

**ANALYSIS OF STRUCTURE, CONDUCT AND PERFORMANCE OF COW MILK
MARKET IN SULULTA WOREDA, ETHIOPIA**

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**A Thesis Submitted to the Graduate School in Partial Fulfillment of the Requirements of
the Master of Science Degree in Agricultural and Applied Economics of Egerton University**

EGERTON UNIVERSITY

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DECLARATION AND APPROVAL

DECLARATION

This thesis is my original work and has not been presented for award of any degree or diploma in any other universities.

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APPROVAL

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DEDICATION

This thesis is dedicated to my parents and specifically my elder brother Teshome Kebede, for their encouragement in my academic carrier.

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ABSTRACT

Ethiopia's economy is based on subsistence agriculture accounting for 40% of the gross domestic product (GDP). Livestock production contributes 30-35% of the gross domestic product and more than 85% of farm cash income. In this respect, milk production plays a major role in the livelihoods of Ethiopians and it accounts for 19% of the export earnings in the country. In relation to this, Oromia region contributes 40% of the country's milk production. Despite this importance, milk is not adequately market-oriented and competitiveness of smallholder farmers is limited by low market participation. The objectives of this study were to; characterize milk producers and traders, determine the structure conduct and performance of milk market and identify the determinants of participation decision of milk producers and volume of milk marketed in the study area. A total of 150 milk producers and 40 traders from four *Kebeles* of the *Woreda* were interviewed to obtain data using multistage and proportionate sampling respectively. The data was analyzed using descriptive statistics, structure conduct performance approach and Heckman two-step econometric method. The results of the market concentration ratio of the top four milk traders was 87.16% of the total milk purchased per year. This revealed the existence of a strong oligopoly milk market in Sululta *Woreda*. Findings revealed that the marketing channel that had the highest (54.55%) marketing margin was channel III (producer-dairy cooperative union- processor- retailer – consumer). The results of Heckman two step econometric estimation showed that years of education, experience, number of cross-bred milking cows, non-dairy income, extension services, number of children under age of five years and membership to dairy cooperatives had a significant effect on participation of households. Furthermore, volume of milk market supply was also affected by education, gender, cross bred milking cows, non-dairy income and family size. Based on the findings, it was recommended that there is need for policies that promote collective organizations which could play a major role in reducing the level of oligopolistic market structure and market inefficiency in Sululta *Woreda*. Moreover, policies that promote inclusion of smallholder farmers in dairy value chain should be enacted. This include investment in adult education, improving access to extension and promoting new technology which replaces human labor should be applied to increase milk market participation and for better functioning of marketing systems.

TABLE OF CONTENTS

DECLARATION AND APPROVAL	ii
COPYRIGHT	iii
DEDICATION	iv
ACKNOWLEDGEMENT	v
ABSTRACT	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES	x
LIST OF TABLES	xi
ACRONYMS AND ABBREVIATIONS	xii
CHAPTER ONE	1
INTRODUCTION	1
1.1. Background of the study	1
1.2. Statement of the problem	3
1.3. Objectives of the study.....	3
1.4. Research questions	3
1.5. Justification of the Study.....	4
1.6. Scope and limitation of the study.....	4
1.7. Definition of Terms	5
CHAPTER TWO	6
LITERATURE REVIEW	6
2.1. Milk production systems in Ethiopia	6
2.2. Milk marketing system in Ethiopia	7
2.3. Approaches to the study of agricultural marketing	9
2.3.1. Functional approach	9

2.3.2. Institutional approach	10
2.3.3. Commodity approach	10
2.3.4. Structure - Conduct - Performance (S-C-P) approach.....	10
2.4. Marketing costs	12
2.5. Marketing margin.....	12
2.6. Marketed and marketable surplus	13
2.7. Empirical studies	13
2.7.1. Structure conduct and performance of markets	13
2.7.2. Factors affecting participation in milk markets and sales volume	14
2.8. Theoretical framework	15
2.8.1. Structure, conduct and performance framework	15
2.8.2. Utility maximization theory.....	16
2.9. Conceptual framework	18
CHAPTER THREE	20
RESEARCH METHODOLOGY	20
3.1. Description of the study area.....	20
3.2. Sampling procedures and sample size.....	22
3.2.1. Milk producers sampling.....	22
3.2.2. Traders sampling	22
3.3. Types and sources of data	23
3.4. Data analysis	23
3.5. Definition of variables and hypothesis.....	28
CHAPTER FOUR.....	34
RESULTS AND DISCUSSION	34
4.1. Descriptive Results.....	34

4.1.1. Socioeconomic characteristics of the milk producers	34
4.1.2. Socioeconomic characteristics of traders	41
4.2. Structure Conduct and Performance of Cow Milk Markets.....	42
4.2.1. Market structure.....	44
4.2.2. Market conduct	46
4.2.3. Performance of milk market	47
4.3. Determinants of milk market participation and marketed volume of milk	54
4.3.1. Determinants of milk market participation.....	54
4.3.2. Determinants of volume of milk marketed.....	57
CHAPTER FIVE	61
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	61
5.1. Summary	61
5.2. Conclusion.....	62
5.3. Recommendations	62
REFERENCES	65
APPENDIX	70
QUESTIONNAIRE	70

LIST OF FIGURES

Figure 1: Milk market structure, conduct and performance model	19
Figure 2: Map of Sululta Woreda	21

LIST OF TABLES

Table 1: Milk production and productivity by region	7
Table 2: Summary of the variables and expected signs	32
Table 3: Results for socioeconomic characteristics of milk producers (<i>N=150</i>)	37
Table 4: Results on gender, extension service, access to credit, access to market information, membership of dairy cooperative and marital status.....	40
Table 5: Socioeconomic characteristic of traders.....	42
Table 6: Milk producers and traders with the volume of milk they handle	44
Table 7: Concentration ratio of milk buyers	45
Table 8: Barriers to entry in milk market	46
Table 9: Perception of pricing strategy in the milk market	47
Table 10: Estimated average cost incurred by milk suppliers and traders (birr/liter)	49
Table 11: The milk marketing channels identified in Sululta	50
Table 12: Performance of milk market of different channels	52
Table 13: Factors influencing Participation decision of dairy households	57
Table 14: Determinants of volume of milk marketed of dairy household	60

ACRONYMS AND ABBREVIATIONS

APEC	Asian Pacific Economic Cooperation
BoFED	Bureau of Finance and Economic Development
CSA	Central Statistical Agency
DDE	Dairy Development Enterprises
GDP	Gross Domestic Product
ETB	Ethiopian Birr
IO	Industrial Organization
LMD	Livestock Market Development
SCP	Structure, Conduct and Performance
SWAO	Sululta <i>Woreda</i> Administrative Office
SWADO	Sululta <i>Woreda</i> Agricultural and Development Office
SWTIO	Sululta <i>Woreda</i> Trade and Industry Office

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

Ethiopia's economy is based on subsistence agriculture accounting for 40% of the gross domestic product (GDP), 60% of exports, and 80% of total employment (LMD, 2013). Livestock production contributes 30-35% of the GDP and more than 85% of farm cash income. In this respect, milk production is playing a major role in the livelihoods of the people of Ethiopia (Anteneh, 2006). The sub-sector also accounts for 19% to the export earnings (BoFED, 2006). Given the considerable potential for increasing smallholder income and employment generation from high-value milk products, development of the milk sector in Ethiopia can contribute significantly to poverty alleviation and improved nutrition in the country (Kebede, 2009).

There are about 10 million dairy cows in Ethiopia producing 3.2 billion liters of milk per year. The production per cow is estimated at approximately 1.54 liters per day for an average lactation period of six months. In fact, national milk production for the period of 1966 to 2001 increased by only 1.6% per year and per capita production declined by 0.8% per year (Staal *et al* 2008). Despite this large number of dairy cows, the milk marketing system is not yet well developed. There are only limited formal marketing and grading systems that are geared towards matching the quality of milk and milk products to market prices.

Although currently milk and milk products are channeled to consumers through both formal and informal marketing systems, above 95% of the national marketed milk volume is channeled through the informal system. The term informal is often used to describe marketing systems in which the government does not intervene substantially in marketing. Such marketing systems are also referred to as parallel markets whereas the term formal is thus used to describe government; the marketing system which is dominated by the government; government controlled dairy development enterprises or official marketing system and the share of milk sold in the formal market is only about 2%. In informal marketing system, milk and milk products may pass from producers to consumers directly or through one or more market agents. Producers sell the surplus milk to their neighbors and/or in the local markets, either as liquid milk or in the form of butter or

cheese. This system is characterized by no license to operate, low cost of operation, high producer prices as compared with formal market and no regulation of operation (Yilma and Inger, 2011).

However, in the formal marketing system milk is distributed by cooperatives and unions and the private sector. Milk collected at collection centers is supplied directly to consumers in the urban towns and the surplus is collected by large dairy enterprises (Yilma and Inger, 2011). There are a few milk processing plants mainly owned and operated by the government and others by private companies. These are concentrated around Addis Ababa (the capital city), and process products such as pasteurized milk, table butter, hard cheese, yoghurt and *ayib* (cottage cheese) (Yigezu, 2003). In the case of this study both formal and informal milk marketing were included.

Lack of access to markets reduces incentives to participate in market-oriented production and perpetuates subsistence production systems. Fresh milk by small holder farmers is important only when close to formal milk marketing facilities such as government enterprises or dairy cooperatives in the country (Holloway *et al.*, 2000). Farmers far from such formal marketing outlets instead prefer to produce other milk products such as traditional cooking butter and cottage cheese. In fact, the largest quantity of milk produced outside urban centers in Ethiopia is processed by the farm household into products and sold to traders or other households in local markets. In most rural areas of the region, the produced milk is transported to the market by locally available means that may include transport on foot, by donkey or public transport. Milk can be collected either by the buyers or taken by the producers to the sales point, but generally, with the exception of a few commercial farms, farmers are responsible for the delivery of their milk into the market chain. Few farmers would travel longer distances to supply milk to urban markets or to earn higher prices (LMD, 2013).

Therefore, improving the position of smallholders to actively engage in the dairy market is one of the most important development challenges of the country (Holloway *et al.*, 2002). Putting in place a functional quality control system is an important tool to bring about improvement in the dairy sector. Milk marketing is an incentive for farmers to improve production. It stimulates production, raise milk farmers' income and living standards and create employment in rural areas (Tassew, 2007). Provision of improved and sustainable milk marketing arrangement in villages is therefore important in the aspiration for advancement of the sector.

1.2. Statement of the problem

Although Sululta *woreda* contributes the highest amount of milk in Oromia region as well as for the country, there is low participation of milk producers in the market. The milk and milk products are not adequately market-oriented and the competitiveness of smallholder milk producers is limited. This could be the result of a poorly developed marketing system. While there are a number of both formal and informal milk channels in the region, neither the number of buyers and sellers of milk nor the relationship between them had been evaluated if indeed they significantly contribute to milk marketing. Additionally, multiple factors which could affect the participation decision of producers in milk market and volume of milk marketed had not been determined. Furthermore, costs and profits of these channels had not been analyzed. This study therefore attempted to contribute to filling the information gap by investigating the structure, conduct and performance of cow milk market in Sululta *Woreda* special zone surrounding Addis Ababa, Ethiopia.

1.3. Objectives of the study

General Objective

The general objective of the study was to contribute to improved livelihoods in Sululta *woreda*, Oromia region special zone surrounding Addis Ababa, Ethiopia

Specific objectives

To characterize the milk producers and marketing agents

To determine structure conduct and performance of milk markets

To identify determinants of milk market participation and volume of milk marketed

1.4. Research questions

What are the socio-economic characteristics of milk suppliers and marketing agents?

What is the structure, conduct and performance of milk markets?

What are the determinants of market participation and volume of milk marketed?

1.5. Justification of the Study

The knowledge of structure, conduct and performance of cow milk marketing and factors affecting marketed volume of milk is crucial because milk sector is the main creator of employment and affects the GDP and development of the country's economy. The main justification for this study was that it would expose the weaknesses that contribute to inefficiencies in milk marketing. The study would generate useful information that would be used to formulate policies and guidelines for interventions that would improve the efficiency of milk marketing system. The results will be available to any interested dairy stakeholder in Ethiopia.

1.6. Scope and limitation of the study

This study would analyze the structure conduct and performance of cow milk market in Sululta *woreda*, which is regarded as the area of major milk producer in the zone, by using both primary and secondary data from the specified areas of study. More specifically, the study would focus on milk markets and would not generalize on markets of other agricultural products. The study was limited by poor infrastructures, political instability and poor record keeping by organizations.

1.7. Definition of Terms

Formal marketing system: refers to official milk marketing system in which the market is controlled by the government.

Informal marketing system: refers to milk marketing system in which the government does not intervene in marketing.

Kebele- the lower administrative level in Ethiopia

Market- A physical place that brings buyers and sellers of milk together

Market actor- someone who is active in the milk market such as collectors, wholesalers, cooperatives, unions and retailers which is the same as market participant

Market channel- Group of people or organizations that direct the flow of milk and milk products from production areas to consumers

Market conduct- it refers to the strategies, the behaviors and policies used by the firms in the industry

Market performance- The economic outcomes that the structure of the market and the firms' conduct. The affordable the prices of the market against higher return to the traders the better the market performance.

Market participation- refers to farmers who are selling any amount of milk in the market.

Market structure- it refers to the set of characteristics and conditions that define and describe the market type

Marketing system- it includes all activities involved in the flow of milk from the point of initial production to the ultimate consumer

Producers: refers to the farmers who are owning the cows for milk production

Woreda- District or the third administrative level next to regional and zonal level in Ethiopia

CHAPTER TWO

LITERATURE REVIEW

This section presents a review of literature on areas that closely relate to this study. It entails issues of milk production characteristics and marketing system along different markets. Marketing dynamics of milk, structure, conduct and performance of market system is outlined.

2.1. Milk production systems in Ethiopia

Agricultural production is predominantly smallholder mixed farming in most highland areas of the country. Livestock husbandry is typically practiced with crops within the same management unit. Milk production system is the most biologically efficient among the systems and it converts those large quantities of roughage, the most abundant feed in the tropics, to milk, the most nutritious food known to man (Anteneh, 2006).

In Ethiopia milk production systems can be classified into two broad categories: commercial system which produces milk mainly for market and subsistence systems which produce milk mainly to meet household needs for consumption. The commercial system generally operates in urban and peri-urban areas with or without holdings of land for feed production. In the other case the rural milk production system is part of the subsistence farming system and includes pastoralists, agro pastoralists and mixed crop- livestock producers. Specifically, they are classified into four major systems. These are pastoralist, the highland smallholder, urban and peri-urban and intensive milk production system (Azage *et al.*, 2003). In this respect, the central part of the country is known by the high land smallholder milk production system in which milk is used for subsistence and market sell (Kebede, 2009). Oromia region is the largest milk producer in the central part of Ethiopia. The region has 44% of Ethiopian's milking cows and produces 40% of the country's milk (LMD, 2013).

Table 1: Milk production and productivity by region

Geographic area	Number of milking cows	Total milk production	Percentage share of milk production
Ethiopia	10,577,781	3,329,854,796	100
Tigray	654948	184,361,998	5.5
Amahara	2244552	740,347,957	22
Oromia	4,650,990	1,320,007,337	40
SNNPR	2,484,993	884,109,110	27

Source: LMD, 2013

2.2. Milk marketing system in Ethiopia

Marketing is a mechanisms or institutions which bring together both buyers and sellers of a particular commodity. As a basic definition, it is a process of satisfying the needs for human beings by bringing products to people in the proper form and proper time and place. According to Winrock (1989), marketing includes all activities which are performed in moving commodities from the site of production to the site of consumption. It also includes all exchange activities: buying and selling; all physical activities performed to give the goods and services which have high utility; and all the auxiliary activities such as financing, risk bearing, market intelligence or disseminating information to participants in the marketing process. It involves the transfer of ownership of products through buying, selling, pricing, and renting and physical movement as well as transformation of the commodity into more usable forms through transportation, handling, storage, processing and packaging. Therefore, marketing involves sales, locations, sellers, buyers and transactions (Sintayehuet *al*, 2008).

A marketing system includes all activities involved in the flow of goods from the point of initial production to the ultimate consumer. It involves processing of raw materials in to final consumer products and then distributing to the consumers. Similar to other African countries, in Ethiopia

milk and milk products are channeled to the consumers through both formal and informal milk marketing systems (Somano, 2008).

Formal versus informal milk marketing systems

Mohamed *et al.* (2004) reported that milk products in Ethiopia are channeled to consumers through both formal and informal milk marketing systems. Milk marketing is an incentive for farmers to improve production. It stimulates production, raise milk farmers' income and living standards and create employment in rural areas (Tassew, 2007). Provision of improved and sustainable milk marketing arrangements in villages is therefore important in the aspiration for advancement of the sector.

Until 1991, the formal market of cold chain, pasteurized milk was exclusively dominated by the Dairy Development Enterprises (DDE) which supplied 12 percent of the total fresh milk in the areas of Addis Ababa (Holloway *et al.*, 2000). These remain the only government enterprise involved in processing and marketing of milk. It collects milk from different sources including large commercial farms and collection centers that receive milk from smallholder producers. The DDE operates 25 collection centers located around Addis Ababa, 13 of them near Selale, 5 near Holeta and 7 around Debre Brehane.

Unlike the early phase of the formal market appears to be expanding during the last decade with the private sectors entering the milk processing industry. Recently, private businesses have begun collecting, processing, packing and distributing milk and milk products. However, the proportion of total milk production being marketed through the formal markets remains small. This implies that these milk markets are particularly limited to peri-urban areas and to Addis Ababa (Somano, 2008).

The informal markets in the other hand, involve direct delivery of fresh milk by producers to consumers in the immediate neighborhood and sale to itinerant traders or individuals in nearby towns (Debrah and Berhanu, 1991). In the informal market, milk may pass from producers to consumers directly or it may pass through two or more market agents. The informal system is characterized by no licensing requirement to operate, low cost of operations, high producer price compared to formal market and no regulation of operations. The term 'informal' is often used to

describe marketing systems in which governments do not intervene substantially in marketing (Kebede, 2009).

In Ethiopia, fresh milk sales by smallholder farmers are important only when they are close to formal milk marketing facilities such as government enterprises or dairy cooperatives (Holloway *et al.*, 2000). Farmers far from such formal marketing outlets instead prefer to produce other milk products such as cooking butter and cottage cheese. In fact, the vast majority of milk produced outside urban centers in Ethiopia is processed into products by the farm household and sold to traders or other households in local markets (*ibid*).

2.3. Approaches to the study of agricultural marketing

A number of approaches are used to study agricultural marketing. Each approach gives information on the nature and working of the marketing process. The most common five approaches are functional, institutional, commodity approaches and structure, conduct and performance model. Therefore, structure, conduct and performance model is one of approaches used to study agricultural marketing.

2.3.1. Functional approach

Functional approach to study marketing is to break up the whole marketing process into specified activities performed in accomplishing the marketing process that getting farm product from producer to consumer. The approach helps to evaluate cost and benefit of marketing functions. The widely accepted functions are: a) exchange (buying and selling), b) physical (processing, storage, packing, labeling and transportation), and c) facilitating (standardization, financing, risk bearing, promoting and market information). Most of these functions are performed in the marketing of nearly all commodities (Kohl and Uhl, 1985).

Marketing of agricultural products consists primarily of moving products from production sites to points of final consumption. In this regard, the market performs exchange functions as well as physical and facilitating functions. The exchange function involves buying, selling and pricing. Transportation, product transformation and storage are physical functions, while financing, risk bearing and marketing information facilitate marketing.

2.3.2. Institutional approach

Institutional approach examines the activities of business organizations or people in marketing. The institutional approach focuses on the study of the various institutions, which perform the marketing activities. These organizations or people are middlemen who perform the operations necessary to transfer goods from the producer to consumer, because of the benefit of specialization and scale that exist in marketing as well as production (Cramers and Jensen, 1982).

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 is said to be the most practical as it helps to locate specific marketing problems of each commodity and improvement measures. The approach focuses on what is being done to the product after its transfer from its original production place to the consumer this imply that it 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 (Kohls and Uhl, 1985).

2.3.4. Structure - Conduct - Performance (S-C-P) approach

Since the 1960, the systematic nature of markets has increasingly been emphasized in defining means of analyzing their efficiency. The structure conduct performance approach or industrial organization school is then developed. As a branch of applied price theory, the basic paradigm of Industrial organization (IO) which was popularized by Bain in late 1950s, holds that market structure influence the competitive conduct of firms in the market, which in turn influences market performance. Therefore, structure, conduct and performance (SCP) is the basic framework of analysis in the theory of Industrial organization.

The S-C-P approach postulates that as market structure deviates from the paradigm of a perfect competition, the degree of competitive conduct will decline and there will be a consequent decrease in supply of output and allocative efficiency, and an increase in prices. This implies that the performance of markets can be assessed based on the level of competition and efficiency in those markets (Williams *et al.*, 2006).

Market structure: According to Bain 1959, market structure consists of characteristics of the organization of a market which seem to influence strategically the nature of competition and

pricing within the market (Go *et al*, 1999). In particular, these are the degree of seller and buyer concentration, entry conditions, and the extent of agent and product differentiation (Scott, 1995). Market structure is also defined as a selected number of organizational characteristics of a market that establishes relationship between buyers and sellers of a homogenous product (Rugayah, 1993). More specifically it refers to the number and size distribution of firms, and any entry barriers arising from the technology of the production. It therefore describes the nature of the degree of competition and pricing in the market. At one end of the market spectrum is perfect competition while at the other extreme end is monopoly. Market structures between these two represents varying degrees of imperfect competition (APEC, 2008).

Concentration of establishment in the hands of a few firms in an industry is generally criticized on the grounds of competition loss. A market is said to be more concentrated when there are fewer number of firms in production or the more unequal the distribution of market share. The higher the concentration level in an industry, the higher would be the degree of monopoly and absence of competition. Nonetheless, high concentration brings greater innovation and technological change and thus the benefits associated with it may perhaps be sufficient to offset the adverse monopoly effects of high concentration (APEC, 2008).

Competitive market and low concentration of an industry indicate low market power held by firms. “According to Alvarado, (1988), market power refers to the condition where the providers of a service can consistently charge a price above those that would be established by competitive market” (Gichangi, 2010). Market power can also be defined as the concentration of resources in the hands of a single producer or an insufficient numbers of producers. It enables a firm to set prices above marginal costs. Dessalegn *et al.*, (1998) mentioned that market concentration refers to the number and relative size distribution of buyers or sellers in a market. There is also existence of some degree of positive relationship between market concentration and gross marketing margin.

Market conduct: marketing conduct refers to the patterns of behavior that enterprises follow in adopting or adjusting the markets in which they sell or buy (Bain, 1968). Thus marketing conduct shows the analysis of human behavioral patterns that are not obtainable, quantifiable or identifiable. In such a way, in the absence of theoretical framework for market analysis, there is a tendency to treat market conduct variables in descriptive manner. Market conduct is exceedingly complex, encompassing as it does virtually all human decision making within business

organization and by extension, household, on top of the market structure, the legal environment and the internal organization of the business enterprise influence the market conduct (Wolday, 1994).

Market performance: market performance can be evaluated by analyzing the costs and margins of marketing agents in different channels. A commonly used measure of performance is marketing margin or price spread. Margin or price spread can be a useful descriptive statistics if it used to show how the consumers' food price is divided among participants of at different levels of marketing system (Idahe, 2013).

2.4. 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 marketing activities in the transportation of goods from producer to consumers. Marketing costs include handling cost (packing and unpacking, costs of searching for a partner with whom to exchange, screening potential trading partners to ascertain their trustworthiness, bargaining with potential trading partners (and officials) 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).

2.5. Marketing margin

A marketing margin is the percentage of the final weighted average selling price taken by each stage of the marketing chain. The total marketing margin is the difference between what the consumer pays and what the producer/farmer receives for his product. In other words, it is the difference between retail price and farm price (Cramers and Jensen, 1982). A wide margin means usually high prices to consumers and low prices to producers. The total marketing margin may be subdivided into different components: all the costs of marketing services and the profit margins or net returns. The marketing margin in an imperfect market is likely to be higher than that in a competitive market because of the expected abnormal profit. But marketing margins can also be high, even in competitive market due to high real market cost (Wolday, 1994).

2.6. Marketed and marketable surplus

Marketed surplus 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. Distress sales, where the product is sold soon after harvest in order to satisfy prior obligations and then repurchased or replaced later on are also included in the definitions of marketed surplus. However, Marketable surplus 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 in the market. In such case, marketed surplus would be a gross term and marketable surplus is the net. It is the amount left with the farmer after meeting his family consumption, payment in kind, gifts and on farm wastage mount after repurchases (Aslam *et al*, 2013).

2.7. Empirical studies

2.7.1. Structure conduct and performance of markets

Different scholars conducted research on agricultural commodities marketing by using market concentration ratios, marketing costs and margins and profit analysis. The result indicates that margin and profit received by marketing actors and level of market efficiency varied with respect to location and size of marketing channels.

Somano (2008) revealed that milk market in Hawwassa and Yergalem was strongly oligopolistic with market concentration ratios of 62.2% and 53.6% respectively, Where as the market type for milk in Shashemane was weakly oligopolistic with concentration ratio of 39.7%. The total gross marketing margin (TGMM) in Hawwassa, Shashemane and Yergalem was 37.2%, 40.9% and 53.3% respectively.

Geteneh (2005) used the concentration ratio and found that in Ada'liben district of Ethiopia, milk market was weakly oligopolistic where 41.2% of the market was dominated by four firms. Local dairy cooperative got 28.3% of market share and the combined three processors had a market share of 21.9%. Intenerate traders got net marketing margin of 7.6% for butter and the dairy processors got the highest net marketing margin (19.9% of retail price) while the least marketing margin (1.05% of the retail price) was obtained by the dairy cooperative.

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

2.7.2. Factors affecting participation in milk markets and sales volume

There is insufficient literature on sales volume of milk and milk marketing in Ethiopia. However in this study attempts is made to review the available findings. Study conducted by different researchers on different product market supply identified different factors of market participation decision.

Idahe (2013) analyzed determinants of butter market participation and marketed volume in Kimbibit District of Ethiopia and the findings revealed that four of the variables: age of the household, education, access to market information and distance to nearest better market were increases the probability of producers' decision to sell butter.

Kuma (2012) found that most of the factors determining decision of participation in milk value addition also determined the level of participation. The Probit model results indicate that social factors: presence of children, distance from urban centers shelf life and labor played a significant role in the probability of milk sales decision positively while poor extension services, age, milk yield per day played a significant role in the probability of milk sales decision negatively.

Bellemare and Barrett (2006) estimated factors affecting animals sell in Kenya and Ethiopia. They observed that the net purchase and net sales volume choices depend on expected market participation. The household head sex (female headed), age, family size, herd size, livestock unit and small stock (goat and sheep) had negative influence on the number of animals sold.

Kidanu (2010) analyzed factors affecting dairy household butter market entry decision and marketed surplus (Probit model) of Heckman two stages in Atsbi, wenberta and Alamata Woredas

in Tigray. Findings revealed that the three of the variables were positively associated with the probability of selling butter. The quantity of butter produced, frequency of extension agent contact and market information access increase chance of household selling butter. The other three significant factors were negatively associated with the probability of participation in the butter market, distance to the nearest market and distance to development center tended to decrease the likelihood of selling butter.

2.8. Theoretical framework

In this study, structure conduct and performance model framework and Utility maximization theory were used.

2.8.1. Structure, conduct and performance framework

In order to determine structure, conduct and performance of milk market in Sululta *Woreda* structure, conduct and performance model framework was used which looks at the relationship between market structure, conduct and performance of firms. The theoretical framework was first developed by Edward Mason (1939) whereas the empirical work was started by his student Jeo S.Bain (1951).

The structure- conduct-performance paradigm attempts to establish the link between market structure and performance. In terms of market structure, the more concentrated an industry, the more market power would be exercised in the industry. The approach stipulates that an industries successful performance in producing benefits for consumers depends critically on the conduct and the competitive behavior of firms in the market. It is argued that when competition amongst firms is almost nonexistent, firms with market power in an industry would lead to worst market outcome for consumers. In turn, firm conduct hinged upon market structure and is more likely to occur when the number of firms in the industry is few and when there are barriers to entry in to the market. On the other hand, when there are many firms in the market, firms are free to enter and they are more likely to compete with each other. Following this reasoning an industry's performance are determined by the conduct of the firms which in turn depend on the structure of the market (Kaonga, 2015).

2.8.2. Utility maximization theory

In order to analyze market participation household head in milk market in Sululta *Woreda* of Ethiopia an agricultural household model framework was applied. According to Singh et al. (1989), the household model assumes the household maximizes utility subject to set of constraints. Following Singh et al. (1989) and assuming absence of transaction costs, the household's problem is to maximize utility function.

$$\text{Maximize utility } U(C, Z_u) \text{ the utility function (1)}$$

Subject to

$$\sum_{i=1}^N p_i m_i + T = 0 \text{ The cash constraint (1.1)}$$

$$Q_i - x_i + A_i - m_i - c_i = 0 \text{ The resource balance (1.2)}$$

$$C(Q, x; z_Q) = 0 \text{ The production technology (1.3)}$$

$$c_i Q_i x_i \geq 0 \text{ The non-negativity condition (1.4)}$$

Where C is consumption Z_u is exogenous shifter of the utility function, p_i is a market price of good i, m_i is quantity that the household decides to sell in the market (positive for sell and negative for purchase), and T represents exogenous transfers and other incomes on the other hand, Q_i represents how much to produce, x_i how much input to use, A_i the endowment in good i, c_i how much of good I to consume, G the production technology and z_q exogenous shifters of the production function.

The cash constraint equation (1.1) states that expenditures in all purchases must not exceed revenues from all sales and transfers. The resource balance equation (1.2) states that for each of the N goods, the sum of the amount used as input, consumed, and sold is equal to the endowment of the good plus what is produced and bought. The production technology equation relates inputs to outputs.

According to Jagwe (2011) and Key et al. (2000) incorporating proportional transaction costs and fixed transaction costs into the household cash constraint yields:

$$\sum_{i=1}^N \left[(p_i - t_{pi}^s(z_t^s))\delta_i^s - (p_i + t_{pi}^b(z_t^b))\delta_i^b \right] m_i - t_{fi}^s(z_t^s)\delta_i^s - t_{fi}^b(z_t^b)\delta_i^b + T = 0 \dots\dots\dots (1.6)$$

To solve the household problem, a Lagrange expression is derived and first order conditions for the consumption goods obtained from equation (1.1) to (1.6)

The decision price, p_i is thus defined as

$$p_i = \begin{cases} p_i - t_{pi}^s & \text{if } m_i > 0 \text{ for a selling household} \\ p_i + t_{pi}^b & \text{if } m_i < 0 \text{ for buying house hold} \\ \frac{\mu_i}{\lambda} & \text{if } m_i = 0 \text{ for self- sufficient household} \end{cases}$$

For empirical analysis, the current study is focused on the selling households. Accordingly the linear expression of equation for the supply functions and the proportional transaction costs was assumed as follows (Jagwe, 2011):

From $Q^s = Q(p - t_p^s - t_f^s, z^Q)$

$$Q(p, z_Q) = p\alpha + z_Q\alpha \text{ and } t_p^s = -z_t^s\alpha_p^s \text{ where } t_p^b = -z_t^b\alpha_p^b \dots\dots\dots (1.7)$$

This leads to linear expression for the supply curve as follows

$$Q^{s*} = p\alpha_m + z_t^s\alpha_t^s + z_Q\alpha_Q \dots\dots\dots (1.8)$$

Where, z_t are exogenous characteristics that affect transaction costs when selling; z_Q are production shifters; z_c are consumption shifters and $\theta_t^s, \theta_Q^s, \theta_c^s$ are their coefficients respectively.

With a linear production threshold Q^s , expressed as

$$Q^s = z_t^s\theta_t^s + z_Q\theta_Q^s + z_c\theta_c^s \dots\dots\dots (1.9)$$

Where Q^{s*} is the latent supply of households if a household is a seller and it is observed when it is higher than the threshold for market participation Q^s . Thus, if $Q^{s*} > Q^s$ then the household is participating in the market as seller. Following this theory, the decision of households to participate in milk market can be determined as follows

$$Q^{s*} > Q^s \equiv \text{prop}(Y=1) = x_i \alpha_i + \mu \dots\dots\dots (1.10)$$

Where α_i is estimation of coefficients while x_i is factors that determine the participation decision of household head.

2.9. Conceptual framework

Figure 1 indicates a flow diagram of the conceptual framework for this study. This framework is a modified structure, conduct and performance framework which would provide a visual view of interaction. A common accepted conceptual framework in industrial organization studies holds that structural conditions which determine the market conduct and subsequent performance of a firm. To assess the market structure, conduct and performance and to properly understand the roles of each element, Waldman and Jensen, (2001), linked those elements and attributes that have direct relationship. In perfectly competitive markets, an atomistic market structure results in efficient economic performance with price equals to marginal cost, efficient firms driven from the market, and long-run economic profits equal to zero.

At the onset of this framework, socio-economic characteristics of producers and traders (such as age, experience, gender, education, marital- status, number of children, number of local cow bred and cross bred, school expenses and occupation) and institutional factors (such as access to credit, extension contact, access to market information, market access and cooperative membership) influence the participation decision of household in the market and the volume of milk marketed which are within the market structure. This is because when the participation in milk market is low, that is when there is a few numbers of producers and traders in the market; the marketing system tends to be imperfect structure. This situation ultimately has impact on the market performance. Finally, the market margin was the measure of performance in ensuring that all the market benefits are passed on to the milk producers. In the long run, it was expected that such benefits would translated to improved milk production and marketing system.

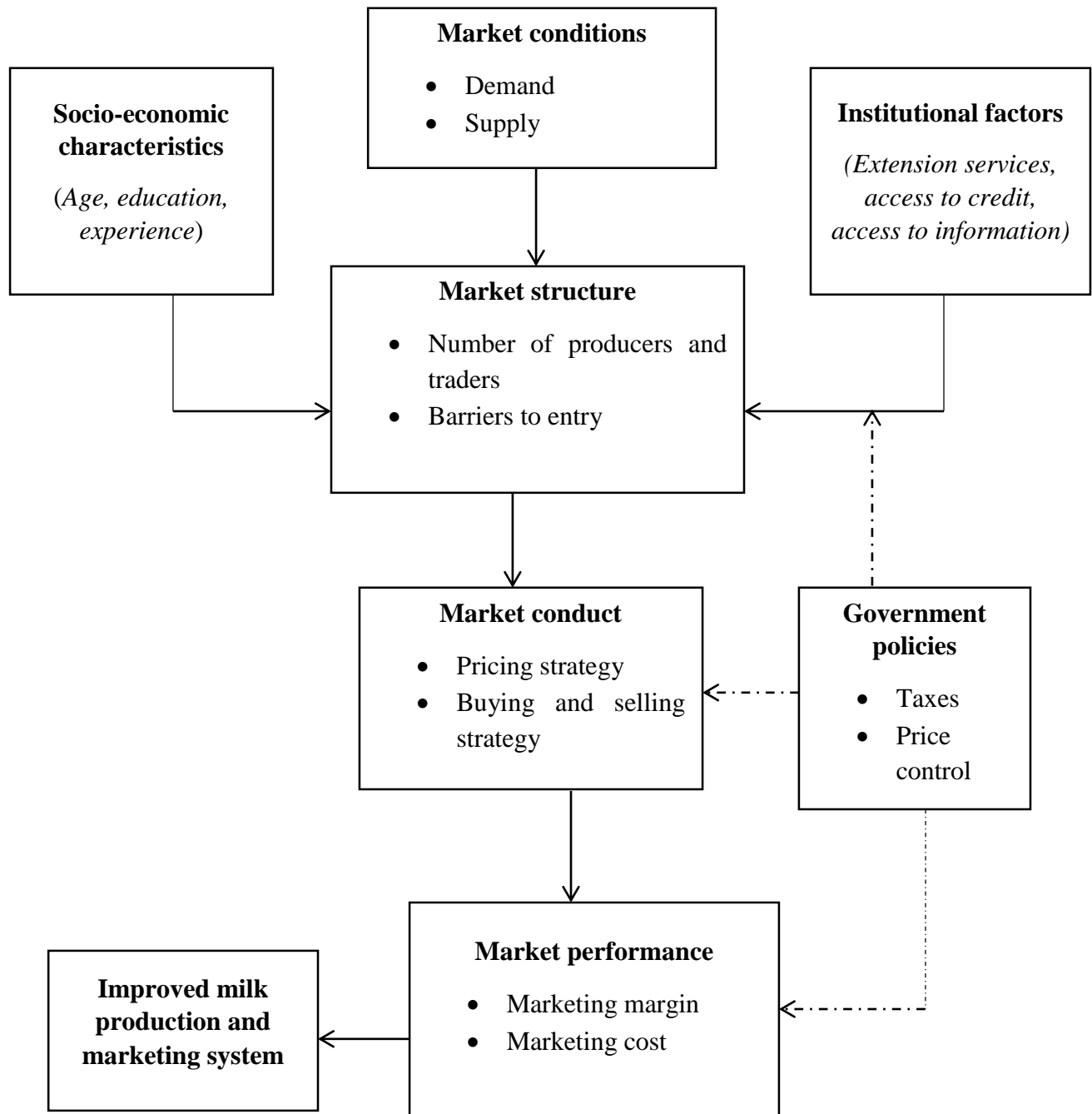


Figure 1: Milk market structure, conduct and performance model

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Description of the study area

The study covered Sululta *Woreda* which is the central part of Ethiopia. As shown in Figure 2, Sululta is one of the *Woredas* in special zone surrounding Addis Ababa in Oromia Regional state. The *Woreda* covers an area of 115,123 hectares of land and currently divided into 23 *Kebeles* and 3 towns namely Chancho, Duber and Durba. Sululta is bordered by Wuchale and Yaya-Gulale *Woreda* in the north, Addis Ababa city administration and Wolmera *Woreda* in the south, Jida and Bereh *Woreda* in the east and Mulo *Woreda* in the west direction (SWADO, 2016). Geographically, the area is situated between 9.07 - 9.52⁰ northing and 38.53 - 38.98⁰ easting while the altitude is ranging from 2851-3700 meters above sea level.

The total population living in the *Woreda* was estimated to be 135459 of which 67748 were men and 67711 were women (SCA, 2014). The population density of the *Woreda* was estimated to be 136.1 per kilometer squares. Agriculture is the main source of income of the population in the *Woreda*. Livestock husbandry and crop production are the predominant economic activities and the major sources of livelihood in the area. The total cultivated land was estimated to be 71242 hectares and cultivated through rain fed. The main farming in the area is livestock rearing followed by crop production, mostly cereal crops such as wheat, barley, teff and pulse crops such as lentil, horse bean, pea and others. The livestock feed resources are grazing land, hay and crop residue.



Figure 2: Map of Sululta Woreda

Source: CSA, 2012

3.2. Sampling procedures and sample size

3.2.1. Milk producers sampling

The sampling frame consisted of all milk producers of *Sululta woreda*. To obtain the desired sample, a multi-stage random sampling was adopted. In the first stage, four *kebeles* (Lilo-chabake, Gorfo, Chanco-Buba and Ako-Afo-Babo) were selected purposively based on the production potential of milk. In the second stage, households were randomly selected using simple random sampling technique where the table of random number was used. The total sample size was determined using the formula adapted by (Kothari, 2004) as follows:

$$n = \frac{z^2 \cdot p \cdot q}{e^2}$$

n = Sample size

z = Confidence interval (z -value, 1.96 at 95%),

p = 0.5% (the expected proportion of the population of milk suppliers)

$$q = 1 - 0.5$$

e = 8% (the allowable margin of error)

$$n = 0.5 * 0.5 \left(\frac{1.96}{0.08} \right)^2 = 150$$

Therefore a sample size of 150 milk producers were interviewed

3.2.2. Traders sampling

To generate the sample size for traders, a list of all market traders from the *Woreda* was obtained from trade and industry office. The list consisted of 133 traders from four *kebeles* (Lilo-chabeka, Gorfo, Chanco-Buba and Ako-Efo-Babo) out of which 75 percent, 17 percent, 7 percent and 1 percent were retailers, semi-wholesalers, milk processing plants and unions respectively. Proportionately, 30 retailers, 6 semi-wholesalers, three milk processing plants and 1 cooperative union were selected.

3.3. Types and sources of data

Both primary data and secondary information were used. Primary data were collected using two types of interview schedules (one for farmers and the others for traders). Milk producers provided information on determinants of milk market participation and marketed surplus while market related information were collected from producers and traders.

Secondary information which were related to the number of producers and traders, market channels and others were obtained from different sources, such as reports of Animal Husbandry, Healthy and Marketing Agency and agricultural office at different levels, *Woreda* cooperative promotion offices. Other sources were previous research findings, journals, books, websites and other published and unpublished materials which were relevant to the study.

3.4. Data analysis

Objective one

To characterize milk producers and marketing agents, descriptive characteristics such as percentages, ratios, means, minimum, maximum and standard deviation were applied in the process of describing socio-economic and institutional characteristics of milk suppliers and traders.

Objective two

To determine the structure conduct and performance of milk markets, the structure-conduct-performance model analysis was used.

Market structure: It was determined based on market concentration by traders and barriers to market entry for potential traders. Concentration is defined as the number, size and distribution of sellers and buyers in the market. The greater the degree of concentration, the greater is the possibility of noncompetitive behavior in the market. For an efficient market, there should be sufficient number of buyers and sellers.

Kohls and Uhl (1985) bring into play as rule of thumb, the four largest enterprises' concentration ratio of 50% or more (an indication of a strongly oligopolistic industry), 33-50% (a weak-oligopoly) and less than that (competitive industry). Therefore concentration in the market was

estimated using the common method of market concentration ratio. The concentration ratio was calculated by the following formula.

$$S_i = \frac{V_i}{\sum V_i} \dots\dots\dots (2)$$

Where

S_i = market share of buyers i

V_i = amount of product handled by buyer i

$\sum V_i$ = total amount of product handled by buyers

$$C = \sum_{i=1}^m S_i \text{ Where } i = 1, 2, 3, \dots, m \dots\dots\dots (3)$$

Where C = concentration ratio

S_i = percentage share of the i^{th} firm

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

Market conduct

Market conduct is the pattern of behavior that firms follow in adapting or adjusting to the market in which they buy or sell. The implication is that they are not readily identifiable, obtainable or quantifiable (Pomeroy, 1989). Therefore, market conduct was treated in a descriptive manner. Market conduct was determined based on pricing strategies and buying and selling practices.

Market performance

Market performance was determined by using marketing costs and margins. Market institutions move milk and milk products from dairy producers to consumers. In this way, all functions or services involve cost. In the marketing of milk, the difference between the price paid by consumers

and the price received by the dairy producers for an equivalent quantity of product is known as marketing margin. Prices at successive stages of marketing at the producers', wholesalers and retailers was compared.

Estimation of Marketing Margin

Marketing margin for the various milk traders was estimated using the following formulas.

$$TGMM = [(cp - pp)/cp] * 100 \dots\dots\dots (4)$$

$$GMMP = [(cp - MGM)/cp] * 100 \dots\dots\dots (5)$$

Where

TGMM = total gross marketing margin

cp = consumer price

pp = producer price

GMMP = producers gross marketing margin

MGM = Gross marketing margin

The producer's share of consumer price was determined as

$$(cp - pp)/cp \dots\dots\dots (6)$$

Where *cp* = consumer price

pp = producer price (taken as producers selling price per unit less producer's marketing costs)

Average milk prices received by producers and paid by consumers during on-peak and off-peak was used for this calculation.

Objective three

Econometric model was used to identify the factors that influence dairy household's participation decision in milk marketing in one hand and determinants of the volume of milk marketed in the other hand. Most recent literatures adopt Tobit and Heckman's two stage models to identify such factors. Current study also applied Heckman two stage model for such purpose.

The choice of Heckman two stage model was considered in order to control selectivity bias, endogeneity problem and to obtain consistent and unbiased parameter estimates. From Heckman two stage models, the first stage was market participation selection equation which helps to identify factors influencing milk market participation decision using Probit model. Then the second stage, OLS regression was fitted along the probit estimated Invers Mill's Ratio in order to identify factors affecting the marketed supply of milk.

Following Gujarati (2004), specification of Heckman two step procedures, which is written in terms of the probability of participation in milk market (PMM) and volume of marketed milk (VMM), is:

The selection equation of binary Probit

$$Y_{il} = X_{il}\beta_1 + U_{li}; U_{li} \approx N(0,1) \dots\dots\dots (7)$$

$$\text{PMM}=1 \text{ if } Y_{il} > 0$$

$$\text{PMM}=0 \text{ if } Y_{il} \leq 0$$

Where Y_{il} = the latent dependent variable, which is not observed;

PMM= is the estimated probability of participation in milk market;

X_{il} =vectors that are assumed to affect the probability of sampled household participation in milk market.

β_1 =is a vector of unknown parameter in equation of participation.

U_1 =residuals that are independently and normally distributed with zero mean and constant variance.

PMM=participation in milk market

VMM=volume of marketed milk

The Observation equation/ OLS regression equation/ supply equation

$$VMM = Y_{2i} = X_{2i}\beta_2 + \alpha\lambda_i + U_{2i}; U_2 \approx N(0, \delta_2)$$

Where

Y_{2i} =observed if and only if PMM=1. The variance of U_{1i} is normalized to one only because only PMM, not Y_1 is observed. The error terms U_1 and U_2 are assumed to be bivariate and normally distributed with correlation coefficient, ρ .

Y_{2i} =regressed on the explanatory variables, X_{2i} and the vectors of invers mill's ratios λ_i from the selection equation by ordinary least squares (OLS).

Y_{2i} =the observed dependent variable

X_{2i} =factors assumed to affect the marketed volume of milk

β_2 =vector of unknown parameter in the marketed volume of milk equation.

U_{2i} =residuals in the observation equation that are independently and normally distributed with zero mean and variance δ_2 .

$$\text{Mill's ratio } (\lambda) = \frac{F(X_1\beta_1)}{1 - F(X_1\beta_1)}$$

$X\beta$ =a density function

$1 - F(X_1\beta_1)$ =distribution function

Then the following empirical model was specified to evaluate objective three using Heckman two stage procedures.

PMM or $Y_i =$

$$\beta_0 + \beta_1 AGE + \beta_2 GENDER + \beta_3 EDUCL - \beta_4 NCHA5 + \beta_5 DTM + \beta_6 NLBMC - \beta_7 NDI + \beta_8 EXC + \beta_9 ATC + \beta_{10} AMIN + \beta_{11} MDCO + \beta_{12} EXP - \beta_{13} CAH \dots\dots\dots(8)$$

Where, PMM is participation in milk market taking the values of 1 for participants and 0 for non-participants, Y_{2i} is the volume of milk marketed by the respondents in the study area.

3.5. Definition of variables and hypothesis

Variables that were expected to affect both producers' participation decision and marketed surplus of milk were specified as follows:

Dependent variable

Participation decision in milk market (PMM): it was the dummy variable that represents probability of the household participation in the milk market. Households were considered as participant if they supply any amount of milk to the market. For the household that participated in milk market, the variable took the value of 1 and 0 otherwise.

Volume of marketed milk (VMM): was continuous dependent variable in the second step of Heckman selection equation. It was measured in liters and represented actual sales of milk per day by dairy household.

Independent variables

The independent variables that were assumed to influence participation decision in milk market and the level of market supply are the following.

Age of household head (AGE): Age was taken as continuous variable referring to the age of household head in years. It was assumed that aged households have experience of producing milk, resource use and have more milking cows and increasing milk production. Age was expected to have a positive effect on market participation and marketed surplus of milk.

Gender of household head (GENDER): This was a dummy variable which took value of 1 if the household head was male and 0, otherwise. It was assumed that the male household head had a positive effect on market participation decision and volume of milk sale due to the need of more income from the sale of milk and also assumed that due to better tendency of male than female to enter into milk market and sale more milk.

Education (EDUCL): This was continuous variable and was measured in years of formal schooling of the household head. Education was hypothesized to affect milk market participation decision and marketed volume of milk positively. This was due to the assumption that education plays an important role in innovation and adoption of new technologies and to get updated demand and supply price information which in turn enhances producers' willingness to produce more and increase milk market sale.

Experience of household in milk production (EXP): it was taken as a continuous variable which refers the number of years the farmer engaged in milk producing activity and was expected to influence participation of household in the market and volume of milk marketed positively. This was due to the assumption that as dairy households get more experience in producing milk, the milk yield increases and then the probability of participation in milk market also increases with the volume of milk marketed. Moreover, dairy household with longer producing experience would have the cumulative knowledge of the entire producing environment. This in turn enable them to adopt improved system of feeding earlier than dairy household with short producing experience.

Number of children under age of 5 (NCHA5): It was continuous variable and refers to the number of children under age of five. It was assumed that mostly milk is the major food for children and it is commonly important in children growth in both rural and urban areas. The increase in the number of children in this age category usually decreases the marketed surplus of milk and reduces the ability of producers' market participation. Due to that the variable was assumed to have a negative impact on the market participation decision of the household and volume of milk sale.

Distance to market (DTM): it was continuous variable measured in kilometers. It refers to distance from the household residence to the nearest milk market. It was assumed that the closer the milk producers to the nearest market, the lower would be the transaction costs and better access to

market information and facilities. Therefore, it was hypothesized that this variable was negatively related to market participation and volume of milk marketed.

Number of local bred milking cows owned (NLBMC): this variable was taken as continuous and was measured in number of local cows owned. It was assumed that as the number of milk cow increases production increases which enhance volume of milk sale. So that the participation decision and marketed milk surplus were assumed to be affected positively.

Number of cross bred milking cows owned (NCBMC): this variable was taken as continuous and was measured in the number of cross bred milking cows owned by households. Due to the assumption that production varies directly with the number of cross bred lactating cows, it was hypothesized that the variable had a positive impact on participation decision in the market and volume of milk marketed.

Non –diary income (NDI): it was taken as continuous variable measured in Ethiopian Birr and represents income originating from different sources other than dairy by household head and other household members. It was assumed that the non-dairy income helps the household to expand production or purchase from the market. It also strengthens the household position in coping with different forms of risks and enters them into economic transaction. Therefore, the variable was hypothesized to affect participation in the market and marketed surplus negatively.

Extension services (EXC): it was taken as a dummy variable taking a value of one if household has access to extension and zero otherwise. It was assumed that extension service is an important source of price information, knowledge and advice for dairy producers. Therefore contact with extension agent was assumed to have a positive effect on market participation and marketed volume of milk. Study by Holloway *et al.*, (2000) has shown that visits by extension agent improve participation and volume of milk sale.

Access to credit (ATC): It was taken as a dummy variable taking a value of one if the household has access to credit and zero otherwise. This variable was expected to influence the marketable supply of milk and market entry decision by dairy household positively. Access to credit improves the financial capacity of dairy households to buy more improved dairy cows, thereby increasing milk production, milk market participation and marketable surplus.

Access to market information (AMIN): It was taken as a dummy variable which took a value of one if the household head has access to market information and zero otherwise. Farmers marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. Therefore, it was hypothesized that market price information was positively related to market participation and marketable surplus. According to Goetz (1992), better market information raises the probability of market participation.

Membership in dairy cooperative (MDCO): It was taken as a dummy variable which took a value of one if the household head is a member of dairy cooperative and zero otherwise. Membership to different groups such as dairy cooperatives increase frequency of information flow among the group members. Therefore, farmers who belong to such groups are better informed and have higher possibility of participating in the milk market. It was therefore hypothesized that membership in dairy cooperative influences market participation and marketable surplus positively.

Consumed amount of milk (CAM): it was taken as continuous variable measured in liters. Households who consume small amount of milk per liters at home supply more volume of milk to the market. Due to this, the variable was expected to have a negative impact on market participation decision and volume of milk marketed.

Table 2: Summary of the variables and expected signs

Variable	Description	Types	Values/unit	Hypothesis
Dependent variable				
PMM	Participation in milk market	Dummy	0=no 1=yes	
VMM	Volume of milk marketed	Continuous	Liters	
Independent variable				
AGE	Age of household head	Continuous	Years	+
GENDER	Gender of house hold head	Dummy	0= female 1= male	+
EDUCL	Education	Continuous	Years of schooling	+
NCHA5	Number of children bellow age of five	Continuous	Number	-
DTM	Distance to market	Continuous	Kilometers	+
NLBMC	Number of local bred milking cows owned	Continuous	Number	+
NCBMC	Number of cross bred milking cows owned	Continuous	Number	+

Continuation of Table 2

NDI	Non diary income	Continuous	Birr	-
EXC	Extension services	dummy	1=yes, 0=no	+
ATC	Access to credit	Dummy	1=yes, 0=no	+
AMIN	Access to market information	Dummy	1=yes, 0=no	+
MDCO	Membership in diary cooperatives	Dummy	1=member, 0=non member	+
EXP	Experience of households	Continuous	Number of years	+
CAM	Consumed amount of milk	Continuous	Number	-

CHAPTER FOUR

RESULTS AND DISCUSSION

In this section the results of descriptive and econometric analysis are presented. The general characteristics of dairy households and milk traders and market structure-conduct-performance of milk markets are described by the descriptive analysis whereas factors affecting dairy households' participation in the milk markets and volume of milk marketed were analyzed by econometric model.

4.1. Descriptive Results

4.1.1. Socioeconomic characteristics of the milk producers

The age distribution of milk producers is presented in (Table 3). It was important to identify the age of households' because it influences their business operations. The overall average age of the respondents' was 44.12 years. The age of participants ranged from 30 to 76 years with the mean of 43.12 years. The composition of milk producers showed that the mean age of non-participant was 45.2 years. There was no statistically significant difference between the mean age of participant and non- participant. The result suggests that the most frequent age of market participants that dominated the market were young. This age bracket is associated with active stage in life with high productive ability and ample access to resources for milk production

Education is the key in production as well as in trading through information sharing, prices awareness as well as input choices among others (Ooko, 2013). The composition of milk producers revealed that the mean years of schooling for participants was 8.29 with 4.38 standard deviation. The composition also revealed that the mean years of schooling for non-participants was 1.2 years. There was a statistically significant difference between the mean years of education for the two groups at 1% level of significance (Table 3). These suggest that milk producers were literate and can easily receive new technology to increase the capacity to produce and manage their milk production to supply to markets. Somano (2008) found that education has a positive effect on the supply of products because it improves the household capacity to process production related and market related information.

The overall mean of experience in dairy production for milk market participant and non-participant was 16.87%. The mean years of experience in dairy production of participant was 21.86 years with standard deviation of 7.42. Whereas the mean year of experience in dairy production for non-participant was 4.84 years. There was a significant difference in average annual years of experience in dairy production of the household heads between participants and non-participants at 1% level of significance (Table 3). This imply that, this year was adequately long enough for participants to have known the numbers and breed of dairy cows which give high yields and the marketing channels as well.

The result revealed that the overall average number of local bred milking cows was 2.82. The result also showed that the average number of local bred milking cows of milk market participant and non-participant were 2.95 and 2.67 respectively. There was no statistically significant difference between milk market participant and non-participant in terms of this variable (Table 2).

Regarding the cross bred milking cows, the overall average of cross bred milking cows was 2.98. It was also shown that the average number of cross bred milking cows per household of milk market participants and non-participants were 4.07 and 1.64 respectively. There was statistically significant mean difference between milk market participants and non-participants in terms of cross bred milking cows at 1% level of significance (Table 3). This Imply that the participants were having more interest for cross bred milking cows than non-participants for the high production and supply of milk.

The result showed that the overall average of non-dairy income was ETB 19378.17. The average of non-dairy income for participant and non-participant were ETB 5386.8 and ETB 53084.66 respectively. There was statistically significant mean difference between the participant and non-participant in terms of non-dairy income at 1% level of significance. This imply that non-participants had greater non-dairy income than milk market participants. This might be due to the fact that non-participants were making in different non-dairy business enterprises.

Regarding to the family size, the overall average number of family members was 5.3. The result revealed that, the mean family size for participants was 5.31 members whereas 5.27 members for non-participants. With regards to this variable there was no statistically significant difference between the participants and non-participants of milk market (Table 3). The milk market

participants with large families often supply more milk to the market. This is due to the fact that family size represent labor resources for dairy production. Somano (2008) found that household members represent labor resources for better management of dairy cows and hence increases the probability of households' decision to participate in the market.

The overall average of children under age of 5 was 1. Given the mean age of milk producers, the mean number of children under age of five of participant and non-participant was 1 (Table 3). This imply that more milk was available for supply. Children under the age of five consume more milk and reduce the amount for sale. Kuru (2013) found that households with larger number of children under age of five years decreased the marketed surplus and have reduced ability to participate in the market.

Regarding to the amount of milk consumed, the overall average of milk consumed per day by the households was 1.33 liters. Furthermore, the average milk consumed per day by milk market participant and non-participants was 1.44 and 1.06 liters respectively. There was statistically significant mean difference between the amount of milk consumed among the groups of milk market participant and non-participant at 5% level of significance (Table 3). The results showed the average milk consumed per day was higher among milk market participants compered to non-participants. This might be due to the fact that a farmer who produces more milk would have enough milk for both consumption and sell.

Table 3: Results for socioeconomic characteristics of milk producers (N=150)

Characteristics	Participant (N=106)		Non participant (N=44)		Over all	Test statistics
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	<i>t-value</i>
Age	43.12	9.26	45.20	19.97	44.12	-0.64
Education	8.29	4.38	1.20	1.52	7.13	10.86***
Experience	21.86	7.42	4.84	2.88	16.87	14.74***
Number of local bred milking cows	2.95	1.88	2.67	1.31	2.82	-1.02
Number of cross bred milking cows	4.07	4.26	1.64	1.14	2.98	4.16***
Non-dairy income	5386.80	5187.74	53084.66	16441.04	19378.17	-26.92***
Family size	5.31	2.49	5.27	2.67	5.3	0.08
Number of children < age 5	1	0.76	1	0.92	1	0.20
Consumed amount of milk	1.44	1.10	1.06	0.89	1.33	1.99**

Note, *** and ** indicate significance at 1% and 5% probability level respectively while Std. Dev. denotes standard deviation.

As presented in Table 4, the overall percentage of milk producers was about 72.67% whereas 27.33% were females. The composition of milk producers revealed that 78.3% of the milk market participating households were male headed, while the remaining 21.7% were female headed. Gender was statistically related to participation decision at 5% level of significance. The results suggest that participation in milk market is dominated by male headed households. This is because agricultural production is the key occupation in rural areas where men live and guide family decision making.

The overall percentage of the respondents receiving extension services was 57.33%. The results revealed that 75.5% of the milk market participants were received extension services and the remaining had not received. The result also showed that only 13.64% of non-participants received extension service. Access to extension service was statistically related to participation decision at 1% level of significance (Table 4). The result suggests that the majority of participants have received extension services. Implying that contact of dairy producers with extension workers serves as an important source of knowledge and information of milk production and marketing. Holloway *et al.* (2000) found that visits by extension workers improved participation and volume of dairy products to sale.

Regarding access to credit, there were four types of financial institutions which engaged in giving credit services. These are governmental and private banks, non-governmental organization, saving Share Company, and Oromia credit. The result showed that the overall percentage of the respondents having credit services was 45.33%. However only 57.55% of milk market participants and 15.91% of non-participants were accessed credit. Access to credit was statistically related to participation decision at 1% level of significance (Table 4). Implying that credit improves the capacity of suppliers to purchase improved dairy cows which is in line with the study of (Kuru, 2013).

Access to accurate market information is a basic element for market participation not only in milk market but also for other dairy products. The result revealed that the overall percentage of the respondents having access to market information from Addis Ababa was only 17.33%. The result also revealed that only 23.58% of milk market participants and 2.27% of non-participants had access to market information in Addis Ababa. Access to market information was significantly related to market participation decision at 1% level of significance (Table 4). This is a clear indication of information asymmetry likely to result in adverse selection. This might be due to scarcity of media channels which could be used to relay such kind of information.

The results revealed that the overall percentage of the respondents for member of dairy cooperative was 46.67%. The results also revealed that 56.6% of participants and 22.73% of non-participants were members of dairy cooperatives. Membership to dairy cooperative was significantly related with participation decision at 1% level significance (Table 4). The result suggest that the majority of the participants were members to dairy cooperatives. This Imply that being a member in dairy

cooperative helps in transportation, input supply and regular payments thus improving the supply of milk.

Regarding marital status of milk producers, the result revealed that 88.67%, 4.64%, 3.33% and 3.33% were married, divorced, single and widowed respectively. It is also shown that 87.74% of participants and 90.91% of non-participants were married (Table 4). In general the result suggest that the majority of milk producers were married and also the majority of milk market participants were married. This imply that with family responsibilities, they would be keen to improve supply of milk at the minimum possible cost over limiting and competing resources. Mertey *et al.* (2013) noted that marriage increases the farmer's concern for supplier welfare thus increases suppliers' participation in dairy production.

Table 4: Results on gender, extension service, access to credit, access to market information, membership of dairy cooperative and marital status.

Characteristics		Participant		Non participant		Over all	
		Frequency	%	Frequency	%	%	X ²
Gender	Male	83	78.3	26	59.09	72.67	5.77**
	Female	23	21.7	18	40.91	27.33	
Extension service	Yes	80	75.47	6	13.64	57.33	48.60***
	No	26	24.53	38	86.36	42.27	
Access to credit	Yes	61	57.55	7	15.91	45.33	21.75***
	No	45	42.45	37	84.09	54.67	
Access to market information	Yes	25	23.58	1	2.27	17.33	9.85***
	No	81	76.42	43	97.73	82.67	
Membership of dairy cooperative	Yes	60	56.6	10	22.73	46.67	14.33***
	No	46	43.4	34	77.27	53.33	
Marital status	Single	5	4.72	0	0	3.33	2.38
	Married	93	87.74	40	90.91	88.67	
	Divorced	5	4.72	2	4.55	4.67	
	Windowed	3	2.83	2	4.55	3.33	

Note, *** and ** indicate significance at 1% and 5% probability level respectively.

4.1.2. Socioeconomic characteristics of traders

The socioeconomic characteristics of traders summarized in terms of age, gender, education, marital status, family size and mean year of experience in milk trading.

The result revealed that age of the traders ranged from 23 to 54 years with the mean of 38.55 years and standard deviation of 6.61 (Table 5). The results suggest that the majority of traders were young. This indicates the importance attached to trading in milk in the *Woreda*.

In terms of traders' experience, the mean number of years in milk trading was 6.05 years with maximum of 16 years and minimum of 2 years suggesting a moderate length. Experience carries with its improved ability in milk trading, informed financial management and subsequent increase in welfare.

The results in Table 5 revealed that 85% of milk traders were males. This is because most of milk organizations are dominated by men. Regarding to education, all the traders were educated with the mean of 11.87 years of schooling and standard deviation of 2.344. Such high levels of literacy help traders to understand market conditions so as to engage in proper buying and selling of milk as well as, proper management of this business. The effect of this would be positive on participation of traders in milk market.

The mean family size of the traders were 3 members with maximum of 5 and minimum of 1 member (Table 5). The result suggest that milk traders have small families. To successfully engage in milk trade calls for total commitment and one way is to minimize family burdens caused by large families.

Table 5: Socioeconomic characteristic of traders

Sample of traders (n=40)		
Characteristics	Frequency	%
Gender		
male	34	85
Female	6	15
Characteristics	Mean	Standard deviation
Age	38.555	6.610
Experience	6.05	3.351
Education	11.875	2.345
Family size	3.175	0.958

4.2. Structure Conduct and Performance of Cow Milk Markets

The structure conduct and performance has been known as the primary approach of examining market performance. It postulates that certain market attributes such as market concentration and barriers to entry affect participant profitability within the relevant market. According to this model, the way in which the firms are organized in the market structure tells a great deal about how they make decision about conduct, this in turn changes the level of efficiency and fairness in the market performance (Idahe, 2013).

For the understanding of marketing system and the relationship between markets and marketing agencies, a general knowledge of the commonly used marketing channel is very important. Identifying the role of agents involved in the marketing channel is necessary to understand how the commodities move through the various channels.

In this section the milk market participant, their roles and linkages in milk market channels are discussed. The channel showed the flow of milk from dairy producer to market intermediaries and on to the consumer.

Smallholder milk producers: These are the first and primary link in the chain. They produce milk and supply to market actors (including dairy cooperative union, semi-wholesalers, milk processors and retailers) and to ultimate end users. Results in Table 6 show that, the sampled smallholder producers transport 31% of the total volume of marketed milk per year to collection centers of cooperatives/ processing plants for marketing of their produce.

Semi-wholesalers: These are important milk market actors who perform the activities of both wholesaling and retailing depending upon marketing conditions. They collect milk from producers directly or through local collectors and deliver it to processing plants or organizational consumers like universities, hospitals, hotels and shops. Out of the total volume of milk marketed, 10.55% were handled by this sampled market outlet.

Milk processing plants: These milk market actors adopts different types of technologies which helps them for further processing of raw milk. Out of the total volume of milk marketed, 42.29% were handled by this sampled market outlet (Table 6). They process raw milk to a number of products such as pasteurized milk, yogurt, cheese and butter. These processed products were supplied to retailers and in some instances direct to end users or consumers.

Retailers: These are dairy marketing intermediaries such as cafeterias or hotels, supermarkets and other large and small scale-retailers who trade milk as part of other retail activity involving sale of other household consumer. Retailers play an important role in milk marketing business by delivering the product to the final consumers even though they handled only 2.28% of total marketed milk. They retail fresh milk and pasteurized milk.

Dairy cooperative union: This represents a collection of primary dairy cooperatives found in one or more districts and organized for common interest. The union negotiates selling price of milk on behalf of their primary dairy cooperatives and provide services such as training, financial audits and other business services. The union is the one which transacts milk produced by members to different marketing actors such as retailers, processing plants and consumers. There is only one

dairy cooperative union (Selale Dairy cooperative union) in the study area and the result suggest that about 44.87% of the total milk marketed was handled by the union.

Consumers: these are the last link in milk marketing channels in the study area. They are institutional buyers and households who buy fresh and posturized milk in the daily basis. Organizational buyers such as big institutions /universities/, training centers, hospitals and etc. found in major cities and towns are also categorized as consumers. The sources of milk for these majority of organizations were semi-wholesalers and dairy cooperatives.

Table 6: Milk producers and traders with the volume of milk they handle

Milk market participants	Volume of milk marketed in liters per year	Percentage of milk handled
Smallholder Producers	2,296,521.85	31
Semi-wholesalers	781,200	10.55
Processors	3,133,845	42.29
Retailers	168,860	2.28
Dairy cooperative union	3,324,230	44.87
Total volume of milk marketed by traders	7,408,135	100

Source: SWADO, 2016

4.2.1. Market structure

The degree of market concentration ratio was used to evaluate the structure of milk market in the district.

4.2.1.1. Market concentration ratio

The concentration ratio for milk market was derived in the main milk market places at Sululta, Chanco, Gorfo and Derba. It was calculated by taking the annually purchased volume of milk by traders at this main milk market places. It was measured by the percentage of milk handled by the

largest four traders in liters and interpreted as an indicator for the degree of competitiveness among the traders.

The results showed that the concentration ratio of milk market in Sululta *Woreda* was 87.16%. According to Kohls and Uhl (1985), the four largest enterprises' concentration ratio of 50% or more is an indication of a strongly oligopolistic industry, 33-50% is a weak oligopoly and less than that shows competitive industry. Therefore, the estimated market concentration ratio (87.16%) in Sululta *Woreda* shows that the structure of the milk market was strongly oligopolistic. The top four traders dominating milk markets were Selale dairy cooperative union and three milk processing plants (Elemtu dairy processing plant, Life milk processing enterprise and Lame dairy processing plant) (Table 7).

Table 7: Concentration ratio of milk buyers

Trader	Volume of milk purchased in liters/year	% share of purchase	% cumulative share of purchase
Dairy cooperative union	3,324,230	44.87	44.87
Elemtu dairy processing	1,312,000	17.71	62.58
Life milk processing enterprise	924,500	12.47	75.05
Lame dairy processing plant	897,345	12.11	87.16
Semi-wholesalers	781,200	10.55	97.71
Retailers	168,860	2.28	100
Total	7,408,135	100	

Source SWTIO, 2016

4.2.1.2. Barriers to entry and exit in milk market

The barriers to entry is something that blocks or impedes the ability of the traders to enter into the market and the barriers to exit is something that blocks or impedes the ability of the traders to

leave the market. The traders in Sululta *Woreda* have mentioned two barriers to entry in the milk marketing systems (Table 8). These were level of trader’s formal education, and initial capital which were used to explain barriers to entry of traders into milk market in the *Woreda*.

Traders reported that without education, it was impossible to enter in trading milk. Likewise, the result revealed that the mean initial capital required to engage in retailing was Ethiopian Birr 2865.52. The mean initial capital required for semi-wholesalers was ETB 4333.33. In general, minimum of ETB 2000 was required for milk traders to enter milk market (Table 8). This indicates that initial capital was the barrier for milk traders.

Table 8: Barriers to entry in milk market

Barrier		Retailers	Semi-wholesalers	Processors	Dairy cooperatives union
Education	%	100	100	100	100
Initial capital	Mean	2865.52	4333.33	22666.66	39,000
	Minimum	2000	3000	20,000	39,000
	Maximum	4000	5000	25,000	39,000

4.2.2. Market conduct

Market conduct refers to the patterns of behavior of the buyers and sellers. This implies that analysis of human behavioral patterns that are not readily identifiable, obtainable and quantifiable (Pomeroy and Trinidad, 1995). Market conduct of milk market was analyzed in terms of price setting strategies, purchasing and selling behavior.

The supply of milk from producing households to traders was in the form of raw milk. The purchasing process did not involve cash transactions but deferred payments. For logistical reasons, cash payment was not possible on a daily basis but was made twice a month through commission agents.

Traders bought milk by themselves from producers or through local milk collectors as commission agents. There was no formal contractual agreement between traders and producers but were based on informal oral agreement and personal relation.

Table 9 presents the perception of traders on how milk prices were set. A small proportion (7.5%) of traders reported that milk purchase price was set by the sellers. About 35% traders understood that purchase price was set by buyers. Another 35% and 22.5% of traders reported that purchase price was set by market and negotiation respectively. The result suggests that purchase price was mostly set by both buyers and market reflecting an imperfect market with information asymmetry.

Table 9: Perception of pricing strategy in the milk market

Pricing strategies	Frequency	Percent
set by sellers	3	7.5
set by buyers	14	35
set by market	14	35
set by negotiation	9	22.5
Total	40	100

4.2.3. Performance of milk market

The average price per liter of milk was used for the marketing margin calculation. Results of analysis of marketing costs and margins were used to determine whether there were serious inefficiencies or excess profits or wide margins due to technical constraints such as transportation. The marketing actors along the chain were producers, semi-wholesalers, processors, dairy-cooperative union, retailers and consumers.

4.2.3.1. Marketing cost

Information was collected on different costs incurred in the process of producing, transporting, processing and selling milk. These cost outlays are referred to as marketing costs. The cost incurred by dairy household for milk production was associated to inputs utilization such as veterinary service, feed, labor, housing, or shelters. The marketing cost incurred by different market actors were costs of market search, transportation, processing, taxes, milk spoilage and the others. The calculation of marketing costs were applied depending on the average price of milk per liter.

The result revealed that total cost incurred by producers to produce a liter of milk was estimated to be birr 6.15 whereas average cost incurred by processors was birr 1.9 per liter. The result also revealed that the average estimated cost incurred by dairy cooperative union, semi-wholesalers and retailers were Ethiopian birr 0.85, 0.845 and 1.6 per liter respectively (Table 10).

Table 10: Estimated average cost incurred by milk suppliers and traders (birr/liter)

Cost of marketing	Agents				
	Producers	Processing plant	Dairy cooperative union	Semi-wholesalers	Retailers
Production cost	5.42	-	-	-	-
Cost of processing	-	0.65	-	-	-
Cost of labor	0.40	0.35	0.10	0.15	0.60
Cost of transportation	-	0.30	0.40	0.35	0.25
Cost of milk search	-	0.05	0.03	-	-
Cost of spoilage	0.08	0.20	0.15	0.10	0.30
Paid taxes	-	0.03	-	0.025	-
Other market costs	0.25	0.32	0.17	0.22	0.45
Total costs	6.15	1.90	0.85	0.845	1.6

4.2.3.2. Marketing margins

Marketing margins are the difference between prices at two different levels and most commonly used to refer the difference between producer and other points in the chain. The marketing margin were calculated for the market channels identified in (Table 11).

Table 11: The milk marketing channels identified in Sululta

No	Milk marketing channels
I	Producer → Semi- wholesaler → Processor → Retailer → Consume
II	Producer → Semi- wholesaler → Retailer → Consumer
III	Producer → Dairy cooperative union → Processor → Retailer → Consumer
IV	Producer → Processor → Consumer
V	Producer → Processor → Retailer → Consumer
VI	Producer → Consumer

Source: SWTIO, 2016

The results in Table 12 showed that the greatest gross marketing margins were 54.55% and 52.17% in channel III (producer - dairy cooperative union – processors – retailers - consumers) and in channel I (producers - semi-wholesalers – processors – retailers – consumers) respectively, of consumers' price

Among different marketing agents semi-wholesalers received the highest gross marketing margin in channel II (producers – semi-wholesalers – retailers – consumers) which accounted for 40.54% of consumers' price followed by dairy cooperative union in channel III (producers – dairy cooperative union – processors – retailers – consumers) which accounted for 35.48% of consumers' price (Table 12).

In general, producers' share of consumers' price was the highest in channel VI (producers – consumers) which accounted for 100% direct sell to consumers and channel IV (producers – processors – consumers) which accounted for 77.5% of consumers' price. Likewise, among different agents, semi-wholesalers obtained the highest net marketing margin of consumers' price in channel II (producers – semi-wholesalers – retailers – consumers) which accounted for 36% followed by dairy cooperative union in channel III (producer - dairy cooperative union – processors – retailers – consumers) which accounted for 30.02% of consumers' price (Table 12). Therefore, the sixth and fourth channels was very important for producers due to high producers' share of

consumers' price in this channels. This happens because of the fact that producers sell their produce direct to consumers and processors in this two channels.

These results clearly give indication of where the government could introduce policy interventions. In most cases, governments have interest in social welfare of citizens and the key areas to help achieve this should be policies geared towards fourth and sixth channels. The fourth and sixth channels were the following.

IV. Producer \longrightarrow Processor \longrightarrow consumer

VI. Producer \longrightarrow consumer

Where IV and VI are channel number four and channel number six respectively.

Table 12: Performance of milk market of different channels

Milk market agents	Milk marketing channels						
		I	II	III	IV	V	VI
Producer	Selling price	11	11	10	12	12	12.5
	Cost of production	6.15	6.15	6.15	6.15	6.15	6.15
	GMMp (%)	48	48.5	45.5	77.5	54.6	100
	NMM (%)	8	7.41	16	26.3	3.35	50.8
Semi-wholesaler	Purchase price	11	11	-----	-----	-----	-----
	Market cost	0.845	0.845	-----	-----	-----	-----
	Selling price	16.5	18.5	-----	-----	-----	-----
	GMMw (%)	33.33	40.54	-----	-----	-----	-----
	NMM (%)	28.2	36	-----	-----	-----	-----
	Market profit	4.65	6.65	-----	-----	-----	-----
Dairy cooperative union	Purchase price	-----	-----	10	-----	-----	-----
	Market cost	-----	-----	0.85	-----	-----	-----
	Selling price	-----	-----	15.5	-----	-----	-----
	GMMc (%)	-----	-----	35.48	-----	-----	-----
	NMM (%)	-----	-----	30.02	-----	-----	-----
	Market profit	-----	-----	4.65	-----	-----	-----
Processors	Purchase price	16.5	-----	15.5	12	12	-----
	Market cost	1.90	-----	1.90	1.9	1.9	-----

Continuation of Table 12

	Selling price	19	-----	18.2	15.5	15.5	-----
	GMMpr (%)	13.16	-----	14.84	22.58	22.58	-----
	NMM (%)	3.2	-----	4.4	10.3	10.3	-----
	Market profit	0.6	-----	0.8	1.6	1.6	-----
Retailers	Purchase price	19	18.5	18.2	-----	18.2	-----
	Market cost	1.6	1.6	1.6	-----	1.6	-----
	Selling price	23	22.70	22	-----	22	-----
	GMMrt (%)	17.39	18.50	17.27	-----	17.27	-----
	NMM (%)	10.43	11.45	10	-----	10	-----
	Market profit	2.4	2.6	2.2	-----	2.2	-----
	TGMM (%)	52.17	51.54	54.55	22.58	45.45	0.00
	Producers portion	48	48.5	45.5	77.5	54.6	100
	Rank of channels by producers' share	6	4	5	3	1	2

Where GMMp is the gross marketing margin of producers, GMMw is gross marketing margin of semi-wholesalers, GMMc is the gross marketing margin of dairy cooperative union, GMMpr is the gross marketing margin of processors, GMMrt is the gross marketing margin of retailers, TGMM is the total gross marketing margin and NMM is the net marketing margin.

Birr was used as a unit measure of all prices in the channels

I, II, III, IV, V and VI stands for channel 1, 2, 3, 4, 5 and 6 respectively.

4.3. Determinants of milk market participation and marketed volume of milk

A two-step Heckman estimation procedure was used to obtain determinants of market participation. This model was used to control endogeneity problem, selectivity bias so as to obtain unbiased and consistent parameter estimates. The model predicted the probability of households to participate in the milk market in the first step using a Probit model and it analyses the determinants of the volume of milk marketed in the second step using OLS with an Inverse Mills Ratio. In the first step, marginal effects were estimated to determine the magnitude of the effect of the explanatory variables on the milk market participation. This is because coefficients in the probabilistic model such as probit shows only the direction of the influence (Gujarati, 2004). On the other hand, in the second step, coefficients were used to determine the magnitude of the explanatory variables effect on the volume of milk marketed. The results are presented in Table 13 and 14.

4.3.1. Determinants of milk market participation

The result in Table 13 showed that out of hypothesized variables, seven variables significantly affected the probability of household's milk market participation decision. These variables were education (EDUCL), experience (EXP), number of cross bred milking cows (NCBMC), non-dairy income (NDI), extension contact (EXC), number of children under age of 5 years (NCHA5) and membership to dairy cooperatives (MDCO).

Education had a positive and significant effect on probability of milk market participation decision and was significant at 1%. The marginal effect indicates that addition of one-year of schooling leads to increase the probability of households' milk market participation by 2.97% (Table 13). This would be due to the fact that the ability of households to acquire new ideas in relation to improved production and market information is improved by education. This is in line with Idahe (2013), Somano (2008) and Geteneh (2005) who found positive and significant relationship indicating that education improves the dairy household's ability to increase production and market related information which in turn increases the probability of participation decision in butter market.

In line with prior expectation, the experience in dairy production of household has positive impact on dairy households' milk market participation decision and was significant at 1%. The marginal

effect of the variable confirms that every one-year increase in experience of dairy production raises market participation decision by 0.57% (Table 13). This would be due to the fact that dairy households having more years of experience in dairy production have a tendency for market participation. This is in line with Tadesse (2011), who found positive and significant relationship indicating that as farmers' experience increased the participation decision and the volume of the product supplied to the market has increased.

As opposed to prior expectation, the number of cross bred milking cows had a negative relationship with household milk market participation decision and statistically significant at 5% probability level. The negative and significant relation between the variables indicates that as the number of cross bred milking cows increases the participation decision of household falls. The marginal effect of the variable show that an increase in number of cross bred milking cows by one head causes the probability of dairy households' milk market participation to fall by 0.84% (Table 13). This was because as the number of cross bred milking cow increases, the volume of milk yield increases and the dairy producer would start processing instead of selling raw milk in the market. This is contrary to Somano (2008) that the number of cross bred milking cows has a significant and positive effect on the participation decision of households in milk market. The conflicting results would largely depend on time and locality of study.

As expected, non-dairy income had a negative relationship with households' milk market participation decision and statistically significant at 1%. The negative and significant relationship indicates that households who had additional non-dairy income had lower probability of market participation. The marginal effect shows that 1 unit addition in non-dairy income of the household decreases the probability of milk market participation decision by 0.001% (Table 13). Implying that the additional non- dairy income strengthens the household position in coping with different forms of risks and enters them into economic transactions. However, Kuru (2013) found that non-dairy income has significant but positive effect on participation decision of dairy households. Such inconclusive results would be due to other factors such as location of study.

As opposed to prior expectation, number of children under age of 5 years had a positive impact on the probability of milk market participation decision and found to be statistically significant at 5% probability level. The marginal effect of this variable shows that a unit increase in the number of children less than 5 years of age in the household, the probability of milk market participation

increased by 4.12% (Table 13). Implying that those of dairy households with many children under age of 5 years were found to increase the probability of households' decision to participate in the milk market. The positive participation was because as the number of children under age of 5 increases, the household prefers to own milking cows instead of buying milk. This often increases milk yield leading to surplus and thus market participation. This is in line with Kuma (2012) who found a positive and significant relationship indicating that when household are sure of having a child under age of six, they look for milking cow in order to feed a child and lactating mother.

Extension service positively affects participation decision of household in the milk market and found to be statistically significant at 10% probability level. The marginal effect confirmed that having extension services with dairy household would increase the probability of participation in the milk market by 5.62% (Table 13). The positive relationship indicates that contact of the dairy household with the extension worker as an important source of information and knowledge causes the participation decision of dairy household to rise. Fikadu, (2013) and Kuru (2013) also reported similar result.

As opposed to the prior expectation membership of dairy cooperative negatively affects participation decision of household in the market and was statistically significant at 1% probability level. The marginal effect confirmed that being a member for the household decreases the probability of participation by 10% (Table 13). The negative relationship indicates that being a member of a cooperative discourages participation in other forms of market outlets. Households would tend to channel all their milk to the cooperative.

Table 13: Factors influencing Participation decision of dairy households

Variable	Coefficient	Std. Err	Marginal effect
Gender	1.87	0.028	0.017
Age	0.048	0.001	0.001
Education	2.612***	0.005	0.03
Experience	0.598**	0.001	0.006
Number of local milking cows owned	0.096	0.005	0.003
Number of cross bred milking cows owned	-0.653**	0.003	-0.008
Non-dairy income	-0.000***	0.001	-0.001
Extension contact	4.173*	0.03	0.056
Family size	-0.437	0.004	-0.006
Number of children under age of 5 years	2.627**	0.018	0.041
Distance to market	-0.354	0.007	-0.01
Access to market information	-1.017	0.027	-0.016
Consumed amount of milk	2.539	0.013	0.007
Membership of dairy cooperatives	-5.377***	0.028	-0.10
_cons	-22.278	0.089	

Number of observation = 150, number of non-participant households = 44, number of households participating in the market = 106, Prob>chi2 = 0.0000, LR chi2 (13) =105.54, pseudo R-squared = 0.7808, log likelihood = -14.812, Wald chi2 (14) = 496.77

Note: ***, ** and * shows significance level at 1%, 5% and 10% probability level respectively.

4.3.2. Determinants of volume of milk marketed

The results presented in Table 14 show the determinants of the volume of milk marketed. Five variables were found to significantly determine the volume of milk marketed. These were gender (GENDER), education (EDUCL), number of cross bred milking cows (NCBMC), non-dairy income (NDI) and family size of household (FMLS).

Gender of the household head had a negative effect and was significant at 5% level. The coefficient indicate that being male household head decreases the volume of milk marketed by 2.6 liters (Table 14). The negative and significant relation between gender of the household and volume of milk marketed indicates that if the household head is male the volume of milk marketed decreases because it is the women who have the experience and knowledge in milk production. Fikadu (2013) found that being a male of the household negatively influences participation decision since they would most likely prefer to involve in other farm and off-farm activity.

Education had a positive and significant effect on the volume of milk marketed and was significant at 1% significance level. The positive relation indicates that addition of one-year of schooling leads to increase the volume of milk marketed in the market by 0.95 liters (Table 14). This was due to the fact that the ability of producing milk of households to acquire new ideas in relation to improved production and market information is improved by education.

As prior expectation, number of cross bred milking cows had a positive relation with the volume of milk marketed and statistically significant at 5%. The coefficient of the variable confirmed that an increase in number of cross bred milking cows by one head causes the volume of marketable milk of dairy households' to increase by 1.08 liters (Table 14). The positive and significant relation between the variables indicates that as the number of cross bred milking cows increases the volume of marketable milk also increases. Similarly, Idahe (2013), Somano (2008), Kuru (2013) and Geteneh (2005) also found that household with larger number of cross bred milking cows was positively associated with the volume of marketed surplus of milk.

As expected, non-dairy income had a negative impact on the volume of marketable milk and statistically significant at 10% significance level. The coefficient of the variable confirmed that 1 unit addition in non-dairy income of the household decreases the volume of milk marketed by 0.001 liters (Table 14). The negative and significant relationship indicates that households who have additional non-dairy income were more inclined to purchase milk from market. The additional non- dairy income strengthens the household position in coping with different forms of risks. However, Kuru (2013) found that non-dairy income had a significant and positive effect on the volume of milk marketed due to the fact that additional non-dairy income are able to purchase improved dairy cows and have increased milk production and volume of sale. The conflicting results would largely depend on time and locality of the study.

Family size had a positive effect on the volume of marketable surplus of milk and statistically significant at 10% significance level. The coefficient of the variable confirmed that as the dairy household family size increases by one head, the volume of marketable milk increases by 0.371 liters per day (Table 14). The positive and significant relation of the variable indicates that the larger the family size, the more the volume of milk is supplied to the market for sale. This is because of the fact that household members represent labor resources for better management of dairy cows and directly related to engagement milk production and marketing activities. Fikadu (2013) and Somano (2008), also reported similar in their result.

According the model output, the Inverse Mill's Ratio (λ) had a negative and statistically significant effect on the volume of milk marketed of household (Table 14). This indicate that there was selection bias in the model.

Table 14: Determinants of volume of milk marketed of dairy household

Variable	Coefficient	Std. err
Gender	-2.601**	1.003
Age	-0.020	0.022
Education	0.950***	0.359
Experience	0.155	0.113
Number of local bred milking cows owned	0.166	0.268
Number of cross bred milking cows owned	1.080**	0.453
Non-dairy income	-0.001*	0.000
Extension contact	-1.294	0.945
Family size	0.371*	0.198
Number of children under age of 5 years	-0.288	0.547
Distance to the market	0.080	0.235
Consumed amount milk	-0.567	0.550
_cons	0.721	1.674
Lambda	-0.107*	0.059
Rho	-0.877	
Sigma	0.122	

Number of observation 150

Note: ***, ** and * shows significance level at 1%, 5% and 10% probability level respectively.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary, conclusion and recommendations of the study conducted in Oromia national regional state in special zone of Addis Ababa with special reference to Sululta *Woreda*.

5.1. Summary

This study aimed to determine the socioeconomic characteristics of milk producers and traders, the structure conduct and performance of milk market and to identify the determinants of participation decision of milk producers and volume of milk marketed in the study area. A total of 150 milk producers and 40 traders from four *Kebeles* of the *Woreda* were interviewed to obtain data. Data were analyzed using descriptive statistics, structure conduct performance approach and Heckman two-step econometric method. Findings showed that several intermediaries were involved in milk marketing at different levels. Producers, semi-wholesalers, processors, dairy cooperative unions and retailers were all identified milk market role players. The market structure was found to be highly oligopolistic with market concentration of 87.16%. The result also showed that the marketing channel that had the highest (54.55%) marketing margin was channel III (producer-dairy cooperative union- processor- retailer –consumer).

The findings of Heckman first stage model showed that four variables had a positive and significant effect on milk market participation. These variables included education level, year of experience, number of children under age of 5 and extension services. On the other hand, number of cross breed milking cows, non-dairy income and membership of dairy cooperatives had a negative and significant effect on milk market participation decision. The results of the second stage showed six variables had significant effect on the volume of milk marketed. Among the variables, education level, family size and number of cross breed milking cows had a positive and significant effect on the volume of milk marketed. Whereas Gender, non-dairy income and Lambda had a negative and significant effect on the volume of milk marketed.

5.2. Conclusion

The result showed that milk market is very highly concentrated with a market concentration ratio of 87.16%. From the concentration it was concluded that the market structure of Sululta *Woreda* was a strongly oligopolistic dominated by few large traders. In terms of barriers to entry to the milk market, the results showed that minimum of ETB 2000 was required for entry. Thus it was concluded that capital was a constraint in entering milk market in Sululta *Woreda*.

The results of market performance revealed that the gross marketing margin was highest (54.55%) in channel III, which starts from producer through dairy cooperative union, processors, and retailers to consumers. The channel with the lowest margins (22.54%) was channel IV, which starts from producers through processor to consumers. Semi-wholesalers had the highest gross marketing margin (40.54%) whereas processors had the lowest marketing margin (13.16%) implying that there is no equal distribution of profits among traders. Hence, the performance of milk market in Sululta *Woreda* seemed to be inefficient.

The findings of Heckman model showed that education, better experience, having extension services and being a member of dairy cooperatives encouraged milk market participation. These variables are potential sources of information. Therefore, it was concluded that better information access enhances milk market participation. Furthermore, based on the results, except for gender and family size, other variables such as years of education, non-dairy income and cross bred milking cows influenced both participation decision and volume of milk marketed. It was observed that gender had a negative effect on volume of milk marketed. Therefore, it was concluded that female household heads increased the volume of milk marketed. The results also showed that family size had a positive effect on the volume of milk marketed. Therefore, it was concluded that the majority of milk producers use family labor for milk production.

5.3. Recommendations

In view of the above conclusion the following are the main recommendations from the study;

Promoting potentially collective organizations (groups of traders) which plays important role in reducing the level of oligopolistic nature of market should take place in Sululta *Woreda*. This should be coupled by strategies that improve competitiveness and efficiency of milk market. Hence

this would enhance the possibility of the presence of efficient and competitive market structure in the area.

Encouraging and empowering female producers could promote participation of women in dairy production and milk trading systems. This is because more participation of women would expand dairy production and upgrade the quality of market supply of milk to the market. Therefore, the government and other stakeholders should provide financial and technical support for female producers and traders.

Promotion of adult education among dairy household and creating experience sharing event to duplicate best practice is recommended. This could increase the participation of dairy household in milk market and volume of milk marketed. Furthermore, ways by which the uneducated households of the community can benefit from production and marketing of milk has to be founded by relevant stakeholders.

Focus should be given for improving access to extension service and technical supervision by agricultural and rural development office. Creating stable extension service could improve farmers' awareness about the benefit of milk marketing. This would improve decision to participate in milk market.

Finally the study recommends that there should be due attention on provision of improved cross breed milking cows by concerned sectors and dairy enterprises for the dairy households. This is because increase in the number of cross breed milking cow increases, the volume of milk yield which enhances market surplus of milk. Focus should also be given for promoting new technology which replaces human labor by government and other concerned sectors to increase milk production and milk sell in the market.

Future research recommendation

This study considered the structure conduct and performance of raw milk market. However, due to time limitation, the marketing system of other dairy products were not considered. In the same way, the study considered only Sululta *Woreda* using cross sectional data. Hence there is a need for further studies which will consider different types of dairy products and more markets at *Woreda* and zonal levels. Furthermore, the study which depends on time series data would also be

required. It is obvious that the marketing system will be improved with better level of efficiency than the current level.

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APPENDIX

QUESTIONNAIRE

TITLE: ANALYSIS OF STRUCTURE, CONDUCT AND PERFORMANCE OF COW MILK MARKET IN SULULTA WOREDA, ETHIOPIA

Dear respondent,

The purpose of this study is purely academic and to generate knowledge that will be useful to the stakeholders in milk marketing. As respondents you are kindly requested to participate in answering this questionnaire and you are assured that any information shared will be strictly confidential.

Date of interview _____

QUESTIONS

Part I: General questions for producers and traders

1. Name of *Kebele* Administration _____ Name of the village _____
2. Name of household head/trader _____ Sex _____ Age _____ Years
3. Religion of the household head/trader 1. Orthodox 2. Protestant 3. Catholic 4. Muslim
4. Marital status of the household head/trader 1. Single 2. Married 3. Divorced 4. Widows
5. Years of schooling of the household head/trader _____
6. Total number of household members/trader (family size) _____
7. Distance of your residence to the district town; _____ km.

Part II: Milk producers

8. Distance of your residence to the farmers training center (FTC) _____ km.
9. Distance of your residence to the nearest market/milk collection center _____ km or _____ walking time (minutes/hrs).
10. Are you member of dairy cooperatives? _____ 1= Yes, 0= no
11. Farming experience in number of years _____

12. Dairy production experience in number of years _____

13. Occupation and annual income of household head

Income sources		Estimated annual income
Farming	Crop production	
	Livestock production	
	Milk production	
	Others sources	
Non-farming		
Total		

14. Did you have access to the transportation facilities? 1= Yes, 0= No

15. What type of transportation do you use from home to market when you sell milk commonly?

1. on foot, 2. Pack animals 3. Vehicle 4. No need of transport 5. Others
(specify) _____

16. Did you have contact with extension service in relation to livestock extension service in year 2015/16? 1= Yes, 0= No

17. If the above answer is yes, how often the extension agent contacted you specifically for livestock and milk production purpose within a year?

1. Weakly 2. Two times a month 3. Monthly 4. Others (specify)

18. What type of extension services did you get in relation to livestock and milk production?

1. Livestock production and management 2. Milk production and marketing
 3. Livestock feed production and management 4. Livestock health 5.
 Others (specify) _____

19. Did you have access to credit? 1= Yes 0= No

20. Did you need credit in the year of 2015/16? 1= Yes 0= No

21. If yes have you received the credit within this year? 1= Yes 0= No

22. If yes for what purpose did you take the credit specifically in relation to milk production?

1. To purchase cross breed milk cows 2. For other milk production expenses 3. To purchase local milk cows 4. For milk cows feed 5. Others (specify)

23. What was your source of credit?

1. Bank 2. Microfinance institution 3. NGO 4. Relatives 5. Others (specify)

24. How many of your children do you have from school? _____

25. School expenses for children _____ birr

26. Indicate your average cost incurred per liter of milk in the process of production and selling

No.	Type of cost	Amount in birr per month
1	Production cost	
1.1.	Feed cost	
1.2	Medical expenses	
1.3	Labor cost	
1.4	Others	
2	Marketing cost	

2.1	Transport cost	
2.2	Milk spoiled	
2.3	Tax paid	
2.4	Other market cost	
3	Total	

27. What is your main purpose of milk production?

1. for sale only 2. For consumption only 3. For both 4. Others (specify)

28. Number of milk cows, average milk production, consumed, processed and sold per day in 2015/16

Cows	No. of milk cows	No. of milking cows	Average milk yield/day in liters	Average milk consumed/day in liters	Average milk sold/day in liters	Amount of milk used for processing	Lactation period in months
Local cows							
Cross breed cows							
Total							

29. Did you sell milk during 2015/16? 1=Yes 0= No

30. If yes, what motivated you to sell milk?

1. The existence of dairy cooperative in the area 2. The need for additional income

3. The presence of many milk buyers in the area 4. Others (specify) _____
31. To whom did you sell milk? 1. Dairy cooperative 2. Processing Company
 3. Semi-wholesalers /Local milk collectors 4. Retailer (hotels, cafeteria, & shop)
 5. Consumers households 6. Others (Specify) _____
32. On average how much liters of milk did you sell per day in a particular market? -----
33. On average what was the price of milk per liter during 2015/16 in Birr? -----
34. In what mode of payment did you receive your money for the sale of milk?
 1. In cash 2. In advance 3. In credit 4. Others (specify) -----
35. When did you receive your money after the milk sale?
 1. as soon as I sold 2. Twice per month 3. Once per week 4. Others (specify)

36. How did you sell milk through the year?
 1. Through commission agents 2. Through brokers
 3. Direct to purchasers 4. Others (specify) -----
36. Who sets the milk selling price?
 1. By myself 2. By buyers
 3. By negotiation 4. By market 5. Others (specify) -----
37. Did you have local market information? 1. Yes 2. No
38. Did you have Addis Ababa price information? 1. Yes 2. No
39. What are the major milk production and marketing problems you have observed?

No.	Production related Problems	Market related Problems

Thank you!

Part II: Milk traders

1. Provide information relating to procurement of milk and milk products you trade in

Traders type	Distance from purchase market to your main resale	Nature of procurement contractual arrangements	Organization of collection/mode of purchase	Mode of payment
1. Cooperatives 2. Wholesalers 3. Unions 4. Retailers 5. Others (specify)		1. None 2. Oral 3. Formal 4. Others (specify)	1. Traders collects at production site 2. Traders collects from collection point 3. Supplier deliver to the market 4. Others (specify)	1. Cash on receipt 2. Weekly bases 3. Monthly bases 4. Others (specify)

2. How long have you been in milk trading business? Explain in number of years -----

3. What are the main barriers to enter in milk market?

1. Initial capital 2. Education 3.

3. Working capital 4. Others (specify) -----

4. What is the minimum of initial capital required to enter the milk market in birr? -----

5. What was the source of your capital? -----

6. From which supplier did you purchase milk?

1. Smallholder producers 2. Semi-wholesalers

3. Processors 4. Dairy cooperatives 5. Others (specify) -----

7. Who is setting the purchasing price?

1. Suppliers
2. Traders
3. Market
4. By negotiation between buyers and sellers
5. Others (specify)

8. Who purchased milk for you?

1. Myself (trader)
2. Commission agents
3. Brokers
4. Others (specify)

9. On average, how much liters of milk do you purchase per day? ----- Liters

10. How much average liter of milk do you buy per year? ----- Liters

11. What is average of purchase price of milk per liter? ----- Birr/liter

12. What factors and levels do you consider when you buy milk? -----

13. To whom do you sell your milk?

1. To consumers
2. To cooperative unions
3. To retailers
4. To semi-wholesalers
5. To processors
6. To others (specify) -----

14. What is the mode of selling?

1. On cash
2. On credit
3. On advance payment
4. Others (specify) -----

15. What is the average of sale price per liter milk? ----- Birr/liter

16. Who is setting your selling price?

1. Buyers
2. Myself (sellers)
3. Negotiation between buyers and sellers
4. Market
5. Others (specify) -----

17. Indicate your average cost incurred per liters per day in the milk trading process

No.	Cost incurred	Birr/liter
1	Marketing cost	
1.1	Purchase price	
1.2	Transport cost	
1.3	Search cost	
1.4	Milk spoiled	
1.5	Other costs	
	Total	

What are the main problems related with purchase and sale milk?

No.	Purchase problem	Sale problem

Thank you!