marketing margins are the best tools to analyze performance of the market. Marketing margin was calculated by taking the difference between producers and retail prices. The producers' share is the commonly employed ratio calculated mathematically as, the ratio of producers' price to consumers' price. Mathematically, producers' share can be expressed as:

$$\mathbf{PS} = \frac{\boldsymbol{pp}}{\boldsymbol{CP}} = \mathbf{1-}\ \frac{\boldsymbol{MM}}{\boldsymbol{CP}} \qquad \mathbf{(3)}$$

Where: PS = Producer's share, Pp = Producer's price, Cp = Consumer price, and MM = marketing margin. The above equation tells us that a higher marketing margin, diminishes

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

Total Gross Marketing Margin (TGMM): According to Mendoza (1995), the total gross marketing margin is done by using the following formula. Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as a percentage.

$$\mathbf{TGMM} = \frac{\text{Consumer price - Producer Price}}{\text{Consumer Price}} \times 100 \quad \textbf{(4)}$$

Net Marketing Margin (NMM): It is the percentage over the final price earned by the intermediary as his/her net income once his/her marketing costs are deducted. The equation tells us that a higher marketing margin diminishes the producer's share and vice-versa. It also provides an indication of welfare distribution among producers and marketing agents.

$$\mathbf{NMM} = \frac{\text{Gross Margin - Marketing Cost}}{\text{Consumer price}} \times 100 \quad \textbf{(5)}$$

3.4.3. Econometric Analysis

In this study multiple linear regression model was used to analyze factors affecting quantity of potato supplied to the market by sample households. This model is appropriate when the dependent variable is of a continuous type. Estimates of the parameters of the linear regression model were computed using the OLS estimation procedure.

However, when some of the assumptions of the Classical Linear Regression (CLR) model are violated, the parameter estimates of the above model may not be Best Linear Unbiased Estimator (BLUE). Thus, it is important to check the presence of heteroscedasticity, multicollinearity and endogeniety problem before fitting important variables into the regression model for analysis.

Multicollinearity problem arises due to a linear relationship among independent variables; and becomes difficult to identify the separate effect of independent variables on the dependent variable because of the existence of strong relationship among them (Gujarati, 2004). Variance inflation factors (VIF) has been used to check existence of

multicollinearity among independent variables included in the model. According to Gujarati (2004), VIF (X_j) can be defined as:

$$\text{VIF } (X_j) = \frac{1}{(1-R_j^2)}$$

Where, R_j is the multiple correlation coefficient between X_j and other independent variables. The rule of thumb is value of variance inflation factor (VIF) above ten indicate existence of collenearity among independent variables.

Hetroscedasticity is a situation in which variance of the disturbance term is not constant. If there is heteroscedasticity problem in the data set, the parameter estimates of the coefficients of the independent variables cannot be BLUE. In this study, Breusch-Pagan test of heteroscedasticity was employed for detecting heteroscedasticity.

The problem of endogeniety occurs when an independent variable is correlated with the disturbance term in the population data generating process, which causes, the ordinary least squares (OLS) estimators of the relevant model parameters to be biased and inconsistent. The source of endogeneity could be omitted variables, measurement error and simultaneity (Maddala, 2001). In this study, Durbin-Wu-Hausman (DWH) test was applied to check the presence of endogeneity. Quantity of potato produced was found to be endogenous. Therefore, to overcome endogeneity problem, two-stage least squares (2SLS) method has been used in identifying the determinants of quantity of potato supplied to the market. Two-stage least squares is similar to OLS except that it uses two completely separate stages during the analysis phase in order to avoid problems of endogeneity (Wooldridge, 2010).

Econometric model specification of supply function is the following:

$$Y_i = \beta_o + \delta Y_{1i} + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + U_i \quad \textbf{(6)}$$

This is structural equation, where:

Y_i = quantity of potato supplied to the market by household i

Y_{1i} = quantity of potato produced by the i^{th} household

X_{1i} = sex of the household head i

X_{2i} = education level of the household head i

X_{3i} = family size (in adult equivalent) of the household i

X_{4i} = distance to the nearest market by the household i

X_{5i} = membership to cooperative (s) of the i^{th} household

X_{6i} = area allocated for potato production by the i^{th} household

X_{7i} = access to credit by household i

X_{8i} = access to extension services by household i

X_{9i} = livestock size of household i

X_{10i} = off/non-farm income of household i

X_{11i} = potato farming experience of the i^{th} household

X_{12i} = quantity of fertilizer applied to potato land by the i^{th} household

U_i = disturbance term, and

$\beta_0,\ \beta_1,\ \beta_2, \ldots, \beta_{10}\ and\ \delta$ are parameters to be estimated (i = 1, 2, 3, …, 122)

In the first stage of 2SLS, quantity of potato produced was regressed over all independent variables including instrumental variables (experience in potato production and quantity of fertilizer applied). The reduced equation is given below.

$$Y_{1i} = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \alpha_6 X_{6i} + \alpha_7 X_{7i} + \alpha_8 X_{8i} + \alpha_9 X_{9i} + \alpha_{10} X_{10i} + \alpha_{11} X_{11i} + \alpha_{12} X_{12i} + V_i \quad \textbf{(7)}$$

Where, Y_{1i} represents quantity of potato produced and harvested by household i, and $\alpha_0, \alpha_1, \ldots, \alpha_{12}$ represent parameter estimates of independent variables included in the reduced equation, and V_i is the disturbance term.

In the second stage of 2SLS, quantity of potato supplied to the market was regressed over predicted value of the dependent variable of the reduced equation (quantity of potato produced) and independent variables included in the model excluding instrumental variables (potato farming experience and quantity of fertilizer applied). The instrumental variables have to satisfy two conditions: The first condition is the instruments should not be correlated with the disturbance term, exogeneiy condition, and the second condition is the instruments should correlate with the endogenous variable, quantity of potato produced, which is referred as relevance condition of the instrumental variable (Wooldridge, 2010). Different tests have been undertaken before using the 2SLS method to check whether using 2SLS method actually solved endogeneity problem. The second stage 2SLS is given as follow:

$$Y_i = \beta_o + \delta Y^*_{1i} + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + U_i \quad \textbf{(8)}$$

Where, Y_{1i}^* represents predicted value of quantity of potato produced for the i^{th} household

3.5. Variables Selection, Definitions, Measurements and Working Hypotheses

Dependent variable

Quantity of potato supplied to the market (QPSM): It is a continuous dependent variable measured in quintals. It represents the amount of potato supplied to the market in quintals during the survey year.

Independent variables

Based on the review of literature, the independent variables expected to determine the quantity of potato supplied to the market were hypothesized as follows:

Sex of the household head (SEXHH): It is a dummy variable that takes a value of zero if male and one if female. Male households have been observed to have a better tendency than female households in fruit production and supply of fruit. Due to obstacles such as lack of capital, access to credit and extension services female households supply less as compared to male (Ayelech, 2011). However in the present study, it is hypothesized to affect quantity of potato supplied to the market either positively or negatively.

Distance to the nearest market (DISTNM): Distance to the market is a continuous variable measured in walking hours from the household's residence to the market centers. The closer the residence of the household to the market center, that reduces cost of transportation so the more would be quantity of potato supplied to the market (Abraham, 2013). Contrary to this, Addisu (2016) reported that distance to the nearest market has a significant and positive relation with the quantity of potato supplied to the market. In this study, this variable is hypothesized to have an inverse relationship with the quantity of potato supplied to the market.

Credit access (CREDIT): This is a dummy variable taking a value of one if the household takes loan and zero otherwise. Access to credit would enhance the financial capacity of the

household to purchase the inputs, thereby increasing potato production and market share. Alemnewu (2010) and Muhammed (2011) found that if pepper and *teff* producer gets credit, the amount of pepper and *teff* supplied to the market will increase. Therefore, access to credit is hypothesized to affect quantity of potato supplied to the market positively.

Non/off-farm income (NFI): It is a continuous variable measured in birr. Off-farm income represents the amount of income household earns in the year out of own farm activities. Non-farm income is the amount of income generated from activities other than crop and livestock production. Households engaged in off-farm and non-farm activities are better endowed with additional income. Additional income improves the households' financial position that in turn enables them to invest in purchasing the needed amount of food and farm inputs (Debela, 2013). Therefore, households who managed to earn more cash income including non/off-farm income are more likely to adopt new potato varieties and purchase fertilizer. Therefore, this variable is hypothesized to have a positive influence on the quantity of potato supplied to the market.

Access to extension service (AEXT): This is a dummy variable that takes a value of one if the household had received extension services during the survey year or zero otherwise. It is expected that extension service widens the household's knowledge with regard to the use of improved technologies and has a positive impact on the quantity of potato sales. Ayelech (2011) found that if fruit producer gets extension, the amount of fruits supplied to the market increases. Therefore, this variable is hypothesized to influence the quantity of potato supplied to the market positively.

Education of the household head (EDHH): It is a categorical variable and takes 1 if illiterate, 2 if attended primary school (1-8 grade), 3 if attended secondary school (9-12 grade) and 4 if earned certificate and above. Formal education enhances the information acquisition and adjustment abilities of the producer, 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 the quantity of potato supplied to the market positively.

Farming experience (FMEXP): It is a continuous variable measured in terms of the number of years spent in potato production and marketing. Abbay (2007) found as

producers' experience in tomato production increased, quantity supplied to the market also increased. Similar to this, experience in potato production is expected to have a positive relation with the quantity of potato supplied to market.

Area allocated to potato production (AAPP): The total land used for potato production is measured in terms of number of hectares a household allocates for potato production and it is expected to affect the quantity of potato supplied to the market positively; because, a producer who allocates a large area of land for potato production than a producer who allocates less area of land and under the same input utilization condition can produce more and supply to the market. Mebrat (2014) and Yeshitila (2012) found that landholding had a significant and positive relation with quantity of tomato and potato supplied to the market, respectively. Hence, this variable is anticipated to have a positive influence on the quantity of potato supplied to the market.

Livestock holding Size (LSTH): This is a continuous variable measured in Tropical Livestock Unit (TLU). Households who have a number of livestock are expected to specialize in livestock production so that they allocate large share of their land for pasture. Study by Rehima (2006) on pepper marketing showed a negative relationship between the size of livestock holding and the quantity of pepper sales. Here, this variable is hypothesized to affect the quantity of potato supplied to the market negatively.

Quantity of potato produced (QPP): It is a continuous variable measured in quintals. It refers to the amount of potato produced by sample households during the survey year. If a higher amount of potato is harvested, the more will be supplied to the market. Ayelech (2011) found that the quantity of avocado and mango produced affect positively the amount of avocado and mango supplied to the market. Debela (2013) also found that the quantity of onion produced positively affects the quantity of onion supplied to the market by smallholder farmers of Fentalle district, East Shewa zone of Oromia National Regional State. Hence, this variable is expected to affect the quantity of potato supplied to the market positively.

Family size (FAMSZ): This is a continuous variable and refers to the family size of the household in adult equivalent. Abraham (2013) pointed that, as vegetable production is a labour intensive activity, vegetable production in general and market supply of vegetable products in particular is a function of labour, among others. Thus, in this respect, family

size is expected to have a positive influence on the volume of sales. But larger family size requires larger amounts for consumption. Thus, family size is hypothesized to affect the quantity of potato supplied to the market either positively or negatively.

Membership to primary potato producers' Cooperative (COOP): It is a dummy variable that takes a value of one if the household is member of a cooperative engaged in potato business, and zero otherwise. It is believed that cooperatives improve understanding of members about the market and strengthen the relationship among the members (Abraham, 2013). Households belonging to a cooperative have also a better bargaining power and may receive a better price than others. Therefore, this variable is expected to affect the quantity of potato supplied to the market positively.

Quantity of fertilizer applied (FQTTY): It is a continuous variable measured in quintals. It represents the quantity of chemical fertilizer applied to potato production per hectare of land. Obviously, fertilizer increases the productivity of land. Hence, this variable is hypothesized to affect the quantity of potato supplied to the market positively.

Table 3: Summary of variables measurements and the expected signs

Dependent variable is the quantity of potato supplied to the market during the survey year				
Variables	Description of the variables	Type	Values	Expected sign
SEXHH	Sex of the household head	Dummy	0 if male, 1 if female	+ve/-ve
DISTNM	Distance to the nearest market	Continuous	Hours	-ve
CREDIT	Credit access	Dummy	1 if can access, 0 otherwise	+ve
NFI	Non/ off-farm income	Continuous	Birr	+ve
AEXT	Access to extension service	Dummy	1 if received, 0 otherwise	+ve
EDHH	Education of the household head	Categorical	1 if illiterate, 2 if (1-8) grade, 3 if (9-12) grade, 4 if above	+ve
FMEXP	Farming experience	Continuous	Year	+ve
AAPP	Area allotted for potato production	Continuous	Hectare	+ve
LSTH	Livestock holding size	Continuous	TLU	-ve
QPP	Quantity of potato produced	Continuous	Quintal	+ve
FAMSZ	Family size	Continuous	Adult equivalent	-ve/+ve
COOP	Membership to primary potato producers' cooperative	Dummy	1 if a member, 0 otherwise	+ve
FQTTY	Quantity of fertilizer applied	Continuous	Quintal	+ve

Source: Own hypotheses based on review of the literature, 2016

4. RESULTS AND DISCUSSION

This chapter presents the findings of the study. Descriptive analysis results do describe the socio-economic and demographic characteristics of the sample households, traders and consumers. Value chain analysis has resulted in mapping potato value chain, actors, their roles and linkages, value chain governance, constraints and opportunities along the value chain. Akin, results provide marketing channels, marketing costs and margins, and benefit share of the major actors in the value chain. Econometric model results portray determinants of the quantity of potato supplied to the market by sample households.

4.1. Socio-economic, Demographic and Institutional Characteristics of the Sample Producers

4.1.1. Demographic Characteristics of Sample Households

Table 4 presents demographic characteristics of the sampled households. Out of the total 122 sampled households, only 10.66% were female headed while the remaining were male headed. The survey result showed that the mean age of the sampled household heads was 43.12 years and ranges from 25 years to 70 years. Out of the total 122 sampled household heads, about 40.98% were illiterate. About 44.26% had attended primary school. The remaining 14.76% had attended secondary school (Table 4). There is no a single sample household head who has completed formal education that lead to certificate award or above.

The mean family size of the sample households was 4 (adult equivalent) with the minimum and maximum family size of 1 (adult equivalent) and 11.50 (adult equivalent), respectively. The result depicted on Table 4 regarding the farming experience of sample households reveal that the mean farming experience in potato production was 11.98 years, ranging from 6 to 21 years. Results depicted in Appendix Table 1 indicate distances of the households' residence from market, development center and road. The average nearest market distance from potato producer households' residence was 1 hr and 21 minutes walking hrs, the minimum and maximum distances being 10 minutes and 3 hrs, respectively with standard deviation of 0.72.

Table 4: Demographic characteristics of the sampled households

Variables	Category	Frequency	Percent
Sex	Male	109	89.34
	Female	13	10.66
Education	Illiterate	50	40.98
	Primary school	54	44.26
	Secondary school	18	14.76

	Mean	SD	Minimum	Maximum
Age	43.12	11.43	25	70
Experience in potato production	11.98	3.30	6	21
Family size (Adult Equivalent)	4.00	2.02	1.00	11.50

Source: Own computation results based on survey data, 2016

4.1.2. Land Use Patterns and Inputs of Production

The survey result shows that the average land holding size of the sampled households was 1.74 hectares and ranges from 0.25 hectare to 5 hectares (Table 5). The result also indicates that the mean land allocated to potato production per household was 0.42 hectare. Furthermore, the survey result shows that only 3.28% potato producer households used irrigation to produce potato whereas the majority (96.72%) produced potato only during long rainy season (*Ganna* in local language).

Regarding the application of inorganic fertilizers, majority of the households (95.08%) applied fertilizer to potato fields while the remaining a few households (4.92%) did not applied fertilizer to their potato land (Table 5). The survey also showed that the average quantity of fertilizer (both DAP and Urea) applied was 2.53 quintals per hectare with a standard deviation of 1.15. Potato producer households in Jeldu district use different potato varieties seed which were originally released by Holota Agricultural Research Center (HARC). During the survey year, the majority of sample households (56.56%) used Gudane potato tuber seed variety. About 21.31% households used Gudane and Chala, about 13.93% households used Jalane, about 4.92% households used Chala and the remaining 3.28% households used combinations of Gudane, Chala, and Jalane (Table 5).

Table 5: A summary of production inputs employed by the sample households

Variable	Observation	Dummy/Category	Frequency	Percent
Access to irrigation	122	Yes	4	3.28
		No	118	96.72
Fertilizer use	122	Yes	116	95.08
		No	6	4.92
Type(s) of seed	122	Gudane only	69	56.56
		Jalane only	17	13.93
		Chala only	6	4.92
		Gudane and Chala	26	21.31
		Gudane, Chala and Jalane	4	3.28
	Minimum	Maximum	Mean	SD
Land holding size (ha)	0.25	5	1.74	0.84
Area allocated to potato production (ha)	0.12	1	0.42	0.23
Quantity of fertilizer applied (Qt/ha)	0	5	2.53	1.15

Source: Own computation results based on survey data, 2016

4.1.3. Access to Services

Access to extension service: The result of the survey indicates that out of 122 potato producer sample households, about 60.66% had received extension services in the 2015/16 production year. About 39.34% of the sampled households reported that they had not received extension services (Table 6). The extension services rendered were about input use, product storage, and product marketing. The extension service providers in Jeldu district were; experts from Jeldu district office of agriculture, development agents, HARC, and *kebele* administration officials.

Access to credit service: Table 6 depicts that 42.62% of the sample households have received credit while 57.38% did not receive credit during the 2015/16 production year. The sources of credit for those who had received credit were Oromia credit and saving Share Company (OCSSC) and Busa Gonofa.

Membership to primary potato producers' cooperatives: The survey result shows that only 30.33% of the sample households were member of primary potato producer

cooperative. The remaining 69.67% were not members of primary potato producer cooperative (Table 6).

Table 6: Sample households' access to extension service, membership to cooperative and access to credit service

Description	Response	Frequency	Percent
Access to extension	Yes	74	60.66
	No	48	39.34
Sub-total		122	100
Membership to primary potato producer cooperative	Member	37	30.33
	Not member	85	69.67
Su-total		122	100
Access to credit	Received	52	42.62
	Not received	70	57.38
Sub-total		122	100

Source: Own computation results based on survey data, 2016

4.2. Value Chain Analysis

Under this section, potato value chain actors, their roles and linkages, map of potato value chain in the study area, potato marketing channels, structure, conduct and performance, constraints hindering potato value chain development and opportunities existing in Jeldu district are presented.

4.2.1. Potato Value Chain Actors and Their Roles

Input suppliers: Input supply is an initial stage in agricultural value chain analysis. In the study area, inputs such as improved seed, fertilizers, pesticides, herbicides and farm implements are supplied by farmers, Jeldu district office of agriculture, traders, Holota Agricultural Research Center, and cooperatives. During the survey year, majority of the households reported that they produced and used their own seed. About 68.03% of the households used own seed and 25.42% of the households used purchased seed from other farmers, traders, Holota Agricultural Research Center and/or cooperatives. The remaining 6.56% reported that they used combinations of their own seed and purchased from cooperatives and traders (Table 7).

Table 7: Sources of potato seed for sample households

Source of potato seed	Frequency	Percent
Own carryout stock	83	68.03
Other fellow farmers	12	9.84
Cooperatives	7	5.74
HARC	6	4.92
Traders	6	4.92
Own source and traders	5	4.10
Own source and cooperatives	3	2.46
Total	122	100

Source: Own computation results based on survey data, 2016

Producers: Potato producers or farmers are the most important actors in the potato value chain. Out of the 6145 quintals produced by sample households during the survey year, about 3724.50 quintals were supplied to the market.

Rural collectors: Rural collectors are those traders who collect potato from producers and sell to wholesalers. They buy potato from producers at farm, road side and sell to wholesalers and sometimes to retailers. Most of them reach a priori agreement with wholesalers on the price and quality of the product and assemble, sort, pack and sell to wholesalers. In case the product is not packed, wholesalers pay lesser price than those sorted and packed, and sorting and packing activities are carried out by the wholesalers.

Wholesalers: Wholesalers are traders who purchase potato directly from producers or local collectors in bulk and transport and sell to regional markets such as Assosa, Nekemte, Dire Dawa, Harar, Mettu, and Mekelle. They have better information and financial capacity than other traders. They have better storage facility in Gojjo the district capital town and/or around their villages. They transport and sell to wholesalers operating in regional markets at least one truck at a time.

Retailers: Retailers are traders who purchase potato from potato producer households either at farm or at the market and resale to consumers. They are known for their limited capacity of purchasing and handling products because of low financial capacity. They purchase potato a day before the market day or on the market day and sell to consumers. In

case the purchased potato is not sold, they either take it home to consume or sell another day especially at *gulit* markets.

Consumers: Consumers buy potato for consumption purpose.

Supportive actors (Enablers and Facilitators): Value chain supportive actors are those who are not directly related to value chain but provide support services such as information, financial services, research, training and advisory services. The main supporters of potato value chain in the study area are Jeldu District Office of Agriculture (JDOA), Primary Potato Producers' Cooperatives, Holota Agricultural Research Center (HARC), Oromia Credit and Saving Share Company (OCSSC) and Busa Gonofa. JDOA provides support services such as fertilizer supply, pesticide and herbicide supply for potato producer households. In addition, JDOA provides training and advisory services through development agents or/and directly using office experts. HARC assists potato value chain through identifying and disseminating new variety of potato seed. It also supports potato value chain by providing training and demonstration to potato producer households. OCSSC and Busa Gonofa are microfinance institutions which provide financial services such as credit service in the study area.

4.2.2. Mapping Potato Value Chain

Potato value chain map shows the visual representation of major actors, their functions and relationship among them. It also shows the flow of potato production inputs from input suppliers to producers as well as flow of the product from producers through different value chain actors to the consumers. It also clearly shows the flows of information among the actors. Figure 4 shows the major actors of potato value chain identified in the study area. These are input suppliers, producers, local collectors, retailers, wholesalers, consumers and value chain supporters. Their respective function in potato value chain and linkages among them are also clearly depicted in the figure.

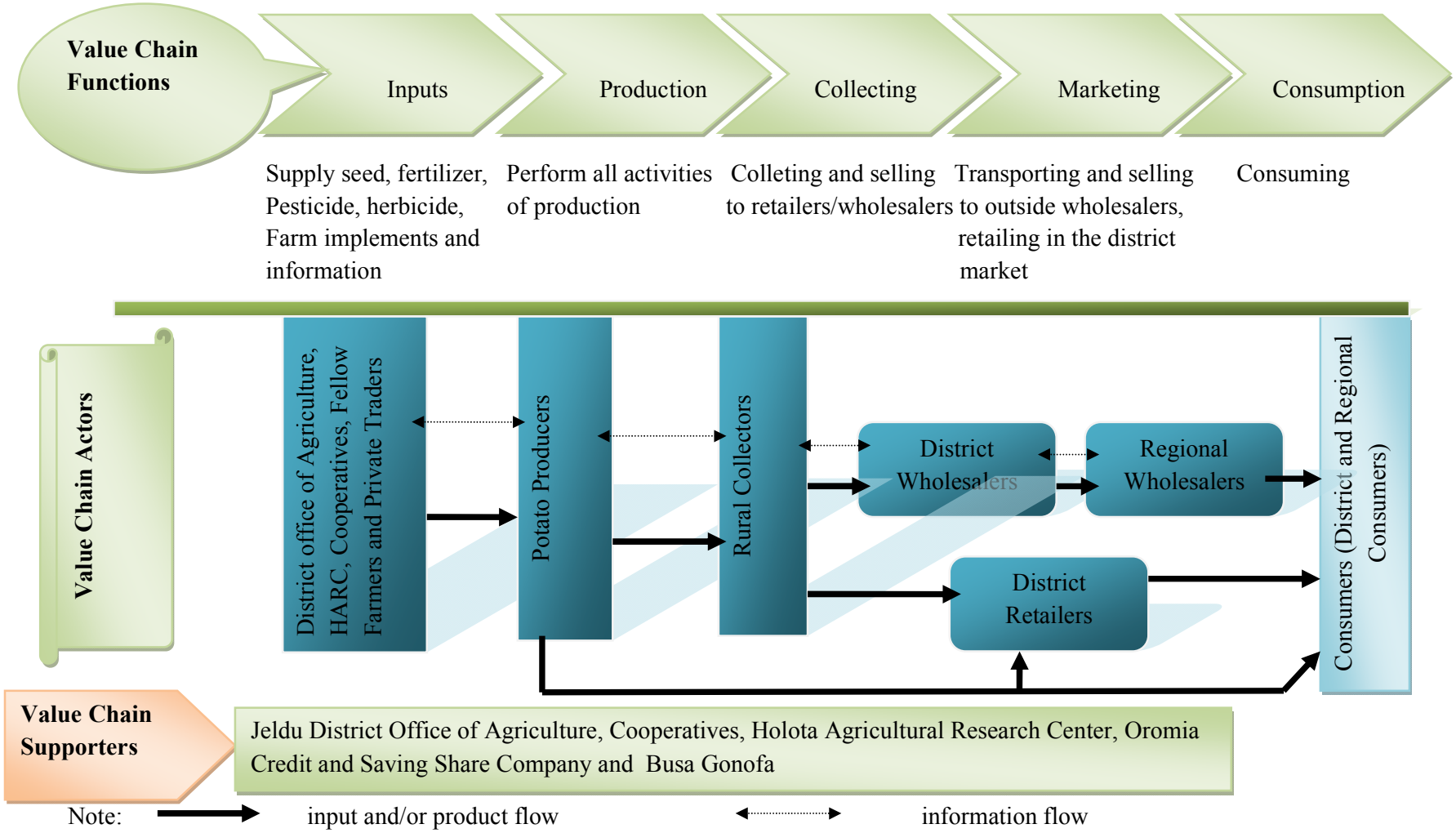

Figure 4: Map of potato value chain in the study area

Source: Own sketch result based on survey data, 2016

4.2.3. Value Chain Governance

Governance is a central concept to value chain analysis, and can be defined as non-market coordination of economic activity. In the study area, potato producer households are neither horizontally nor vertically coordinated with other value chain actors. They produce and sell their product mostly right after harvest to meet their immediate financial needs. They are largely price takers. Wholesalers are the major and key actors influencing the price of the product. They have better financial and information than the other value chain actors. They are highly coordinated among themselves. They directly or indirectly influence the activities of other value chain actors in the study area. Hence, wholesalers have a market power in the study area.

4.2.4. Potato Marketing Channels

Five major potato marketing channels were identified in the study area during the survey time. Potato producer households in the study area sell their potato either at farm, roadside, traders' store, at local market or combinations of two or more possible places. The major potato marketing channels identified were:

Channel I: Producers → Consumers: It represented 5.05% of the total potato marketed during the survey year. The channel was found to be the least important marketing channel in terms of its volume of transaction.

Channel II: Producers → Retailers → Consumers: It represented 8.36% of the total potato marketed during the survey year. It was the third most important marketing channel in the study area in terms of its volume of transaction.

Channel III: Producers → Wholesalers → Consumers (Regional Markets): In this channel district wholesalers purchase potato directly from farmers either at the farm, roadside or at their own store and transport to different parts of the country, and sell in regional markets such as Nekemte, Dire Dawa, Harar, Mettu, Mekelle and Assosa. This was the first most important marketing channel identified in the study area. It accounted for 51.90% of the total amount of potato marketed during survey year.

Channel IV: Producers → Local collectors → Wholesalers → Consumers (Regional Markets): The channel represented 26.90% of potato marketed during the

survey year. It was found to be the second most important channel in the study area in terms of the volume of transaction.

Channel V: Producers → Local collectors → Retailers → Consumers: This channel was found to be the fourth important marketing channel in the study area. It represented about 7.79% of potato marketed during the survey year.

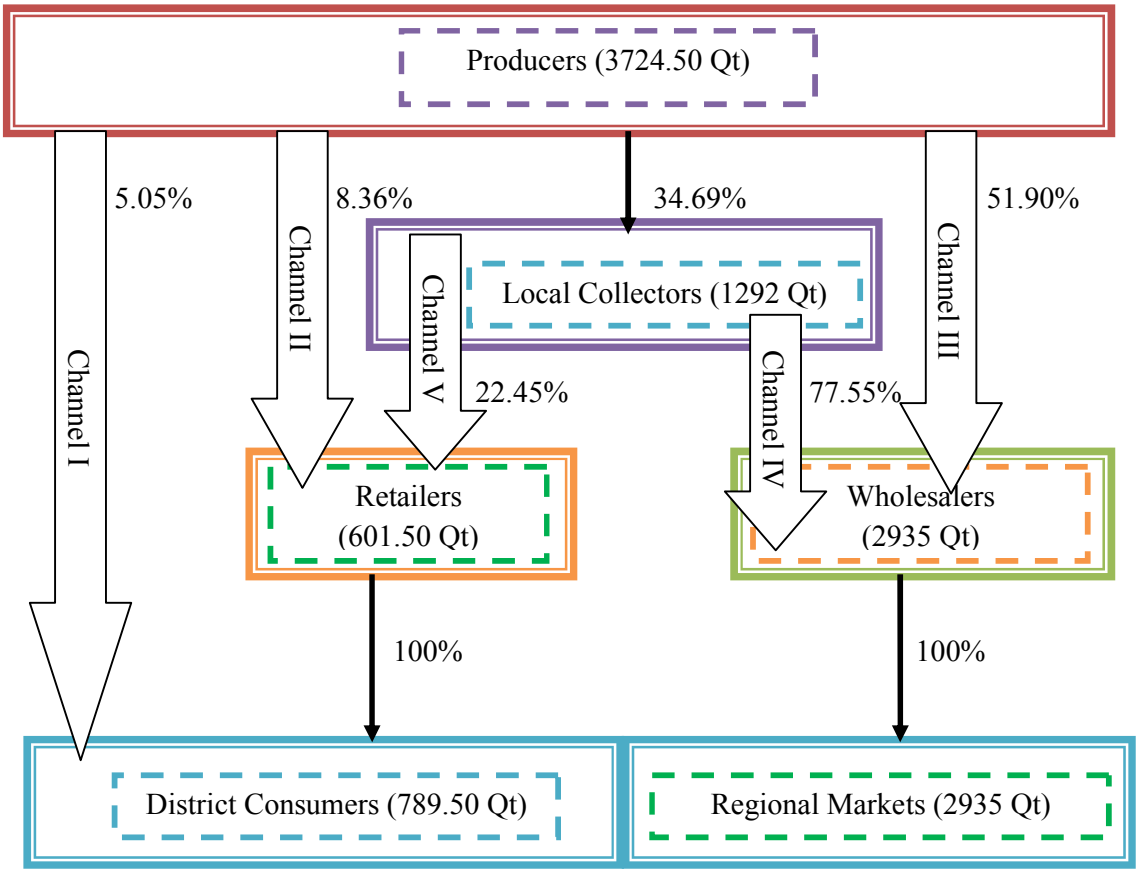

Figure 5: Potato marketing channels

Source: Own sketch based on survey data, 2016

4.2.5. Structure, Conduct and Performance of Potato Marketing

4.2.5.1. Market structure

In this study, the structure of potato market was evaluated by using the degree of market concentration and conditions of entry and exit from the market.

Market concentration ratio

In this study, district level market concentration ratio was used to analyze the structure of potato market in the study area as the numbers of traders were limited in their respective villages. It was calculated by taking annual quantity of potato purchased during the survey period. First, the sum of annual quantity of potato purchased by all traders was computed. Then the market share of the four leading traders was calculated by dividing their respective quantity of annual potato purchased by the sum of quantity of annual potato purchased by all traders. Then after, the concentration ratio of the four leading traders was computed by adding their market share during survey period. Accordingly, the district level concentration ratio for potato was found to be 42.69%. This indicates that the market was a weak oligopolistic market during the survey year.

Barriers to entry

In this study, capital requirements, potato trading experience, licensing procedure and lack of continuous supply are considered to know whether there is entry barriers or not in potato market.

Capital requirements: Almost all the traders (locall collector, wholesalers and retailers) (93.75%) reported that capital was their major entry barrier during the survey year (Appendix Table 3). Hence, it can be concluded that capital was one of the entry barriers in potato trading in the study area.

Potato trading experience: The survey result indicated that traders' experience ranges from 2 up to 14 years with an average experience of 5.3 years. The existence of wider gap between traders indicated that experience was not a barrier to enter into potato trading in the study area.

Licensing procedure: According to the survey result, only 15.63% of the traders have license whereas 84.37% of them have no potato trade license (Appendix Table 3). Traders reported that license has no use rather than paying tax as anybody can enter and exit from potato trading.

Lack of continuous supply: According to the survey result, lack of continuous supply throughout the year was one of the entry barriers in the study area. About 37.50% of

sampled traders reported that lack of continuous supply throughout the year discouraged them (Appendix Table 3).

4.2.5.2. Market conduct

In this study potato market conduct was analyzed in terms of traders' price setting strategy, purchasing and selling strategies.

Traders' price setting strategy

Survey result indicated that 65.60% of the sample traders' purchase price setting strategy was the force of demand and supply. They reported that they negotiate with sellers and negotiation is based on the existing market price. The remaining 34.40% reported that they set purchasing price by themselves. Further, about 62.50% of the sampled traders reported that they set selling price through negotiation with the buyers. The remaining 37.50% of the sampled traders reported that they set selling price through negotiating slightly with the buyers (Table 8).

Table 8: Traders' price setting strategy

Purchase price setting strategy	Number of traders	Percent
Negotiating with sellers	21	65.60
Set the price independently	11	34.40
Selling price setting strategy		
Negotiating with buyers	20	62.50
Slightly negotiating with buyers	12	37.50

Source: Own computation results based on survey data, 2016

Traders' purchasing and selling strategies

According to the survey result, 71.80% of the sampled traders bought their produce from sellers directly by themselves. The remaining 28.20% reported that they bought their produce from sellers by themselves and using daily labourers. The survey also indicated that all traders sold their produce directly by themselves. It is also learnt that potato traders have used different methods to approach their clients. Accordingly, 50% of the traders attracted their suppliers by paying better price. The remaining 37.50% and 12.50% of the traders attracted their suppliers by using fair weighting scaling and offering credit services, respectively (Appendix Table 4).

4.2.5.3. Market performance analysis

In this study production costs, marketing costs and marketing margins and profit were calculated to evaluate the performance of potato market in the study area.

Production cost of potato in Jeldu district

Potato producing households in the study area incur different cost to produce potato per hectare of land. Based on the data collected from sample households, the cost of production and returns at the prevailing prices were used to estimate the profits. Table 9 shows the summary of identified and quantified costs which were incurred by the producers in the production process.

The average price of fertilizer was valued at 1600 birr per quintal and 1100 birr per quintal for DAP and Urea, respectively. Labour cost was estimated based on the wage of labour in the locality. Thus, family labour was evaluated at the prevailing wage rates of hired labour in the village. Sample households reported that the average rental value of the land per year was 4000 birr per hectare. Hence, rental value of land was taken at 4000 birr per year for one hectare in the study area. Depreciation charges on farm implements were calculated using the straight-line method, by dividing the original cost of item (less salvage value) by the expected life of the item. Other costs such as cost of oxen power, pesticides and herbicides were also reported by sample households.

According to the survey data, average productivity of potato was 120 quintals per hectare during the survey period, in Jeldu district. The output was valued at farm gate price of households which was on average 310 birr per quintal. Total revenue of potato producers was estimated by multiplying the average yield per hectare of land and farm gate price. Gross income was estimated by deducting total cost from total revenue. Table 9 also indicates that average cost of production of potato in Jeldu district was 178.67 birr per quintal.

Table 9: Average cost of production and profitability of potato (Birr/ha)

Items	Cost (Birr/ha)
Seed	8000
DAP	3200
Urea	1100
Labour for land preparation	420
Labour for sowing/ planting	300
Labour for weeding	800
Labour for harvesting	400
Cost of oxen power	1050
Chemicals (pesticide and herbicide)	1940
Total variable cost	**17210**
Rental value of land	4000
Depreciation of farm implements	230
Total fixed cost	**4230**
Total cost	**21440**
Yield (Qt/ha)	120
Total revenue per hectare at 310 birr/ Qt	**37200**
Gross income	**15760**
Production cost (Birr/Qt)	178.67

Source: Own computation results based on survey data, 2016

Marketing costs, margins and profit analysis

Marketing costs and marketing margins were estimated to compute the share of profit captured by main actors under various marketing channels.

Table 10: Estimated marketing margin and profit share of major potato value chain actors

Actors	Cost/profit (birr/Qt)	Marketing channels				
		I	II	III	IV	V
Producers	Cost of production	178.67	178.67	178.67	178.67	178.67
	Selling price	410	350	330	300	300
	Marketing cost	49	39	29	32	32
	Gross profit	182.33	132.33	122.33	89.33	89.33
	GMMp (%)	100	77.78	47.14	42.86	66.67
Local collectors	Purchase price				300	300
	Selling price				370	350
	Marketing cost				39	16
	Gross profit				31	24
	GMMlc (%)				10	11.11
Wholesalers	Purchase price			330	370	
	Selling price			700	700	
	Marketing cost			174.35	174.35	
	Gross profit			195.65	155.65	
	GMMw (%)			52.86	47.14	
Retailers	Purchase price		350			350
	Selling price		450			450
	Marketing cost		26			36
	Gross profit		74			64
	GMMr (%)		22.22			22.22
TGMM (%)		0	22.22	52.86	57.14	33.33

Where TGMM,GMMp,GMMlc, GMMw and GMMr represints Total Growth Marketing Margin, Growth Marketing Margin of Local collectors, Growth Marketing Margin of Wholesalers and Growth Marketing Margin of Retailers, respectively.

Source: Own computation results based on survey data, 2016

Table 10 indicates that the largest marketing cost was incurred by the wholesalers. This is due to high transportation cost wholesalers do often incur to transport the produce to regional markets. In addition, wholesalers' personal expenses, telephone, guarding and tax are relatively high. It also showed the profit earned by main actors (Producers, local collectors, wholesalers and retailers).

Accordingly, producers' profit was high in channel I which was 182.33 birr per quintal. In this channel producers sell potato directly to consumers and receive price paid by consumers. Producers' marketing cost was also high in this channel which was 49 birr per quintal. Producers' profit was 132.33 birr per quintal and 122.33 birr per quintal when they

sell to retailers and wholesalers, respectively. Producers receive the lowest profit 89.33 birr per quintal in channel IV and V when they sell to local collectors.

From traders, wholesalers shared the highest profit 195.65 birr per quintal and 155.65 birr per quintal, when they purchase from producers and local collectors in channel III and IV, respectively. Retailers received profit of 74 birr per quintal when they purchase from producers, and 64 birr per quintal when they purchase from local collectors. Local collectors receive the lowest profit which was 31 birr per quintal in channel IV and 24 birr per quintal in channel V, when they sell to district wholesalers and district retailers, respectively.

The result also indicated that TGMM was highest in channel IV which was 57.14% and the lowest in channel II which was 22.22%, respectively, excluding channel I. High TGMM reduces the producers' share (GMMp), which is the percentage share of producers from the total consumers' price. Accordingly, producers' share (GMMp) was high in channel II which was 77.78% from the total consumers' price, and lowest in channel IV which was 42.86%, excluding channel I. The result also showed that the maximum gross marketing margin from traders was taken by wholesalers, which accounts for 52.86% of the consumers' price in channel III and 47.14% in channel IV followed by retailers which was 22.22% in channels II and V. The minimum gross margin is taken by local collectors which accounted for 11.11% in channel V and 10% in channel IV.

4.2.6. Constraints and Opportunities of Potato Value Chain in Jeldu District

One of the merits of value chain analysis is that it helps to clearly identify bottlenecks to the development of the chain right from input supply up until the consumption level in intense way. In this study, a number of constraints hindering potato value chain development in the study area were identified. The constraints and opportunities are briefly discussed below:

4.2.6.1. Constraints hindering potato value chain development

Production constraints

During the survey period, sampled households reported that they faced different production constraints. About 97.54%, 90.98% and 77.87% of the sample households reported lack of

irrigation facility, prevalence of diseases and pests, and shortage of arable land as their production constraints, respectively (Table 11). About 31.97% and 26.23% of them reported ineffectiveness of pesticides and adverse weather conditions as their major production constraints in the study area.

Table 11: Major production constraints of potato producers

Constraints	Frequency	Percent
Lack of irrigation facility	119	97.54
Disease and pests	111	90.98
Shortage of arable land	95	77.87
High price of fertilizers	88	72.13
Weak extension services	74	60.66
Untimely distribution of fertilizers	56	45.90
Shortage of labour during production	43	35.25
Ineffectiveness of pesticides	39	31.97
Poor quality seed	33	27.05
Adverse weather condition	32	26.23

Source: Own computation result based on survey data, 2016

The most important physical inputs for potato production are improved seeds, fertilizers, pesticides/herbicides and irrigation water. Research and extension services, information and appropriate technological support are non-physical inputs that are equally important as physical inputs to obtain higher yields. Out of 122 sample households, about 72.13% and 45.90% of them reported high cost of fertilizers and untimely fertilizer distribution, respectively (Table 11). The average price of DAP and Urea was found to be 1600 birr/Qt and 1100 birr/Qt respectively, during the survey year. Higher prices make fertilizer to be one of the major constraints which hinder potato production in the study area. Producers reported that there was unfair distribution of fertilizer in the study area. Poor quality potato seed and weak extension services are additional potato production constraints that need to be tackled.

Marketing constraints

Table 12 provides the major marketing constraints that hinder potato producers in the study area. Out of 122 sample producers, about 76.23% reported low price of the product and 71.31% reported perishability of the product. The low price might be due to the seasonality of the production and perishable nature of potato. Potato producers also reported other

marketing problems such as poor road infrastructure, price fluctuation, limited credit services and poor government support.

Table 12: Marketing constraints of potato producers

Constraints	Frequency	Percent
Low price of the product	93	76.23
Perishability of the product	87	71.31
Poor road infrastructure	80	65.57
Price fluctuation	75	61.48
Limited credit services	65	53.28
Poor government support	45	36.89

Source: Own computation results based on survey data, 2016

Marketing constraints that were faced by the traders were also identified. Shortage of capital was the major marketing constraint for the traders; as 93.75% of the sample traders reported existence of the problem. Other marketing problems include lack of continuous supply throughout the year, competition with unlicensed traders, administrative problems and high cost of transportation to reach regional markets (Appendix Table 5).

4.2.6.2. Opportunities of potato value chain

Despite the above constraints, there are potato value chain opportunities to be acknowledged. Suitability of the area for potato production is the prime opportunity identified during the survey time. High demand for the product throughout the year, good experience in potato production and trading, proximity to Holota Agricultural Research Center and availability of improved seed and other inputs of production were also potato value chain opportunities identified in the study area.

4.3. Econometric Results

This section presents results of econometric model. Primary data collected from 122 potato producers were analyzed using STATA version 12. Multiple linear regression model was used to identify factors determining the quantity of potato supplied by the producers to the market. The dependent variable, quantity of potato supplied to the market was transformed logarithmically. This was done to normalize the quantity of potato supplied to the market during the survey year.

4.3.1. Specification Tests

Prior to the application of multiple linear regression model, very common problems associated to multiple linear regression model were checked. Tests of multicollinearity among independent variables, hetroscedasticity and endogeneity were undertaken and discussed as follows:

Test of multicollinearity: The existence of multicollinearity among the independent variables was checked using estat VIF STATA command. The rule of thumb is, VIF greater than 10 indicates existence of severe collineariy among independent variables. The results indicated that there was no problem of multicollinearity because the result of VIF is less than 10 for all variables and the mean VIF was 1.49 (Appendix Table 6).

Test of hetroscedasticity: In this study, Breush-Pagan test for hetroscedasticity was applied to test the presence of hetroscedasticity in the data set. The p-value was 0.3899. Therefore, the null hypothesis (constant variance) was accepted, and no hetroscedasticity problem exists in the data set (Appendix Table 11).

Test of endogeneity: In this study, quantity of potato produced was suspected to be endogenous and tested using STATA command estat endogenous after ivregress. The result shows, Durbin (score) chi2 (1) = 3.9275 with (p-value = 0.0478) and Wu-Hausman F (1,108) = 3.5830 with (p-value = 0.0611). These indicate that the null hypothesis exogeneity of the quantity of potato produced was not accepted (Appendix Table 7). Estimating the coefficients of independent variables using OLS method is inconsistent. Therefore, two-stage least squares (2SLS) method was used to overcome endogeneity problem.

Two-stage least squares is appropriate if we have valid instrumental variables. Weak instrumental variables cannot solve endogeneity proplem. Hence, testing the validity of the instruments is very important before applying 2SLS method. In this study, estat firststage STATA command after ivregress was used to check whether the instruments are weak or not. The F-statistics was found to be 83.923; the general rule of thumb is F less than 10 indicate presence of weak instrumental variables. The null hypothesis presence of weak instruments is not accepted since the calculated F-value is greater than the critical value (Appendix Table 7). Therefore, the instruments are not weak and hence valid instruments.

Overidentifying restrictions test was also applied using Hansen-Sargan test and Basmann test using estat overid STATA command after ivregress. The result of Sargan test shows a p-value of 0.4478 and Basmann test shows a P-value of 0.4741 (Appendix Table 7). These indicate that the model is correctly specified and the instruments are valid.

4.3.2. Determinants of Quantity of Potato Supplied to the Market

To analyze the determinants of quantity of potato supplied to the market, 2SLS method was employed. In the first stage, quantity of potato produced was regressed over twelve independent variables including instrumental variables. The result shows that sex of the household head, experience in potato production and quantity of fertilizer applied affected positively and significantly quantity of potato produced (Appendix Table 8). The predicted value of quantity of potato produced was saved to be used as independent variable in the second stage of 2SLS method. Experience in potato production and quantity of fertilizer applied were used as instruments for quantity of potato produced.

In the second stage of 2SLS method, quantity of potato supplied to the market was regressed over predicted value of quantity of potato produced and hypothesized independent variables excluding instrumental variables. The result shows that four variables namely, quantity of potato produced, education level of the household heads, membership to primary potato producers' cooperatives and area allocated to potato production affected positively and significantly quantity of potato supplied to the market. Contrary to these, livestock holding (measured in TLU) affected quantity of potato supplied to the market negatively and significantly (Table 13).

Results in Table 13 further show that the model is significant at 1% significance level. The null hypothesis (all the coefficients are simultaneously zero) is not accepted. The coefficient of multiple determination (R-square) indicates, about 89.36% of the variation in the quantity of potato supplied to the market among sample households was explained by independent variables included in the model. Even if there is no rule of thumb to say the model is a good fit, R-square value greater than 50% is considered as a good fit. Therefore, this model is good in explaining the relationship between dependent variable and independent variables included in the model.

Table 13: Determinants of quantity of potato supplied to the market (2SLS result)

Variables	Coefficients	Standard errors	t-value
Quantity of potato produced	0.010***	0.001	4.98
Sex of the household head	-0.045	0.093	-0.49
Education level of the household head*			
Attended primary school	0.180***	0.062	2.87
Attended secondary school	0.179*	0.093	1.92
Family size (Adult equivalent)	0.015	0.016	0.98
Distance to the nearest market	0.039	0.043	0.91
Membership to cooperatives	0.184***	0.074	2.47
Area allocated to potato production	2.621***	0.136	19.14
Access to credit	0.055	0.063	0.86
Access to extension services	-0.071	0.068	-1.05
Livestock holding	-0.015**	0.007	-2.00
Off/non-farm income	-0.003	0.006	-0.53
Constant	0.696***	0.257	2.70
Number of observations	122		
F (12, 109)	76.26		
Probability > F	0.0000 ***		
R-square	0.8936		

Note: Dependent variable is logarithm of quantity of potato supplied to the market

***, ** and * are significant at 1%, 5% and 10% significance levels, respectively

Source: Own analysis results based on survey data, 2016

The independent variables significantly affecting quantity of potato supplied to the market are briefly discussed below:

Quantity of potato produced: As hypothesized**,** quantity of potato produced by the households during the survey year indicated positive and significant relation with quantity of potato supplied to the market at 1% significance level. Debela (2013) found that quantity of onion supplied to the market was significantly and positively affected by quantity of onion produced. The coefficient of quantity of potato produced shows an increase in the quantity of potato produced by one quintal resulted in 1% increase in the quantity of potato supplied to the market, keeping other variables constant.

Education level of the household head: As expected education level of the household head showed significant and positive relation with quantity of potato supplied to the market. The coefficient implies that compared to illiterate households, households who have attended primary education supplied 18.0% more to the market at 1% significance

level, keeping other variables constant. The coefficient also shows that compared to illiterate households, households who have attended secondary education supplied 17.9% more to the market at 10% significance level, keeping other variables constant. Previous studies (for example, Habtamu, 2015; Christoprher *et al.,* 2014; Yeshitila, 2012) argued that education level of the household heads had significant and positive relation with quantity of potato supplied to the market.

Membership to cooperatives: As expected this variable had significant and positive relation with the quantity of potato supplied to the market at 1% significance level. The coefficient of this variable implies, being a member of cooperatives results in 18.4% increase in the quantity of potato supplied to the market as compared to households who are not members to cooperatives, keeping other variables constant. Similar to this study, Bizualem *et al.* (2015) found that households who are member of coffee cooperatives supplied more to the market as compared to households who are not member to coffee cooperatives.

Area allocated to potato production: As hypothesized, this variable indicated significant and positive relation with the quantity of potato supplied to the market at 1% significance level. This implies that those households allocated more land to potato production have managed to supply more product to the market. The coefficient shows an increase in the area allocated to potato production by one hectare would result in 262.10% increase in the quantity of potato supplied to the market. Similar to this result, Mebrat (2014) and Yeshitila (2012) found landholding to have significant and positive relation with the quantity of tomato and potato supplied to the market, respectively.

Livestock holding: As expected, this variable has turned out to have a significant and negative relation with the quantity of potato supplied to the market at 5% significance level. This is because, households who own more livestock allocate their land to cereal crops to produce feed as a joint product. They also fallow land for grazing which could decrease land available for potato production. The coefficient indicates as livestock holding increases by one TLU, the quantity of potato supplied to the market decreases by 1.5%, keeping other variables constant. Similar to this result, Efa *et al*. (2016) found that livestock holding has significant and positive influence on the quantity of *teff* supplied to the market.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary

The overall objective of the study was analyzing potato value chain in Jeldu district of West Shewa zone. The specific objectives were mapping potato value chain actors, their roles and linkages, assessing profit margins along various marketing channels, assessing constraints hindering potato value chain development and opportunities existing, and analyzing the determinant factors affecting the quantity of potato supplied to the market.

The study used both primary data and secondary data sources. Primary data were collected from 122 producers, 32 traders and 25 consumers. Secondary data were also collected from District Office of Agriculture, *Kebeles'* Administrations, District Revenue and Custom Authority Office, Central Statistics Agency, published and unpublished journals. The data were analyzed using STATA software package. Descriptive statistics such as mean, ratio and standard deviation were employed to describe sample respondents characteristics. Value chain analysis was undertaken to map actors, their roles and linkages. Structure, conduct and performance were used to analyze potato market. Two-stage least squares regression was employed to analyze the determinant factors affecting the quantity of potato supplied to the market by sampled households. The findings of the study are briefly summarized as follows:

Out of 122 sample households about 89.34% were male headed and the remaining 10.66% were female headed. The result also confirmed that age of the households ranges from 25 to 70 years. Regarding educational status of the households, about 40.98% have not attended formal education. The remaining 44.26% and 14.76% have attended primary education and secondary education respectively. An average family size of the households was four in terms of adult equivalent. According to the survey result, average landholding was 1.74 hectares and an average 0.42 hectare of land was allocated to potato production.

The major actors of potato value chain in the study area were input suppliers, producers, collectors, wholesalers, retailers, consumers and supportive actors. Input suppliers' function were supplying seed, fertilizers, herbicides/pesticides and farm implements. Producers perform all activities right from land preparation and acquiring inputs to the harvesting and marketing of the product. Traders (local collectors, wholesalers, and

retailers) perform activities such as assembling, retailing, transporting and selling to regional markets.

The structure of the market was analyzed by using market concentration ratio of the four leading traders. Accordingly, the concentration ratio was found to be 42.69% which indicates a weak oligopoly. The conduct of the market was analyzed by traders' price setting strategy, traders' purchasing and selling strategies. The results indicate that about 65.60% of the traders' purchase price was determined by negotiation with the sellers. The remaining 34.40% of the traders reported that they determined purchase price. Regarding selling price, about 62.50% of the traders reported that selling price was determined through negotiating with the buyers while the remaining 37.50% reported that selling price was determined through negotiating slightly with the buyers. According to the result of the study, about 71.80% of the traders purchase by themselves and the remaining 28.20% of the traders purchase by using daily labour and by themselves. All of the traders' selling strategy was selling directly to their buyers.

About five potato marketing channels were identified in the study area. Channel III was found to be the most important channel in terms of its volume of transaction. Channel I was found to be the least important channel in terms of its volume of transaction. Producers received the maximum profit (182.33 birr/quintal) when they directly sell to district consumers. They received the lowest profit (89.33 birr/quintal) when they sell to local collectors. Total Gross Marketing Margin was highest in channel IV which was 57.14% and lowest in channel II which was 22.22%, excluding channel I. Producers' share (GMMp) was highest (77.78%) in channel II and lowest (42.86%) in channel IV. From traders, wholesalers received the highest (52.86%) marketing margin in channel III and 47.14% in channel IV. The lowest marketing margin was received by local collectors which was 11.11% and 10% in channel V and IV, respectively.

Different constraints hindering potato value chain development at different stages are identified. Accordingly, lack of irrigation facility, disease and pests, shortage of arable land, high input cost, weak extension services, untimely distribution of fertilizers, poor quality seed and adverse weather condition are producers' production constraints that need to be tackled. Producers also faced marketing constraints such as low output price, perishability of the product, poor road infrastructure, price fluctuation and limited credit

services. Traders also faced different marketing constraints like shortage of capital, lack of continuous supply throughout the year, competition with unlicensed traders, administrative problems, and high transportation cost to reach regional markets.

Two-stage least squares (2SLS) regression model was run to analyze the determinants of the quantity of potato supplied to the market. In the first stage, quantity of potato produced was regressed over all exogenous and instrumental variables. In the second stage, quantity of potato supplied to the market was regressed over predicted value of quantity of potato produced and all the independent variables excluding instrumental variables. As a result, quantity of potato produced, area allocated to potato production, education level of the household heads and membership to cooperatives affected significantly and positively the quantity of potato supplied to the market. However, livestock holding affected the quantity of potato supplied to the market significantly and negatively.

5.2. Conclusions and Recommendations

Based the findings of this study, appropriate recommendations which would benefit producers and other value chain actors to design appropriate approaches to develop potato value chain are made. The recommendations would also equivalently help government or all interested to develop appropriate interventions to realize equitable benefit among the value chain actors.

The survey result indicated that there is no irrigation facility in the study area and potato producer households for various reasons do not use irrigation for potato production. However, irrigation is vital to enhance production and productivity which would sustain supply of potato throughout the year. Therefore, it is highly recommended to develop irrigation facility.

The survey also revealed high inputs cost and delay in distribution. To increase quantity supplied to the market both production and productivity should improve. To enhance production and productivity of potato, producers should get right types of inputs at the right time and at reasonable prices. Hence, efforts should be made to distribute quality inputs, fertilizers and chemicals timely at affordable prices.

Results show that there is no coordination among value chain actors. Producers are neither vertically nor horizontally coordinated. The result of econometric model also revealed that membership to cooperatives affects quantity supplied significantly and positively. Organizing producers through cooperatives is one of the mechanisms to increase producers' bargaining power. So, it is strongly recommended to assist and encourage establishment of cooperatives and memberships. Coordination among producers and other value chain actors is also needed for efficient marketing system.

Econometric model result revealed that quantity of potato produced affect quantity supplied to the market significantly and positively. Therefore, quantity of potato produced should improve. Hence, disease resistant varieties seed, fertilizers and effective chemicals should distributed timely at affordable prices. Furthermore, universities and research institutions should give strong attention in identifying and disseminating high yielding and disease resistant potato varieties seed and new technologies.

It has become clear that the quantity of potato supplied to the market is affected by the educational level of household heads significantly and positively. Education is believed to build knowledge about improved inputs, new technologies and marketing of the product. Therefore, provision of formal and informal education should improve.

Lastly, the quantity of potato supplied to the market is affected by area allocated to potato production positively and significantly. Given the limited land available to farmers, it would be very difficult to expand area allocated to potato production. Instead, it is strongly recommended to intensify inputs of production on the available land to increase productivity to the possible maximum level.

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7. APPENDICES

Appendix Table 1: Distance from market, road and development station

Distance from	Mean	SD	Minimum	Maximum
Nearest market	1hr and 13 minutes	0.72	10 minutes	3 hrs
All weather road	25 minutes	0.40	0	1 hr and 30 minutes
Development station	50 minutes	0.49	1 minute	2 hrs

Source: Own computation results based on survey data, 2016

Appendix Table 2: Means of income generating activities of sample consumers

Activities	Frequency	Percent
Trading	17	68
Renting house	11	44
Agriculture	6	24
Employment	3	12
Daily labour work	2	8

Source: Own computation results based on survey data, 2016

Appendix Table 3: Sample traders' barriers to entry and potato trading license

Barriers	Frequency	Percent
Shortage of capital	30	93.75
Lack of continuous potato supply	12	37.50
Have potato trade license	5	15.63

Source: Own computation results based on survey data, 2016

Appendix Table 4: Traders' purchasing and selling strategies

Description	Number of observations	Frequency	Percent
Who purchase potato?	32		
Own		23	71.80
Own and daily labours		9	28.20
Who sell potato for you?	32		
Own		32	100
Methods to approach your clients	32		
Offering better price		16	50.00
Fair weighting scale		12	37.50
Offering credit services		4	12.50

Source: Own computation based on results of survey data, 2016

Appendix Table 5: Marketing constraints of traders

Constraints	Frequency	Percent
Shortage of capital	30	93.75
Lack of continuous supply	12	37.5
Competition with unlicensed traders	8	25
Administrative problem	7	21.87

Source: Own computation based on results of survey data, 2016

Appendix Table 6: Test for multicollinearity

Variables	VIF	1/VIF
Sex of the household head	1.19	0.841
Education (categorical)*		
Primary school	1.39	0.720
Secondary school	1.58	0.632
Membership to cooperative	1.69	0.593
Family size (Adult Equivalent)	1.42	0.705
Distance from nearest market	1.39	0.720
Area allocated to potato	2.06	0.484
Access to extension	1.58	0.632
Access to credit	1.43	0.698
Livestock holding	1.45	0.688
Off/non- farm income	1.39	0.720
Quantity of potato produced	1.28	0.778
Mean of VIF	**1.49**	

Source: Own test results based on survey data, 2016

Appendix Table 7: Endogeneity and over identification tests of quantity of potato produced

Variables	R^2	Adjusted R^2	F (2,107)	Probability >F
Quantity of potato produced	0.666	0.626	83.923	0.0000

Minimum eigenvalue statistic = 83.923

Critical values — Number of endogenous regressors: 1

Ho: Instruments are weak — Numbers of excluded instruments: 2

	10%	15%	20%	30%
2SLS Size of nominal 5% Wald test	19.93	11.59	8.75	7.25
LIML Size of nominal 5% Wald test	8.68	5.33	4.42	3.92

Test of endogeneity:	Test of overidentified restrictions:
Durbin (score) chi2 (1) = 3.9275 (p=0.0478)	Sargan (score) = 0.5760 (p = 0.4478)
Wu-Hausman F (1,108) = 3.5830 (p=0.0611)	Basman chi2 (1) = 0.5124 (p= 0.4741)

Source: Own test results based on survey data, 2016

Appendix Table 8: The first stage of 2SLS method (determinants of quantity of potato produced)

Variables	**Coefficients**	**Standard errors**
Sex of the household head	6.898*	3.603
Education level of the household head*		
Attended primary school	-1.896	2.489
Attended secondary school	2.262	3.721
Family size (Adult equivalent)	-0.009	0.616
Distance to nearest market	-0.518	1.709
Experience in potato production	2.894***	0.464
Membership to cooperatives	3.132	2.900
Area allocated to potato production	-3.613	5.513
Quantity of fertilizer applied	5.750***	1.508
Access to credit	2.035	2.491
Access to extension services	-2.565	2.692
Livestock holding	0.305	0.313
Off/non-farm income	0.109	0.264
Constant	68.548***	6.134

*** and * are significant at 1% and 10% levels of probability, respectively

Source: Own analysis result based on survey data, 2016

Appendix Table 9: Conversion for adult equivalent

Labor class	Age (years)	Conversion factor
Children	Less than 7	0
Children	7-14	0.4
Adult male	15-64	1.0
Adult female	15-65	0.8
Old male	Greater than 65	0.5
Old female	Greater than / equal 65	0.5

Source: Stork *et al*. (1991)

Appendix Table 10: Conversion factors used to compute tropical livestock unit

Animal category	Conversion factors
Calf	0.25
Weaned calf	0.34
Heifer	0.75
Cow and ox	1.00
Horse	1.10
Donkey (adult)	0.70
Donkey (young)	0.35
Camel	1.25
Sheep and goat (adult)	0.13
Sheep and goat (young)	0.06
Chicken	0.013

Source: Stork *et al*. (1991)

Appendix Table 11: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of logarithm of quantity of potato supplied to the market

chi2 (1) = 0.74

Prob > chi2 = 0.3899

APPENDIX 2. QUESTIONNAIRE

General instructions for Enumerators:

- ✓ Greet the respondents politely, introduce yourself and make clear the objective of the study
- ✓ Please fill the interview schedule according to the respondents reply (do not put your own feeling or your own personal opinion)
- ✓ Please ask each question clearly and patiently until the respondents gets your points
- ✓ Please do not forget to use units provided for each
- ✓ Prove that all the questions are asked and the interview schedule format is properly completed.

Name of Enumerator: _____ Signature: _____ Date: _____

I. Producers' Survey Questionnaire

1. General information

1. Name of household head: _____

2. District: **Jeldu**, Name of Kebele: _____

3. Age of the household head: _____ years

4. Sex of the household head: 1. Male 2. Female

5. Education level of the household head: 1. Illiterate 2. Primary school (1-8) 3. Secondary school (9-12) 4. Certificate and above

6. Marital status: 1. Married 2. Unmarried 3. Divorce 4. Widowed

7. Religion of the household head: 1. Protestant 2. Orthodox 3. Wakefata 4. Muslim

8. Total family size including household head: Male -------- Female ---------- Total ---------

	Children (less than 7 years)	Children (7-14 years)	Male (15-64 years)	Female (15-65 years)	Male and Female (greater than 64 years)
Total					
Working on farm full time					
Working part time on farm					
Employed off- farm					

9. Distance of your residence from the nearest market center: _____ hrs walk.

10. Distance of your residence to the nearest development center: _____ hrs walk.

11. Distance to all weather roads: _____ hrs walk.

12. What is your major source of income? (Multiple answer possible) 1. Crop production 2. Livestock production 3. Both crop and livestock production 4.Grain trading 5. Livestock trading 6. Others (specify)

13. How long have you practiced production of potato? _____ Years

14. Are you a member of any cooperative? 1. Yes 2. No

15. If your answer for Q.14 is yes, what is the name of the cooperative? _____

16. What services did you get from the cooperative? _____

17. If your answer for Q.14 is no, what is the reason? _____

18. Do you have your own transport facility? 1. Yes 2. No

19. If your answer for Q.18 is yes, what type? 1. Transport animals 2. Cart 3. Vehicle 4. Others (specify) ----------

2. Land Use Information in the last cropping season (2007/2008 E.c)

Description	Area (timad)	Area (ha)	Value (birr/timad or per ha)
Owned land			
Rented land			
Shared land			
Grazing land			
Irrigable area			
Total land holding			

(Note: 1 ha = 4 timad or 1 timad = 0.25ha)

3. Crop production Information

1. Production of grain, vegetable and other crops in last production season (2007/2008 E.C):

Type of crops	Total Area in Hectare (including area used more than once)	Total Production in (Qts)	For Store (Qt)	Home consumptions(Qt)	For seed (Qt)	Sold (Qt)	Selling Price (birr/Qt)	
							Maximum	Minimum
Potato								
Onion								
Tomato								
Cabbage								
Pepper								
Other vegetables								
Wheat								
Berly								
Beans & peas								
Maize								

2. How many times did you produce potato in the last production season? -------

3. What type of potato production system do you adopt? 1. Sole cropping 2. Intercropping 3. Mixing with other crops 4. Others (specify) ----------

4. Please fill the following table regarding planting, harvesting and selling time of potato in 2007/08 production year.

Activities /Months	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Planting												
Harvesting												
Selling												

5. Why do you engage in potato production? 1. High demand 2. Disease resistance 3. Resource suitability 4. High price 5. Being in contract farming 6. Easy to produce 7. Other reasons, specify ----------

6. Do you participate in contract farming to produce potato? 1. Yes 2. No

7. If your answer to Q6. Is yes, what are the quality requirements you fulfill on the contract farming? ----------

8. From where did you get those quality requirements information? 1. Development agents 2. Cooperatives 3. Union 4. Other specify----------

9. Did you get quality requirements information as you need/on time/? 1. Yes 2. No

10. If no, what are the possible reasons? 1. Not available in the area 2. I don't have communication access 3. Other, specify----------

11. How do you fulfill those quality requirements (quality control methods)? ----------

---

12. What kind of supports did you get from the buyer in order to fulfill their quality requirements? 1. Training 2. Inputs 3. Credit 4.other (specify) ----------

13. Did you have pre-arranged agreements on price with your buyer? 1. Yes 2. No

14. If yes, how do you pre-arranged----------

15. What benefits did you get being in contract farming/pre-arranged agreements/? 1. Securing selling price 2. Securing quantity sale 3. Credit facility 4. Other, specify----------

4. Input utilization

1. What type of potato seed variety did you use? 1. Improved 2. Local 3. Both,

2. If you had used improved variety, which varieties did you used? ----------,---------

3. What is your source? 1. Agricultural office 2. Cooperatives 3. Traders 4. Research centers 5. Own 6. Others, specify ----------

4. How did you get? 1. Cash 2. Credit 3. Others (specify) ----------

5. At what price did you purchased ----------birr/Qt and --------birr/Qt and how much did you purchased ----------Qt ----------Qt local and improved respectively in 2007/08 E.C production year.

6. Did you get enough amounts and types of seed as you need? 1. Yes 2. No

7. If no, what are the possible reasons? 1. High price 2. No credit facilities 3. Limited supply 4. Quality problem 5. Others (specify) ----------

8. Is there any problem relating to improved seed supply? 1. Yes 2. No

9. If yes, what are these problems? ----------

10. Did you use fertilizers and chemicals? 1. Yes 2. No

11. If yes, where did you get? 1. Agricultural office 2. Cooperatives 3. Traders 4. Others (specify) ----------

12. How did you get? 1. Cash 2. Credit 3. Others (specify) ----------

13. Did you get enough amounts and types as you need? 1. Yes 2. No

14. If no, what are the possible reasons? 1. High price 2. No credit facilities 3. Limited supply 4. Quality problem 5. Others (specify) ----------

15. Inputs used for potato production and cost of inputs during 2007/2008E.C production season.

Input types	Items	Amount used	Cost (birr/ha)	Total cost (Birr)
Land	Land rented (ha)			
Seed	Local variety (Qt/ha)			
	Improved variety (Qt/ha)			
Fertilizers	DAP (Qt/ha)			
	Urea (Qt/ha)			
	Compost (local unit)			
	Farm yard manure (local unit)			
Pesticides/ Herbicides	Pesticides (Liter/ha)			
	Herbicides (Liter/ha)			
Oxen (if rented)	Oxen days for plowing (pair of oxen/day)			
Others	Specify			
Total				

16. If you use irrigation for potato production, what source, method, frequency of use, and costs of irrigation? (Multiple responses are possible).

Crop type	Sources	Hours used per	Total number	Cost of using

	1. pond 2. River 3. Spring lake 4. Hand dang hall	day for irrigation water application	of days for irrigation water application till harvest	motor pump/ hour (Birr)
Potato				

17. How do you cultivate your land for potato production? 1. Hand tool 2. Oxen

3. Tractor 4. Others (specify) ----------

19. Labour requirement for potato production (includes for plowing, sawing, weeding, harvesting, transportation, irrigation water application and etc)

Crop type	Sources of labour and quantity required (ha)				
Potato	Family			Hired	
	Men	Women	Child	Quantity	Wage/day

20. What type of farm implements do you use for potato production? Give years of purchase and price.

Farming implements	Number	Years of purchase	Price (Birr/unit)	Total (Birr)
Plough				
Hoe				
Harrow				
Motor pump				
Others (specify)				

21. How is the trend of volume of potato production during the past 5 years? 1. Increasing 2. Decreasing 3. The same 4. No regular pattern

22. If the production increases, what are the reasons? _____

23. If the production decreases, what are the reasons? _____

24. Would you like to expand potato production? 1. Yes 2. No

25. If your answer for Q.24 is yes, why? _____

26. If your answer for Q.24 is no, why? ----------

28. Value addition activities for potato before selling and associated costs

Value adding activities	Mark as (X)	Estimated cost (birr/Qt)
Cleaning		
Cutting		
Storage		
Others (specify)		

30. Is there any problem relating to value adding activities? 1. Yes 2. No

31. If yes, what are these problems? ----------

5. Information Access

1. Did you know market price before you sold your potato? 1. Yes 2. No
2. If yes, what was/were your source of potato market information?

1. Traders 2. Market participant farmers 3.Cooperatives 4. Mass media

5. Others (specify) ----------

3. What type of information did you get? 1. Price information 2.Market place information 3.Buyers' information 4.Other (specify) ----------

4. Do you have mobile phone? 1. Yes 2. No

5. If yes, do you use it for potato market information? 1. Yes 2. No

5. If your answer for question No.4 is yes, cost of using mobile for potato market information only ---------- birr/year

6. Marketing Aspects

1. Did you participate in potato marketing? 1. Yes 2. No

2. If your answer for Q1. Is yes, are you selling immediately after harvesting? 1. Yes 2. No

3. If no, how long have you kept it before selling it? ----------

4. Why you kept it? ----------

5. Do you have storage facilities in your home? 1. Yes 2. No

6. If no, where do you store? Specify ----------

7. Is there any problem relating to storage? 1. Yes 2. No

8. If your answer for Q.7 is yes, indicate the total volume of the product damaged in quintal.

Crop type	% loss before harvest	% loss after harvest	Total loss (Qt)
Potato			

9. To whom you sale your potato? (Multiple answers is possible)

1. Cooperatives 2. Local collectors 3. Wholesalers 4. Retailers 5.processors 6. Consumers

10. What is the reason you selected to sale to the one selected in No.9? 1. Pays high price than

others 2. Low transportation cost 3. Frequent purchase 4.Others (specify) ----------

11. Where could (did) you get them? 1. At the farm level 2.At the district market

3. At the local (village) market 4. Others, specify----------

12. How much you sold for

1. Cooperative ----------Qts at ----------Br/Qt 2. Local collectors----------Qts at -------- Br/Qt 3. Wholesalers ----------Qts at-------- Br/Qt 4. Retailers ----------Qts at ---------Br/Qt

5. Processors ----------Qts -------- Br/Qt 6. Consumers ----------Qts ----------Br/Qt

13. How many hours you need to travel to get the following (on foot?)

1. Cooperative ----------hrs 2. Local collectors ----------hrs 2. Wholesalers ------hrs 4.Retailers -------hrs 5. Processors -------hrs 6 . Consumers -------- hrs

14. Who determine selling price

1. Myself 2. Traders 3. Depending on demand and supply

4. Cooperative 5. Through pre-agreed price

15. Is there any problem in determination of selling price? ----------

16. Means of transportation used: 1. Animals 2. Man power 3. Vehicles 4. Cart 5.Others -

17. Is there transportation problem? 1. Yes 2. No

18. If your answer for Q.17 is yes, what is the problem? ----------

19. Do you have a linkage with other value chain actors? 1. Yes 2. No

20. If your answer for Q19.is yes, with whom do you have? (Multiple response is possible)

1. Local collectors 2. Wholesalers 3. Retailers 4. Processors 5. Consumers 6. Brokers

21. Farm gate lagged year (2006/07 E.C) average selling price of potato _____Birr/qt

24. How is the trend of price of potato per quintal during the last five years? ----------

25. What are the marketing costs you incur when you take your potato to the market?

Activities	**Cost (birr/Qt)**	**Remark**
Transportation		
Loading/ unloading		
Others (specify)		

7. Credit Utilizations

1) Did you need credit in the last cropping season (2007/2008 E.C)? 1. Yes 2. No

2. If yes, have you received credit for potato production purpose? 1. Yes 2. No

3. If yes, how much did you take for potato production purpose? ----------Birr at ---------- interest from formal and ---------- Birr at ----------interest from informal sources respectively.

4. For what purpose did you take the credit in relation to potato production?

1. To purchase fertilizer 2. To rent in land to expand potato production 3. To purchase seed 4.To purchase transporting animals 6. To purchase Motor pump/irrigation equipment

5. From whom did you get credit? (Multiple responses are possible) 1. Relative 2. Bank 3. Micro finance institution 4. Friends 5. Traders 6. NGO 7. Others (specify) _____

6. Is there any problem relating to credit? 1. Yes 2. No

7. If yes, what are these problems? ----------

8. Extension Services

1. Did you get extension service in relation to potato production in 2007/2008 E.C? 1. Yes 2. No

2. If yes, who provided the extension services?

1. DAs 2. Office of agriculture 3. NGOs 4. Model farmers 5. Research centers 6. Cooperative 7. Others (specify) ----------

3. What type of extension services did you get in relation to potato?

1. Input use 2. Product storage 3. Credit use 4. Product marketing 5. Others---------

4. If you had an extension contact in 2007/2008 E.C production year, how frequent did you meet with them? 1. Once in a week 2. Once in a month 3.Two time a year 5. Contact days ---- in a year

5. Is there any problem relating to the extension services? 1. Yes 2. No

If yes, what are these problem(s)? ----------

6. If your answer for Q1. is No, what was/were the reason(s) not to get? ----------

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9. Livestock Production

1. Do you have livestock? 1. Yes 2. No

2. If yes, number of livestock owned: 1. Oxen ---------- 2. Milking cows -------- 3. Heifers - 4. Young bull ------ 5. Calves ----- 6. Sheep ----- 7. Goats --------- 8. Donkey ----- 9. Young Donkey --------- 10. Horse ------ 11. Mule -------- 12. Poultry chicken --------- 13. Bee hives --

10. Income from Off-farm and Non-farm Activities

1. Did you/your family participate in off/non-farm activities? 1. Yes 2. No

2. If yes, fill the table for the 2007/2008 production year

Type of off/non-farm activities	Indicate the participants **(X)**			Total annual income (Birr)
	Men	Women	Children	
1.				
2.				
Total annual income generated from off/non- farm (Birr)				

11. GENERAL QUESTIONS

1. Who do you think benefiting more from potato value chain in your area? ----------

2. Who do you think contributing more to potato value chain in your area? ----------

3. Who do you think play a governance role in potato value chain in your area? ----------

4. What are the major constraints (problems) relating to potato production and marketing in your area? Specify in order of importance

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5. What are the existing good opportunities in relation to potato production and marketing in your area? Specify in order of importance

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6. What kinds of support or facilities do you need from government organs, financial institutions or NGOs existing in your area to improve your potato production and trading? Specify in order of importance

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II. TRADERS' (Local collectors, Wholesalers, Retailers, Brokers and Processers) Interview Schedules:

1. General Information

1. Name of trader---------- Age------- Sex -------

2. Region---------- Zone---------- District/ Town ----------

3. Religion of trader 1. Protestant 2. Orthodox 3. Muslim 4.wakefata 5. Other ----------

4. Language the trader could speak 1.Afan Oromo 2. Amharic 3. Both 3. Other (specify) ---

5. Type of trade: 1. Collector 2. Retailer 3. Wholesaler 4. Broker 5. Processer 6. Other -----

6. Marital status 1. Single 2. Married 3. Divorced 4. widowed

7. Family size including you: Male---------- Female---------- Total ----------

8. Educational level of the respondent----------

9. How long have you been operating the business? ----------years

10. Did you trade alone or in partnership? 1. Alone 2. Partnership 3. Other (Specify) --------

11. If partnership, how many are you in the joint venture? ---------- Persons.

12. Total number of peoples employed in your business: Family member, ----------Male ----------female ----------Total and Non family member, ----------Female --------Male ---------- Total

13. What is your business? Put in order of importance and business proportion

Activity	Rank
Assembling	
Retailing	
Wholesaling	
Brokerage	
Processing	
Exporting	
Others (specify)	

14. Do you participate in potato trading year round? 1. Yes 2. No

15. If your answer to Q.14 is No, at what period of the year do you participate? 1. When purchase price becomes low 2. During high supply 3. Other(specify) ----------

16. Number of market days you participate in a week? ----------

17. Do you practice trading other than potato? 1. Yes 2. No

18. If your answer to Q.17 is yes, what? ----------

19. What was the amount of your initial working capital when you start potato trade business? ---------- Birr.

20. What is the amount of your current working capital? ---------- Birr.

21. What is your source of working capital? (Multiple responses is possible)

1. Own 2. Loan 3.both own and loan 4. Gift 5. Share 6. Others (specify) ----------

22. If you took loan, from whom did you borrowed?

1. Relative/family 2. Private money lenders. 3. Microfinance institution 4. Friend 5. Other traders 6. NGO (specify) -------- 7. Bank 8. Others (specify) ---------

23. How much did you take? _____ birr from formal, ----------birr from informal sources at ------ interest for formal and --------- interest for informal.

24. What was the reason behind the loan? 1. To expand potato trading 2. To purchase potato transporting vehicles/animals. 3. Others (specify) ----------

25. How was the repayment schedule? 1. Monthly 2. Quarterly 3. Semiannually 4. When you get money 5. Annually 6. Others (specify) ----------

26. Is there change in accessing finance for potato trade these days? 1. Improved 2. Deteriorated 3. No change

27. What mode of transportation did you use? Give in percentage

1. Man power ( ) 2. Animal back ( ) 3. Vehicle ( ) 4.cart ( ) 5. Others (specify) ---------

28. Do you carry out any physical treatment to maintain product quality? 1. Yes 2. No

29. If your answer to Q.26 is yes, mention, ----------

30. Asset owned:

Asset		Number
Storage	Separate house	
	Residence	
Telephone		
Mobile		
Weighting scale		
Shop		
Bicycle		
Motor cycle		
Vehicle		
Others (specify)		

31. Are there entry barriers in potato trading? 1. Yes 2. No

32. If your answer to Q.31 is yes, what are they? 1. Capital 2. Information collusion 3. Administrative problems 4.Stiff competition with unlicensed traders 5. High monopoly with prior control of farmers 6. Other (specify) ----------

33. Linkage with commercial value chain actors: (Multiple response is possible) 1. Farmers 2 Retailers 3. Wholesalers 4. Consumers 5. Local collectors 6. Brokers 7. Others (specify)

2. Purchase Practice

1. From which market and supplier did you buy potato? (Multiple market area is possible, multiple answers are possible and write the codes in correspondence to the market area and other answers should be written in accordance)

Market (location name)	From (write code)	1. Producers 2. Collectors 3. Retailers 4. Wholesalers 5. Cooperatives 6. Brokers 7. Unknown 8. others (specify)	Quantity purchased (Qt)	Average price (Birr/Qt)	Payment 1. Cash 2. Credit 3. Advance payment

2. From which market do you prefer to buy most of the time? ----------

3. Why do you prefer this market? 1. Better quality 2. High supply 3. Shortest distance 4. Low price 5. Others (specify) ----------

4. Are all your purchasing centers accessible to vehicles? 1. Yes 2. No.

5. If your answer to Q.4 is No, what proportions are accessible (in %)? ----------

6. How do you measure your purchase? 1. By sack 2. By basket 3. By weighting scale (kg) 4. Others (specify) ----------

7. Who sets the purchase price? 1. Myself 2. Set by demand and supply 3. Sellers 4. Other (specify) ----------

8. Who purchase potato for you? 1. Myself 2. Broker 3. Commission agent 4. Family members 5. Friends 6. Casual labour 7. Others ----------

9. If your answer to Q.8 is brokers, casual labour or commission agent, what they cost you per quintal ----------birr or per market day ----------birr

10. How do you attract your suppliers? 1. Giving better price 2. By visiting them 3. Fair scaling /weighing 4. Giving them credit 5. Using brokers 6. Advertizing using influential peoples 7. Other (specify) ----------

11. Do you consider quality requirement of your customers in purchasing activities? 1. Yes 2. No

12. If your answer to Q.11 is yes, what quality requirement do you consider for potato? ----

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13 What was your source of information about quality requirement of your customers? -----

14. Which are the months of the year when prices are lowest for potato? ----------

15. Which are the months of the year when prices are highest for potato? ----------

16. Is your purchasing price higher than your competitors? 1. Yes 2. No

17. If your answer to Q.16 is yes, what was the reason? (Multiple answers is possible); 1. To attract suppliers 2. To buy more quantity 3. To kick competitors 4. To get better quality 5. Others (specify) ----------

18. How many regular suppliers do you have? Producers _____, Collectors _____, Processors _____, Wholesalers _____, Retailers _____, others _____.

19. Have you ever stopped purchasing due to lack of fund? 1. Yes 2. No

20. If your answer to Q.19 is Yes, for how long? ----------days

21. Is obtaining sufficient volume is a problem? 1.Yes 2. No

22. Have you ever stopped purchasing due to lack of supply? 1. Yes 2. No

23. If your answer to Q.22 is Yes, for how long----------days.

24. Do you pack your purchase? 1. Yes 2. No

25. If your answer for Q.24 yes, what were your packing materials? 1. Sisal sack 2. Plastic Sack 4. Basket 5. Others (specify) ----------

26. What is the cost of packing? _____Birr/Qt

27. Did you store potato before you sold? 1. Yes 2. No

28. If your answer to Q.27 is yes, for how long did you store? -------- --------- hrs/days.

29. Did you grade your potato? 1. Yes 2. No

30. If your answer for Q.29 yes, what was the basis of your grading? 1. Color 2. Size 3. Taste 4. Other(specify)_____

31. What is the cost of grading? _____Birr/Qt

32. What is the most frequently used mode of transport to transport from purchasing sites to storage or grading Centre? (Multiple responses are possible)

1. Head loading 2. Pack animals 3. Animal cart 4. Trucks 5. Others____

3. Selling Practices

1. To which market and to whom did you sell potato. (Multiple answers are possible; write the codes in correspondence to the market area and other answers should be written accordingly)

Market (location name)	To whom (write code)	1. Processors 2. Consumers 3. Retailers 4. Wholesalers 5. Cooperatives 6. Brokers 7. Hotels and Restaurants 8. Unknown 9. others (specify)	Quantity sold (Qt)	Average price (Birr/Qt)	Payment (%) 1. Cash 2. Credit 3. Advance payment

2. How did you sale your produce? 1. Direct to the purchaser 2. Through broker 3. Other (specify) ----------

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

4. What do you do, if the product is not sold on time? 1. Took back home 2. Took to another market 3. Sold it at lower price 4. Sold on other market day

5. When did you sell? (Selling strategies select the number): 1. Store and sell when price rises 2. Sell as soon the purchase 3. Sell in pieces as buyers comes 4. Others (specify) -----

6. How did you attract your buyers? 1. By giving better price relative to others 2. By using brokers 3. By fair scaling 4. Advertising 5. Others (specify) ----------

7. How many regular buyers do you have? Wholesalers_____, Consumers_____, Processors

_____, collectors _____, Retailers _____, others _____

8. Did you know the market prices in different markets (on farm, village market and other areas) before you sold your potato? 1. Yes 2. No

9. If yes, what was your source of information? _____

10. What percent of the total produce is sold on local/district market? ----------%

11. What percent of the produce is sold to domestic market, which is out of district markets,----------%

12. What percent of the produce consumed at home? ----------%

13. Who sets selling price? 1. Myself 2. Set by demand and supply 3. Buyers 4.

14. Are there charges (taxes) imposed by government at the market? 1. Yes 2. No

15. If your answer to Q.14 is yes, ---------- amount (Birr) and what is the basis of payment?

---

16. Do you want to expand potato trading? 1. Yes 2. No

17. If your answer to Q.16 is yes, why? ----------

18. If your answer to Q.16 is No, why? ----------

19. Indicate your average cost incurred per quintal in the trading process of potato in the last production year (2007/2008 E.c)

Cost components	**Cost incurred (Birr/Qt)**
Purchase price	
Labour for packing	
Loading/unloading	
Transportation cost	
Sorting	
Storage cost	
Loss in transport and storage	
Processing cost	
Telephone cost	
Watching and warding	
Other personal expenses	
License and taxes	
Other costs(if any)	
Total cost	
Selling price	
Revenue	

20. Are there problems on potato marketing? 1. Yes 2. No

21. If your answer to Q.20 is yes, what are the problems? Fill the table below

List of problems	**Give number in order to priority (1,2,3,…)**
Shortage of capital	
Lack of credit	
Lack of demand	
Quality problem	
Lack of government support	
Lack of good road and other infrastructures	
Others (if any)	

22. What do you think are the causes of the problems? ----------

23. What do you suggest to correct these problems? ----------

III. Consumers Interview Schedules

1. Name of Respondent: ----------

2. Region: ----------Zone: ----------District (sub city): ----------*Kebele:* ----------

3. Age of the respondent: ------- years

4. Sex of the respondent: 1. Male 2. Female

5. Religion of the respondent 1. Protestant 2. Orthodox 3. Muslim 4. Wakefata 5. Other ----

6. Family size: 1. Male -------- 2. Female -------- 3. Total ----------

7. Education level of the respondent ---------- years of schooling

8. Marital status: 1. Married 2.Unmarried 3. Divorce 4.Widowed

9. Distance to nearest town (potato market center) ----------km or ---------hrs walk

10. what is your annual earning ----------birr? What is your major means of income generation? 1. Farming 2.Trade 3. Employment 4. Others (specify) ----------

11. Is potato consumed in your family? 1. Yes 2. No

12. If yes, Experience in potato products consumption? _____ Years

13. Do you produce and consume or purchase? 1. Purchase 2. Produce 3. Both

14. If you purchase, what is the proportion of your income used for purchase of potato? ----

15. If you produce, do you sell potato in the market? 1. Yes 2. No

16. If your answer for Q15 is yes how much do you sell in 2007/08 production year? -------Qt

2. Demand for potato

1. What type of potato products did you purchased for consumption? Please respond to the following questions. (Multiple responses is possible)

Quantity purchased (per market per Kg)	No. of market days per week	Low price paid (Birr/kg)	No. of months you might have bought at lower price	High price paid (Birr/Kg)	No. of months you might have bought at higher price	From whom did you buy

2. Do you consider any quality requirements to purchase potato? 1. Yes 2. No

3. If yes, what quality requirement do you consider? ----------

4.From whom did you purchase potato most of the time? 1. Producers 2. Local collectors 3. Wholesalers 4. Retailers 5. Processors

5. Why did you select to purchase from your answer to Q.4? ----------

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6. What are the constraints hindering consumption of potato? Rank horizontally (1= most severe, 2= second severe and etc)

Supply shortage	Income shortage	Lack of storage facility at home	High price of product	Poor product handling	Lack of market information	Perish ability	Others (if any)

7. Do you know the benefits of consuming potato product? 1. Yes 2. No

8. Why do you prefer to consume potato? ----------

9. Do you prefer packed or fresh potato product? 1. Packed 2. Fresh

10. What should be done to increase potato product consumption? ----------

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Thank you very much for your time and responding!!