THESIS ON DETERMINANT OF SMALL HOLDER DAIRY FARMERS MARKET PARTICIPATION: THE CASE OF ANGOLELATERA WOREDA NORTH SHOA, AMHARA REGION, ETHIOPIA.

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THESIS ON
DETERMINANT OF SMALL HOLDER DAIRY FARMERS MARKET PARTICIPATION: THE CASE OF ANGOLELATERA WOREDA NORTH SHOA, AMHARA REGION, ETHIOPIA.

PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER’S OF APPLIED DEVELOPMENTAL ECONOMICS IN THE GRADUATE SCHOOL OF BAHIRDAR UNIVERSITY

BY
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June 2, 2017
Bahir Dar
DECLARATIONS
I Birhanu Taye Kebede registration BDU0803121PR do hereby declare that this thesis is my original work and that it has not been submitted partially or in full by any other person for an award of a degree in any other university/institution.

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APPROVAL

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ACRONYMS AND ABBREVIATIONS

BM        Bimodal Medium
CC        Contingency Coefficient
CDF      Cumulative Distribution Function
DM        Dairy Market
FGD      Focus Group Discussion
GDP      Gross Domestic Product
Hec      Hectare
IIA     Independence from Irrelevant Alternatives
IMR      Inverse of Mills Ratio
LF      Likelihood Function
LLF      Log Likelihood Function
ML      Maximum Likelihood
NGO      Non-Government Organization
USD      United State Dollar
USAID   United States Agency for International Development
VIF      Variance Inflation Factor
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ABSTRACT

This study was designed to explore the determinant factors that influence smallholder dairy farmers’ decision to participate in the milk and milk product market to sell their product in Angolelatera Woreda. To examine this primary data was collected from 322-samples smallholder dairy farmers were randomly selected to collect from four rural kebele of Angolelatera. Descriptive statistics and binary logit regression model are used to analyze the data and estimate the dairy farmers’ decision to milk and milk product market participation. The result of descriptive statistics implies that only 37.58% of the small holders’ dairy farmers are participating in the milk and milk product market in the Woreda. The binary logit regression model results proved that determinant like, extension service, family size, information accesses, milk yield per cow, and education level of household head, appropriateness of price of milk per liter, experience of dairy production of household head, sex of household head and non-dairy income source with the range of 1%-5% level of significance. If the significant variable of this study shows that, some of them increasing participation in one hand and will decrease on the other hand. Hence, the study suggests increasing farmers to diversified knowledge on milk and milk product market participation.

Keywords: Smallholders; logit; Dairy Marketing; Participation; Angolelatera; Amhara; Ethiopia.
CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Ethiopia is the one with large potential in livestock resource from the sub-Saharan African countries first in African countries and ninth in the world. Dairying is one of the livestock production systems practiced all over the world including in Ethiopia, participating all level member of market-oriented farms (Tadess et al., 2016)

Ethiopia has relative favorable climate and region with fewer animal diseases stress that makes the country to have substantial potential for dairy development. Considering such potential and investing in development intervention to the dairy sector will contribute to poverty alleviation in the country by increasing the income of smallholder dairy producer. In addition to this it, also increase market participation and creating employment opportunity. In 2010, the dairy sector production was a total of 2940 million liters of milk from about 9.6 million cows at the national level and created about 588,000 full-time farm jobs (Zelalem, Y. et al., 2014)

Dairy was a common farming enterprise and income-generating activity in Ethiopia, as most Ethiopian people’s livelihood related with cattle rearing though influenced by different problems in dairy development. Low adoptions of improved dairy practices are the major features of the dairy sub-sector. Dairy technology generation and dissemination process give less emphasis to socioeconomic, cultural and agro-ecological situations of the client (Bekele A. et al., 2015)

Dairy has a long period history and it is practiced as an integral part of agricultural activities in Ethiopia. Although the beginning of dairy research and dissemination of improved dairy practices lasts for more than five decades, the majority of the farmers continue to adopt traditional dairy practices (Workneh A. et al., 2015) Different empirical studies show that, Productivity of milking cows on average is very low. Ethiopia produces approximately 3.2 billion liters from 10 million milking cows and an average of 1.54 liters per cow per day over location periods of 180 days (USAID, O’Lankes, Inc,
So that the livestock accounts about 40% of agricultural GDP and 20% of the total GDP that is Birr 3.6 billion. The Amhara region contribution is about 30% of the country livestock production, from this the share of milk production is a significant amount of the total GDP. At the regional level, livestock production is an integral part of mixed farming system contributing 22% and 12.5% of agricultural GDP and total GDP respectively (Tadess A. et al., 2014)

Ethiopia is a net importer of dairy production with import values significantly exceeding export values. In the five-referent year, 2005-2009, export values increase from 73,000USD to 123,000USD while import values increased from about 5.6 million USD to 10.3 million USD. Milk production increases during the last two decades at the national level, but the per capita milk consumption has decreased from 26 liters per annum in1980 to 22 liters in 1995, 19 liters in 2000 and 16 liters in 2009 (ZelalemY., 2011).

Ethiopians milk consumption habit is still very poor and below recommended. They have daily milk intake at 17 liters per capita and even below the average. This is because of Africa-wide average in per-capita consumption. In Ethiopia on average, the smallest expenditure among food expenditures spent on the dairy production. Approximate 83% of the total milk produced consumed at the household level and only 7% is supplied to formal and informal markets. In the rural part of the country, the consumption of milk will be not be determined by the families members (USAID, O’Lankes, Inc., 2010).

Angolelatera Woreda found in the central highland of Ethiopia. Even though it has the substantial potential for dairy production and it gets opportunities for development of improved smallholder dairy production, the Woreda has been still lacking a market for their dairy production. Therefore, this study was designed to identify the major factors affecting smallholder dairy farmer’s market participation.

1.2. Statement of the Problem
Ethiopia possesses the largest livestock population in Africa. Dairy production depends mainly on indigenous livestock genetic resources. Despite its potential for dairy development, the productivity of indigenous livestock genetic resources, in general, low
and the direct contribution it makes to the national economy is limited (Benyam T., 2016). And also the dairy potential of Ethiopia expressed by different opportunities like the presence of high livestock genetic resource and different production system, access to services and land input, high-income generation and employment opportunities (Tadesse Guadu et al., 2014)

According to Binyam Tadesse (2016), dairy farming is a common farming enterprise and income generating activity to the national economy of Ethiopia. The dairy subsector faces common problems like lack of qualified personnel in research and extension organizations, the low economic status of the majority of the farmers to afford improved dairy practices, the absence of access to the market, the high cost of cross breed and absence of an operational breeding strategy and policy. In general, low productivity, low-level use of agricultural technologies and low adoptions of improved dairy practices are the major ones.

In addition, Dairy farm plugged with a number of challenges like, health problem, lack of infrastructure, environmental issues and lack of access to credit, reproductive challenges and lack of trained manpower are some of the major reason for poor performance of dairy cattle, production and cause a huge loss of production (Tadesse Gu. et al., 2014)

Various studies (Beyene T.e, 2016; Zelalem Y., 2011; USAID Land O'lans Inc, 2010) agreed that the nation potential for dairy development almost all milk and milk products are dominantly domestic marketed and there is no substantial export market for daily financial needs. About 95% of marketed milk at the national level is channeled through the informal system that producers sell the surplus milk produced to their neighbors and the local markets either as liquids milk or in the form of butter or "Ayib". Additionally, high transaction cost from poor infrastructures like lack of information technologies and limited access to extension service, which reduces the ability of smallholder producers to be competitive. This lack of access to information spill over into a lack of awareness about the market price of their milk. Due to these and other related reasons market participation of smallholder dairy farmers is very poor and hinders the contribution the subsector to the national economy.
According to the documents obtained from Woreda offices, Angolelatera woreda is one of the highland areas of Ethiopia that has a favorable agronomic condition for milk production and access to land to do more; it found a short distance from the capital city of Ethiopia and located close proximity of Debre Birhan town. These bring an opportunity to proper access to infrastructure, which is the core for the market opportunity to Angolelatera Woreda. In addition to this, there is no water supply problem and the demand for milk and milk product increases day to day. Regardless of the available potentials and opportunities, most of the smallholder dairy farmers practice traditional and seasonal based farming system thus their market participation was insignificant, so the subsector does not even the local demand for milk and milk product market.

Although Angolelatera Woreda has a huge potential for milk production and good access for basic marketing side road, the Woreda is still one of food insecure area in the region. This indicates that there were factors that constrain the participation of smallholder dairy farmers in this subsector.

Most of the time Angolelatera Woreda smallholder dairy farmers marketing system is more informal which influences the income of the farmers from milk and milk product sell. In this study area at the previous time, no research has conducted on dairy sectors. Hence, the study was identifying the factors that affect the market participation of smallholder dairy farmers based on the above statement; the study was purposefully answered the following empirical question:

1.3. RESEARCH QUESTION
The study was addressed the following basic research questions

1. What are the existing situations of market participation decision of smallholder dairy farmers in Angolelatera Woreda?
2. What are the determinants of market participation of smallholder dairy farmers Angolelatera Woreda?
1.4. OBJECTIVES OF THE STUDY
The general objective of this study is identifying constraints of the market participation for dairy farmers in the study area

1.4.1 The Specific Objective:
1. To investigate the existing situation of market participation decision of smallholder dairy farmers in the study area.
2. To examine the determinants of smallholder dairy farmers decision to participate in milk and milk product market in the study area.

1.5. Significant of the Study
The study was analyzed market participation of smallholder dairy farmers milk production in the study area and reasonable to it. It also delivered a holistic picture of existing challenges, opportunity, and potential in the dairy farm. Furthermore, it identifies the opportunities and constraint of the market participation of dairy farmers in the study area. In addition to this, it helps the job opportunity of the subsectors. The information generated could also help numbers of research and development organization, traders, producers, extension service, government and non-government organization to assess their activities and redesigning their mode of operation and altimetry influence the design and implementation of policies and strategies.

1.6. Scope of the Study
The study was conducted in Amhara National Regional State, North Shoa Zone special emphasis in Angolelatera Woreda, with regard to the time and financial constraints the study was focused on four rural kebeles, the activity of smallholder dairy farmer's market participation. This study deals with analyzing to the determinant of smallholder dairy farmers market participation in Angolelatera Woreda. The research also investigated the specific factors affecting smallholder dairy farmers’ decision in milk and milk market participation. This research also covers accessibility of market information, extension service, accesses of credit, the time required to market, milk yield per cow, total grazing land, none-dairy income source and appropriate price of milk per liter.
1.7. Limitations of the Study
The study was conducted only Angolelatera Woreda Amhara regional state, one of 167 Woreda of the region. Therefore, the result and data obtained through this study cannot be generalized to other Woreda of the region because the region has different agroecology and environmental condition the result of the study may have limitations to the region as whole even so, it may be will use full for area with similar context with the study area. So that it requires future research, which included samples Woreda in the region with perception smallholder dairy farmers' market contract agreement.

1.8 Organization of the Thesis
The rest of this thesis is organized as follows chapter two present literature reviews which discusses previous works done by other researchers to identify variables that used to test measures the research objective. chapter three addresses research method such as description the study area, data type and data source, method of data collection, sample method, sample size determination method of data analysis and estimation procedure. Chapter four gives results discussion of the study. Chapter five of this thesis presents the conclusion of the study and policy implication.
CHAPTER TWO

2. REVIEW OF LITERATURE

This chapter reviews some relevant literature review regarding smallholder dairy farm market participation first, section 2.1, reviews the theoretical issue of smallholder dairy farmers market participation in developing countries context. Then in the next section (2.2) present same relevant empirical literature on the determinant of smallholder dairy farmer's market participation in the developing countries. In small hold dairy farmers', market participation stated in this part.

2.1. Theoretical Framework

2.1.1. General Overviews of Market Participation

They are the different achievement of input and output markets institutions. Like property rights and land tenure, market regulations, cultural and social factors affecting consumption preferences, production and market opportunities and constraints, agro-climatic conditions, and production and market-related risks are other external determinants of the commercialization process (Pender et al., 2006).

On the other hand, factors like smallholder resource endowments including land and other natural capital, labor, physical capital, human capital etc. are household specific and considered internal determinants of market participation. The determinant of market participation decision is in smallholder farmers are different from the context of different developing countries. The scale of commercialization in one enterprise enhanced in the other and smallholder farmer's scale of commercialization in the two enterprises determined by common factors. For example, the crop and livestock commercialization status are independent and the determinants are different (Gosho et al., 2012).

The decision of smallholder to enter the market influenced too many household factors (Gebreselassie, Ludi, 2008). Small householder's agricultural commercialization is driving forces increased by different factors. They are macroeconomic and trade policies, market reform, rural infrastructure improvement and the development of legal and contractual environments (Gebreselassie, Sharp, 2008).
Economists have generally treated the smallholder farmer’s decision to participate in markets. Such as producing households, decide whether to participate buying or selling and how much to buy or sell this opinion stated by different authors (Goetz, 1992; Key et al., 2000; Holloway et al., 2001; Bellmare and Barrett, 2006). Similar to this according to Egbetokun and Omonona (2012) the major determining factors influencing farmer’s participation in the market are age, marital status, the source of labor, farming experience, farm size. The probability of participating in output markets depends on household size, distant to the nearest marketing channel, price of the commodity and sex of the farmer (Onoja et al., 2012)

2.1.1.1 Demand and Market Development

Ethiopia has the largest livestock population in Africa but the contribution of this resource to the economy is narrow and ultimately the country is in poverty. Demand for dairy products seems to exceed supply in the country in most of the dairy production potential area. Dairy development has a big role in contributing income and employment (R. Dayanandan, 2011). The limiting of dairy development in the dairy farm place included: availability and costs of feeds, shortage of farm land, discouraging marketing system, waste disposal problems, genotype improvement problem, poor extension and animal health services, and knowledge gaps are regarding to improved dairy production systems at all region (Sintayehu Yigrem, et al., 2008).

As China has undergone new change over the last few decades since Deng Xiaoping’s Open Door Policy, China has followed this trend of an increasing demand for dairy products. As with other industries in mainland China, the domestic dairy industry is moving ahead at a massive fast rate. Lastly, at the same time when China is building its own industry together with the growing demand, trade liberalization by combination the World Trade Organization has brought strong rivalry from foreign milk producers (Richard Zhang and John Roberts, 2016).

There is effective market view for increased production of dairy products through scaling-up. Analysis of consumer patterns of purchase and consumption of dairy products points to the good prediction for increasing the market for dairy products. This is because the current per capita consumption of dairy products is very low and the consumers think
their current level of consumption is inadequate and interested in increasing their level of consumption if the dairy products are available at reasonably priced. In general, the demand for dairy and dairy products is unfulfilled regional and national market opportunities (Asfaw Negassa. 2009.)

2.1.2 Small Holder Dairy Farmer's Market Participation in Developing Countries

Market participants and none market participants farmers were resolute by different socio-demographic characteristics (Sigei K. Geoffre, et al., 2013). In similarly the strength of poor smallholder farmers to reach markets and actively involved in them poses a crucial development challenge. Market distance results in reduced farm-gate prices increased input costs and lower returns to labor and capital. This, in turn, reduces incentives to participate in economic transactions and results in subsistent rather than market-oriented production systems. Poor populated rural areas distance from towns and high transport costs all pose physical barriers limited market access. Transaction costs such as lack of information about markets, lack of negotiating skills, and lack of collective organization are other impediments to market access. The question of how to expand the market participation of smallholder livestock producers is a major challenge facing many governments and non-governmental organizations (NGOs) in developing countries (M.M. Ahmed, et al., 2006).

They are a number of challenges for market access poses of the spreading out of smallholder milk production and processing. One factor of current dairy exports in Ethiopia is the cost of milk production is low but transaction costs are high. The development and promotion of small-scale processing technologies are critical to increasing the participation of smallholder producers in the dairy market. This is particularly important for Ethiopia where the demand for dairy products dominated by butter rather than fluid milk. Milk groups and co-operatives increase the participation of small householders in fluid milk markets in the Ethiopian highlands. Explained by,(Staal,1995) Similar to this dairy processing in Ethiopia is generally based on ergo(fermented milk in Ethiopia) without any defined starter culture,Raw milk is either kept at ambient temperature or kept in a warm place to ferment prior to processing (Mogessie 2002).
There is also the need to motivate the consumption of dairy products in the country as low demand for dairy products can potentially discourage production in the end. Review of the development of the dairy sector in Ethiopia indicates that there is a need to focus interventions more articulately. Because of development interventions should be aimed that addressing both technological gaps and marketing problems. Being located in the bimodal medium (BM) rainfall zone positively and strongly affected farmer decision to participate in milk markets. This zone characteristically uses production inputs more efficiently, implying that farmers in this zone have a positive return on resources invested, hence the positive and strong effect on probability of participating in milk markets as sellers (E.K. Balirwa et al., 2016).

Chinese government market reforms basic to developments in China’s dairy markets. In China, National, regional, and local government investments in every level of the dairy product supply chain have been critical to the spreading out of milk production and the improved quality and variety of processed dairy products. The government of China has stated its intention to increase milk production by 15 to 18 percent in North China by 2007 through additional investments in inheritance, management, and processing. In addition to government support, China’s dairy industry is also receiving substantial investments from international dairy firms based in Europe, Australia, and New Zealand (Iowa Ag Review, 2004).

2.1.3 Smallholder Dairy Farmer's Market Participation in Ethiopia

The fast-growing populations the means of Low level of production decline in the local production over the years, as a result, have to lead to an increase in import dependence in dairy Products. Belavadi and Niyogi (1999) Due to this rapid urbanization in some developing Countries as if Ethiopia has created domestic demand for high-value food items creating market opportunities for indigenous production, particularly, milk and milk products. The degree of vertical and horizontal integration dairy marketing systems is not the same from country to country (Mohammed et al., 1997).

An effective milk- marketing network benefits both producers and consumers, and through its linkages with related sectors, the national economy as a whole (Berhane and Workneh, 2003). On the other hand, in Ethiopia, milk and milk products are markets
trained both informal and formal marketing systems. In the dominant informal marketing system, producers sell to consumers directly or to unlicensed traders or retailers. Price is usually set through negotiation between the producer (seller) and the buyer; this system is predominant in the rural dairy production system. In the formal marketing system, there are cooperatives and private milk collecting and processing plants that receive milk from producers and channel to consumers, caterers, supermarkets and retailers described by (Tegegne, et al., 2013)

In Ethiopia, milk and milk products are marketed through both informal and formal marketing systems. In the dominant informal marketing system, producers sell to consumers directly or to unlicensed traders or retailers. Price is usually set through negotiation between the producer (seller) and the buyer; this system is predominant in the rural dairy production system. In the formal marketing system, there are cooperatives and private milk collecting and processing plants that receive milk from producers and channel to consumers, caterers, although the number of cooperatives is few and it is performance is low (Woldemichael 2008).

2.1.3.1 Formal Marketing System
The formal marketing system usually controlled by the government includes organized collection, processing and distribution of fresh milk and other dairy products at the authorized, government-controlled prices. The Dairy Development Enterprise of Ethiopia is an example of formal marketing systems in Africa (Zelalem, et al., 2011) Compared to farms that discontinue milk sales; farms from the modern marketing channel have significantly higher revenues, whereas farms from the traditional marketing channel have similar revenues. Consequently, stop to milk sales could be regarded as optimal for firms not willing to modernize. For those who wanted to modernize but failed to do so, irrespective of the reasons, this decision resulted in the more serious financial situation (JanFałkowski, 2011)
2.1.3.2 Informal Marketing System
In the informal marketing system, the smallholder sells their surplus supplies to neighbors or in the local market. Either as liquid milk or in the form of butter or a cottage-type cheese (ayib) (Bennett, 2001). A similar study by Mohamed (2000) the two similar study ideas quoted in (Zelalem. et al, 2011). In addition to explained in other way indicated that the informal market involves the direct release of fresh milk by producers to the consumer in the immediate neighborhood and sale to itinerant traders or individuals in nearby towns. Most of all the milk produced in Ethiopia comes from smallholders in rural areas. Due to a variety of factors, quality and production are persistently low, and only a small fraction amount sold in informal markets. They are opportunities to add value to the informal dairy chain should investigate (Eva Carrillo de Albornoz Loriente, et al., 2015)

2.2 Review of Empirical Study

2.2.1 Smallholder Dairy Farmer's Market Approach
Traditional (informal) milk markets have evidently played a key role in dairy development in both regions and in most countries. In different countries with the strongest growth, such as Pakistan, India, Sudan and Uganda, traditional, small-scale markets control over 80% of marketed milk. All the evidence suggests that the traditional market dominance is not a result of lack of investment informal market channels, or of non-enforcement of national milk standards; relatively they are the result of continued strong demand for the products and services that they proffer (Zelalem, et al., 2011)

2.2.2 Dairy Market System in Ethiopia
As is common in others, African countries like Kenya and Uganda, similarly to dairy products in Ethiopia channeled to consumers through both formal and informal dairy marketing systems. Until 1991, the formal market of the cold chain, pasteurized milk was completely dominated by dairy development enterprise, which supplied 12% of the total fresh milk in the Addis Ababa area (Holloway et al. 2000) quoted in(M.M.Ahmed, et al., 206) agree on it. Recently, private businesses have begun collecting, processing, packing and distributing milk and other dairy products. The proportion of total production being
marketed through the formal markets remains small (Muriuki and Thorpe 2002) quoted in (M.M.Ahmed, et al., 2006) agree on it.

Dairying in Ethiopia is predominantly a smallholder activity, in terms of both milk production and volume of sales. Annual national milk production from both urban and rural dairy production systems was estimated at 1.5 million tons, equivalent to USD $398.9 million according to evidence of (FAOSTAT 2007) quoted in (Hailemariam Teklewold, 2016) agree on it. The rural dairy systems are which includes pastoralist, agro-pastoralist, and the mixed crop-livestock farming system. They constitute 97% of the total national milk production and 75% of commercial milk production, (Ahmed et al.2004) quoted in (Hailemariam Teklewold, 2016) agree on it. They are significant commercial and aid imports of powdered milk (Azage and Asfaw 2004) quoted in (Hailemariam Teklewold, 2016) agrees it.

To see Propelled by the government’s target to transform smallholder subsistence production into a market-oriented dairy production system. The smallholder dairy sub-sector in Ethiopia has experienced some changes in the last few years. The system also promoted the foreword of improved feeding and management practices into the farming system. Milk processing is also a growing industry in some parts of the country. Both state and private dairy development enterprises in Ethiopia collect milk from dairy farms. Most of the time farms are in urban and peri-urban areas has a smaller size from rural areas. In response, currently, a number of commercial dairy farms are emerging in urban and peri-urban areas, and the numbers of smallholder rural dairy farms are increasing in areas that have market access explained in (Azage 2004).

In the country region, most dairy market study finding indicated that milk marketing system was predominantly traditional, fragmented due to lack of proper milk standardization, grading, inspection, and licensing. It also characterized by adulteration, poor quality, weak seasonal demand and low price. The literature was conduct and performance of market chains in the study area. The researcher also used to data analyzes method is concentration ratio, Hirschman-Herfindahl index Result of the study policy recommendation to government intervention needs to in terms of adult education and training. Extension services, licensing and inspection of competing milk trader's
producers are required to ensure achievement of a minimum hygiene and quality standards in the production and marketing of milk in the region (BediluDemissie, et al., 2015)

2.2.3. Determinant of Small Holder Dairy Farmer's Market Participation

Ethiopia’s economy primarily depends on agriculture. Smallholder farmers dominantly run the sector moreover contributes to about 50% of GDP and provides employment for about 83% of the total population. Dairy farming agriculture is considered important for motivating growth, economic development, food security and poverty reduction. The literature was initiated with determinant of market participation and financial profitability of smallholder dairy farm and the data analyze method maximum likelihood estimation procedure such as Logit model factor affecting decision, Tobit model used factors affecting volume of supply and total revenue less total arable cost and OLS were used in examining financial profitability of the dairy farmers. The result of this literature shows that household demographic and socio-economic characteristics and distance of market from the center of urban area (BultossaTerefe Willy and Adeba Gemechu, 2016)

Differently, milk production and extension contact have emerged as the two most important policy variables favorably influencing the power of market participation. Distance to market has negatively influenced the likelihood of producers’ market participation, irrespective of hills or plains. On one occasion, the households decide to sell; this variable has been set up not to significantly affect their level of participation in the plans. However, market distance has been negatively influencing power of market participation in the hills. The literature has been analyzed the factor that determined the dairy farmers choice of marketing channel and to what degree level of commercialization. Method of analysis is multinomial logit model, the key finding of the study show that milk production and extension contact have emerged as the two most policy variable (D.Bardhana, et al., 2012)

Market participation of farmers was justified because of poverty reduction arguments in which farmers should be able to plan, transport, store, and sell their products in the market participation process. In Ethiopia different empirical works show that production of peasant farmers could be increased through land and input use. However, market
participation has been low due to weak rural infrastructures, uncompetitive markets, and low technological input usage. The literature review focuses on economic analysis of factors affecting the market participation of smallholder farming. Multinomial logit regression analysis revealed by what factors influence the probability of being. Better extension service and capacity building are the main findings of the study (Leykun Birhanu Demeke and Jemma Haji, 2014).

Households' heads with large land holdings, more educated and producing more milk volumes had a higher possibility of selling through cooperatives marketing option. In addition, had access to information on market prices preferred to sell on their own than to sell through the dairy cooperatives. It suggested that smallholder dairy farmers profiled, organized in groups and educated on the most appropriate marketing channel. The literature wanted to analysis vertical and horizontal integration as a determinant of the market channel among smallholder dairy farmers. The data analyze method is logit regression model (James K. Mutura, et al., 2015)

Correspondingly, the literature stated it the data analysis method binary logistic model was employed factor affecting dairy market participation the result of the study household's market participation decision affected by household demographic and socioeconomic characteristics and transaction costs represented by the distance to market and urban centers. In additionally financial profitability affected by distance from market, extension visit, and education level of the household head, a number of milking cows owned and family size. A result suggests that production and marketable surplus should be improved through the introduction of improved technologies and adequate marketing infrastructure like roads and transport facilities should be established between rural and urban areas in the district to support improved market participation. The poor farmers' households were to participate in the dairy market and improve its supply of dairy products to the urban consumers (Bultossa Terefe Willy and Adeba Gemechu, 2016).

A literature indicates that market participant households have better diversity food diet compared to non-participant households. Individual members of market participant small households, including children under five, also have better diversity food diet compared to those in non-participant small households. Therefore, we conclude that transforming
the dairy sector from subsistence to a market-oriented production system and integrating dairy farmers into the milk market has the potential to improve food security in rural Ethiopia. We observed that increased milk production in market participant small holds did not translate into more milk consumption at the household level, as has been agree with in previous research (Steglich, 1998; Tangka et al., 2002).

It seems that households use the additional income generated from selling milk at the market to raise their different food diet quality and improve the nutritional status of their family members, especially children. This finding can encourage Ethiopian policy makers further stimulate smallholder market integration and the transformation of their production. The study also calls for hopeful milk consumption at the household level as an important strategy for addressing micronutrient deficiencies in the country. The literature examines the factors of milk market participation on the Household and intra-household dietary diversity and on the nutritional status of young children. The analysis method was used to T- test statistics with propensity score matching by binary logit model regression (Birhanu, et al., 2016).

The literature was undertaken factor affecting market outlet choice. Data analysis method Multinomial logit model has analyzed it. The result of the study show that as one of the key factors to milk raise market outlet choices, dairy extension services should strengthen through redesigning or reforming implementation strategies or civilizing/strengthening existing policy. It is should be strengthened to enable farmers to produce surplus milk for markets and should plan means to reduce local milking cow numbers by replacing them with crossbred cows (BerhanuKuma, et al., 2013)

The literature conducted to understand the hygienic practices during production and further handling of milk and milk products. The data analysis method was descriptive statistics mean and frequency procedures. The result of the study stated that, the importance of dairy farming to the living of the community in question. In addition to that milk and milk products to the producing household nutrition, health and income, development interventions are required to raise production and improve the efficiency of the product of the traditional milk processing equipment (Abebe, et al., 2013)
In similarly manner expressed this literature to improving smallholder farmers market supply and market access for the dairy product. The analytical framework for this literature based on the volume chain concept. Both descriptive and econometric analysis of the survey data made. The econometric model of this literature is Heckman two-stage estimation model. the finding of this study articulated that membership of smallholder dairy producers in a milk-marketing cooperative is a key factor in determining their decision to participate in milk and butter markets and levels of market participation. Quantities of milk and butter produced, marketed and consumed by the members of cooperatives are significantly larger than non-members are. However, the current levels of cooperative milk collection, processing, and marketing activities are not large enough to have a significant impact (AsfawNegassa. 2009).

In this study, the researcher used different international published articles; international presentation term papers and study area related Woreda offices documents were used. Almost all empirical literature reviews follow similar research design. The researchers used different sampling techniques. Some of them used random sampling methods, whereas the others used purposive sampling techniques. The data collection sources are both primary and secondary data. Data analysis methods focus on Heckman two-stage estimation model, multinomial logit model, and binary logit model. Almost all dependent and independent variable used by all researchers are similar like dependent variable market participation and level of supply or market participation. Independent variables are age, sex, education, family size, and land size, numbers of a cow, milk yield, extension service, credit access, information access, and distance to the market, technology, and infrastructures. The result of those researchers shows that independent variables the determinant powers to dependent variable different to in different study areas.

In this study area at the previous time, no research conducted on dairy sectors. Therefore, the researcher was used to a similar variable and appropriate research method, and then identified the significant factors of smallholder dairy farmers' market participation in Angolelatera Woreda.
2.3 Conceptual framework

The conceptual framework of the determinant of smallholder dairy farmers' milk and milk product market participation made by smallholder dairy farmers in Angolelateralera Woreda is illustrated in fig1, indicating smallholder dairy farmers market decisions of milk and milk product market participation as the result of interaction several variables. Based on the characteristics, those factors are grouped into personal attitudes, demographic factors and economic factors (Bowl.2013)

Fig1: Conceptual framework determinant of smallholder dairy farmers decisions milk and milk product market participation in Angolelateralera Woreda. Source: own divination.
CHAPTER THREE

3. RESEARCH METHOD

3.1 Description of the Study Area
The study was conducted in Angolelateral Woreda, which is one Woreda in North Shewa Administrative Zone, Amhara Regional State, Ethiopia. It is about 110 km far from Addis Ababa, the capital of Ethiopia to the North and 20 km from Debrain town to the south. The Woreda has also 19 rural and 2 urban Kebeles. Angolelateral Woreda is adjacent to Oromia regional state. It is with an area of about 78248.6 hectares of which about 70.4% has is under crop, about 13.5% has is under grazing land, about 0.37%hac is under forest, 2.32% is under Built area,7.32% hac under Shrubland,1.1% is under Woodland,4.99% hac is Bare land and 0.42% hac is Plantation land uses. (Angolelateraworeda, Agricultural office, 2008E.C.and Angolelateral Woreda, Livestock Resource Development and Health Office, 2008 E .C). The major river in the Woreda is known as Chacha River. There are also several seasonal streams are flowing across the Woreda. Based on the 2000 E.C. census, the population is estimated about 95,732 and, out of which 21, 433 are farmers, 11.23% live in urban and 88,76% rural areas. The age groups 0 -14 years, 15-64 years and above 64 years constituted 41.68%, 54.28% and 4.0% of the population, respectively (CSA, 2000E.C.). A farming system is classified into livestock and cereal crop. Production like Barley, legumes crop and wheat are the major ones. There are also 157, 380 cattle 157, 946 sheep, 13, 781 goats, 14,718 horses, 29,981 donkeys, 1332 miles and 106,727 Poultry in the Woreda. Cattle and sheep are major ruminants' livestock. The commonly prevalent livestock diseases are- Rypanoso-miasis, Black leg and pasteurellosis (Angolelateral Woreda Agricultural Office, 2008E.C, and Angolelateral Woreda. Livestock Resource Development and Health Office, 2008 E.C). Climatically, Angolela classified into highland (53%). midland (35%) and lowland (12%) zones. Most lands of this Woreda range in altitude between from 1,385 to 3,500 meter. Its vast area receives rainfall an average of 1000mm. Annual temperature ranges 10c\(^0\)-22c\(^0\). (IPMS, 2005 Angolelateral Woreda Agricultural office, 2008E.C Angolelateral Woreda Livestock Resource Development.
3.2 Data Type and Data Source

3.2.1 Data Type
In order to conduct this research, both primary and secondary data type were employed to achieve objectives.

3.2.2 Data Source
Primary Data Source: The primary data was collected from a sampled household of Angolelatera Woreda from 4 rural kebele (Cerity, Chefanen, Burra, Cheky) by trained data collectors using pre-tested questionnaire. In addition to this for triangulation purpose key informant interview and focus group discussion have conducted.

Secondary Data Source: Secondary data were collected from the journal, books, and CSA data from North Shoa Zone and Angolelatera Woreda administrative office annual reports.

3.3 Method of Data Collection
The method of data collection can directly affect the reliability of a research. While collected primary data, the researcher has employed the following techniques namely
structured questionnaires, key informant interview and focus group discussions (FGD).

**Questionnaire:** - A questionnaire compiled and served as the measuring instrument for the study. In conducting this study, questionnaires was mostly used as means of gathering data. The structured questionnaire was consisting of both open-ended and close-ended questions that should employ to collect quantitative and qualitative data from the respondents. It used to gather data on smallholder farmers' characteristics, socioeconomics, and demographic characteristics, from information, input utilization and access to services such as extension, credit, information, technology use, milk production and milk market participation. The questionnaire was review by an advisor of this study. Questionnaires were pre-tested used to farmers who would not part of the sample, a final questionnaire was prepared, and used responses obtained from the farmers.

Focus Group Discussion (FGD): The major aim of FGD is in order to find detail information from a diverse group of the community (elders, youths, and women) about the major determinant of participation. In every selected kebele the researcher has conducted focus group discussions. The participants in the focus group discussions from each kebele comprised of 8-12 household heads.

Key informant interview: - The interview was used to get information that cannot obtain using questionnaires and FGD. For the interview, the researcher was employed 10 Woreda and kebele dairy sector experts and that was selected by purposive sampling technique.

**3.4 Sampling Method**

In this study, the researcher employed both random and non-random sampling techniques. Random sampling especially two stages stratified random sampling technique was used. Which is based on the number of cows owned by smallholder dairy farmers and thus have three stratum, household owned small number of cow (1-3cows owned), household owned medium number of cow (4-10 cows owned)
and household owned large number (greater than 10 cows owned) (Agolelatera Woreda Agricultural office report, 2008E.C).

According to Woreda office report, 2008 household owned a large number of a cow in the study area is lower in number, so for this study was taken only two stratum that were household owned small number of cow and household owned a medium number of a cow. In addition to this, the sample of rural kebele selection was based on random and representative. In the sampling units, 10 experts from each sample kebele and Woreda sectors was selected by using non-probability purposive sampling technique.

3.4.1 Sampling Procedure
To undertake this research, the study was followed appropriate procedure, which was defining the target population, specifying sampling frame, selecting sampling unit, deciding the sampling techniques and sample size to improve relevance and accuracy of research findings by using a representative sample size of the population. Therefore, for this study, the sampling procedure presents the target population, sampling frame, sampling unit; sample size was explained as follows.

3.4.1.1 Population
According to the Woreda agricultural office (2008E.C) annual report, the target population of the study mainly consists of totally, 10,465 smallholder dairy farmers. Hence, it is a sample of these members was taken as for this study to get the required primary data.

3.4.1.2 Sampling Frame
Therefore, the sampling frame of the targeted population (N) for this particular research study was listed 2000 smallholder dairy farmers of 4 rural kebele of the Woreda City, Chefanen, Burra, and Cheeky.

3.4.1.3 Sampling Unit
The sampling unit for this study was 322 smallholder dairy farmers who would be obtained by used to the sample size formula, and 10 dairy sectors export Woreda and kebele who was a need to selected by using purposive sampling technique, for an interview.
Table 3.1: - Sample of Smallholder Dairy Farmers Strata

<table>
<thead>
<tr>
<th>Name of kebele</th>
<th>Farm size</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small size</td>
<td>Medium size</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Chefanen</td>
<td>47</td>
<td>15</td>
</tr>
<tr>
<td>Cerity</td>
<td>35</td>
<td>5</td>
</tr>
<tr>
<td>Cheky</td>
<td>57</td>
<td>17</td>
</tr>
<tr>
<td>Burra</td>
<td>54</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>193</td>
<td>52</td>
</tr>
</tbody>
</table>

Source: own classified (2017)

3.5 Sample Size Determination

Determining the sample size for a study is a crucial component of study design. It is not an easy task for the researcher. Because; both large and small size samples have their own limitations. Large sample size might be wide and unmanageable, and the too small sample can be unrepresentative.

To ensure the sample representativeness, the study was used to appropriate sample size. Therefore, the researcher was determined to accept 5% level of precision and want to have 95% confidence interval. Cochran (1963: 75) has been used, and the formula is given by:

\[
no = \frac{Z^2pq}{E^2}
\]

Using the formula if \(N>10,000\),

\[
n = \frac{Z^2pq}{d^2} = \frac{(1.96)^2(0.50)(0.50)}{(0.05)^2} = 384
\]
Where: n= the desired sample size

d= margin of error (maximum allowable error)

Z= the standard normal variable at a required level of confidence (95%)

P= the proportion in the target population estimated to have characteristics being Measured (50% is taken or 0.5).

q=1-p

The target population is10,465 smallholder dairy farmers and sample frame from 4 rural Kebele 2000 dairy farmers, simplified formula to calculate sample size as follows

\[ n = \frac{N}{1+N(e)} \text{ or } n=\frac{no}{1+(no-1)} \]

Whereas n= the desired sample size

N = is the population size

no = is the formula for larger population \[ \rightarrow n = \frac{384}{1+\left(\frac{384-1}{2000}\right)} = 322 \]

3.6. The study Analysis Method
The data analyze applied to both descriptive statistical and econometric model. The econometric analysis employed to study the effect of explanatory variables on participation. This study analysis method was by STATA version 12 and the descriptive tool was employed such as percentages, frequency, mean and standard division.

3.6.1 Descriptive Statistics
Descriptive statistics methods, includes percentages, means and standard divisions in process of comparing different independent variables. Therefore, the descriptive type of research was employed more appropriate for describing the current situation.
3.6.2 Econometrics Model

For this study, the researcher is used to binary choice regression model and the maximum likelihood estimation procedures. Such as logit or probit models are generally more efficient (Gujarati, 1988). The logit and probit models are comparable, the main difference being that the logistic function has slightly flatter tails that are, the normal curve under logit function approaches the axes more quickly than in the case of probit function (Gujarati, 1988). Therefore, for this study, the logit model is chosen according to, (DeMaris, Teachman, & Morgan, 1990), it assumes logistic distribution and it is relatively simple from the mathematical point of view and lends itself to a meaningful interpretation to formulate the determinant of participation.

We are interested in estimating the probability that individual smallholder dairy farmers market participation, given the individual’s factor X. We assume that this probability can be expressed the logistic function, According to econometrics book (Gujarati, 2004) Logit regression model for individual (ungrouped) data \( Y_i = f(X_i, D_i) = \text{Prob} (Y_i = 1 \mid X_i) = P_i \) is given by:

\[
P_i = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}}
\]   \hspace{1cm} (1)

where, \( Y_i = \text{market participation} \)

\( X_i = \text{continuous factor affecting market participation} \)

\( D_i = \text{qualitative (dummy) factor affecting market participation} \)

We do not actually observe \( P_i \), but only observe the outcome \( Y = 1 \), if an individual participates in the market, and \( Y = 0 \), if the individual does not participate in the market. Since each \( Y_i \) is a Bernoulli random variable, we can write

\[
\text{Pr} (Y_i = 1) = P_i
\]   \hspace{1cm} (2)

\[
\text{Pr} (Y_i = 0) = (1 - P_i)
\]   \hspace{1cm} (3)
Suppose we have a random sample of \( n \) observations. Let \( f_i(Y_i) \) denote the probability that \( Y_i = 1 \) or 0, the joint probability of observing then \( Y \) values, i.e., \( f(Y_1, Y_2, \ldots, Y_n) \) is given as:

\[
f(Y_1, Y_2, \ldots, Y_n) = \prod_{i=1}^{n} fi(y_i) = \prod_{i=1}^{n} p_i^{y_i} (1 - p_i)^{1-y_i} \tag{4}
\]

Where; \( \Pi \) is the product operator, Note that we can write the joint probability density function as a product of individual density functions because each \( Y_i \) drew independently and each \( Y_i \) has the same (logistic) density function. The joint probability is given in Eq. (4) is known as the likelihood function (LF). Equation (4) is a little embarrassed to manipulate. However, if we take its natural logarithm, we obtain what is called the log-likelihood function (LLF):

\[
\ln f(Y_1, Y_2, \ldots, Y_n) = \sum_{i=1}^{n} [Y_i \ln(P_i) + (1 - Y_i) \ln(1 - P_i)]
\]

\[
= \sum_{i=1}^{n} [Y_i \ln(P_i) - Y_i (1 - P_i) + \ln(1 - P_i)] \tag{5}
\]

\[
= \sum_{i=1}^{n} \ln\left(\frac{P_i}{1-P_i}\right) + \sum_{i=1}^{n} \ln(1 - P_i)
\]

From (1) it is easy to verify that

\[
(1 - P_i) = \frac{1}{1 + e^{\beta_1 + \beta_2 X_i}} \tag{6}
\]

as well as

\[
\ln\left(\frac{P_i}{1-P_i}\right) = \beta_1 + \beta_2 X_i \tag{7}
\]

Using (6) and (7), we can write the LLF (5) as:

\[
\ln f(Y_1, Y_2, \ldots, Y_n) = \sum_{i=1}^{n} Y_i(\beta_1 + \beta_2 X_i) - \sum_{i=1}^{n} \ln \left[1 + e^{(\beta_1 + \beta_2 X_i)}\right] \tag{8}
\]

As you can see from (8), the log likelihood function is a function of the parameters \( \beta_1 \) and \( \beta_2 \), since the \( X_i \) known. In ML our objective is to maximize the LF (or LLF), that is, to obtain the values of the unknown parameters in such a manner that the probability of observing the given \( Y \)’s is as high (maximum) as possible. For this purpose, we differentiate (8) partially with respect to each unknown, set the
resulting terminology to zero and solve the resulting expressions. One can then apply the second-order condition of maximization to confirm that the values of the parameters we have obtained do in fact maximize the LF. Therefore, you have to differentiate (8) with respect to $\beta_1$ and $\beta_2$ and proceed as indicated. As you will quickly grasp, the resulting expressions become highly nonlinear in the parameters and no explicit solutions can obtain. That is why we have used one of the methods of nonlinear estimation. Once the numerical values of $\beta_1$ and $\beta_2$ obtained, we can easily estimate (1). The ML procedure for the probit model is similar to that for the logit model, except that in (1) we use the normal CDF rather than the logistic CDF. The resulting expression becomes rather complicated, but the general idea is the same. Therefore, we would not pursue it any further stated by econometrics book (Gujarati, 2004).

Following Liao (1994) Gujarati (1988) and Aldrich and Nelson (1984), quoted in (Bultossa Terefe Willy 2016) agreed the logistic distribution for the market participation decision was expressed as

$$p_i(y = 1) = \frac{1}{1+e^{\gamma_i}} = \frac{e^{\gamma_i}}{1+e^{\gamma_i}} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \doi
effect gives the expected change of being increase versus non-increase in market participation per unit change in an explanatory variable. The logistic regression slope, the coefficient, interpreted as the change in the marginal effect associated with a unit change in the independent variable (Xi).

\[
p_i = \frac{1}{1+e^{-(\beta_0+\beta_1X_1i+\beta_2X_2i+\ldots+\beta_nX_ni)}}
\] ................................................(3)

If \( P_i \), is the probability of market participation decision, then \((1- p_i)\) is otherwise. Now \( dY_i/dX_i \) is simply the marginal effect in favor of market participation.

### 3.7 Estimation Procedure

Before taking the selected variable into the model, it is very important to check for the existence of Multicollinearity among the continuous variables and confirm the degree of association among discrete variables. Variance Inflation Factors (VIF (Xj)) technique was employed to identify the problem of Multicollinearity among continuous variables. Large VIF are indicators of multicollinearity and as a rule of thumb VIF >10 were indicated need remedial action. (Maddala, 1988). Quoted in (Bultossa Terefe Willy 2016).

Similarly, there may be an interaction between two qualitative variables, which can lead to the problem of high association. To detect this problem, the contingency coefficient was computed.

If contingency coefficient greater than 0.75 indicates that there is Multicollinearity among qualitative variables. Model adequacy and goodness of fit are tested.
3.7.1. Variable Description Measurement

Table 3.2: - *Estimating the Level of hypothesized Effect, Explanatory Variables have on the Dependent Variable.*

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>measurement</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex of the household head</td>
<td>Sex</td>
<td>Dummy Gender of household head</td>
<td>None</td>
</tr>
<tr>
<td>Age of the household head</td>
<td>Age</td>
<td>Continue Age of household level</td>
<td>+/-</td>
</tr>
<tr>
<td>Education attainment of the household head</td>
<td>Educ</td>
<td>Continue Household head education level</td>
<td>+/-</td>
</tr>
<tr>
<td>Family size</td>
<td>FIZ</td>
<td>Continue Number of household members</td>
<td>+</td>
</tr>
<tr>
<td>Total Land Size</td>
<td>TLS</td>
<td>Continue Land holding of household head by hectares (Hec)</td>
<td>+</td>
</tr>
<tr>
<td>Total grazing land</td>
<td>TGL</td>
<td>Continue Land holding of household head by hectares (Hec)</td>
<td>+</td>
</tr>
<tr>
<td>Milk Yield Per Cow</td>
<td>MYPC</td>
<td>Continue Numbers of milk cow per yield amount of milk per day by liter</td>
<td>+</td>
</tr>
<tr>
<td>Experience Dairy Product</td>
<td>EXP</td>
<td>Continue Household head experienced to dairy production</td>
<td>+/-</td>
</tr>
<tr>
<td>Extension Service</td>
<td>ETS</td>
<td>Continue Contact with extension functionaries</td>
<td>+</td>
</tr>
<tr>
<td>Credit Access</td>
<td>CRA</td>
<td>Dummy Access to credit available</td>
<td>+</td>
</tr>
<tr>
<td>Information Access</td>
<td>IFA</td>
<td>Dummy Whether has easy access to information</td>
<td>+</td>
</tr>
<tr>
<td>Time required to the market</td>
<td>TRM</td>
<td>Continue Average distance from far to market of sale</td>
<td>-</td>
</tr>
<tr>
<td>Appropriate Price of Milk Per Liter</td>
<td>APMPL</td>
<td>Dummy Price of milk per liter in the local market appropriated</td>
<td>+</td>
</tr>
<tr>
<td>Non-dairy Income Source</td>
<td>NIS</td>
<td>Dummy Household income anters farm activities and off- farm activities</td>
<td>+/-</td>
</tr>
</tbody>
</table>

Source: own definition of explanatory variables (2017)
Based on the literature, considering personal behavior of dairy farmers market participate dependent and independent variables was expressed as follow

Dependent variable: The dependent variable for binary logit analysis has a dichotomous nature the representing market participate small to hold. The houses hold to dairy farmers' market participates or not participate. It is represented in the model by 1 for participate and 0 for non-participate.

The major independent variables included in the analysis are:

Sex of household head, Age of household head Education of the household head, Family size of household head, Land size, Amounts of hectares grazing land, Milk yield per cow, Credit access, Source of market information, Experience of dairy production, Extension service, Time required to the market, Appropriate price of milk per liter and Non- dairy income source

Sex of the household head: In the mixed farming system, both men and women take part in livestock management. Generally, women contribute more labor input in areas of feeding, cleaning of barns, milking, butter and cheese making and sale of milk and other products. However, obstacles, such as lack of capital and access to institutional credit, competing use of time, and access to extension service, may affect women’s participation and efficiency in ruminant livestock production (Tanga et al., 2000).

Age of household head: -this variable measured in years and it is a continuous variable represented by negative integer values. Then Age of a household head variable determines market participation.

The education level of the household head: It was measured in terms of formal years of the school facing in primary school, secondary school, and others. The educational level of the individual is one of the important factors preparing the individual to receive and utilize new information to be more productive. It was assumed that the level of education of the household head was positively affecting the participation in milk marketing.

Family size of household: Refers to the number of people living in the same residence. They have a different Family size of household in the study area. It is a continuous independent variable to the number of members in the family including children, adults
and dependent. Measured in terms of adult equivalent (Stroock, 1991) was included in the model as a variable explaining variation in market participation. Families with more household members tend to have more labor. Production in general and marketable surplus, in particular, is a function of labor. Thus, family size is expected to have a positive impact on market participation but larger family size requires larger amounts for consumption, reducing the marketable surplus.

Total Land size: This refers to the total area of land that a farm household owned in hectares. In agriculture, the land is one of the major factors of production. The availability of land enables the owner to earn more agricultural output which in turn increase the market supply (Desta, 2004) Therefore, landholding and dairy market participation are an indirect relationships.

Total grazing land size: The amount of land grazing of cattle. The scarcity of land is becoming a critical problem in many parts of Ethiopia, in certain localities, an estimated 50 percent of the population have a problem of land scarcity. If land degradation not halted and reversed in some areas of the country, it could become extremely difficult to expand dairy production, as there would be less and less land that could use for grazing and growing fodder crops. In the traditional sector, the land becomes a constraint to milk production because of overstocking. In urban and peri-urban dairying, lack of grazing land is often a limiting factor. (Zelalem, et al, 2011)

Milk yield per cow: It is continuous independent variable measured milk yield per cow in a liter. The past studies revealed that the variable positively affected market surplus (Singla and Rai, 1998 Woldemichael,2008) quoted to (Berhanu et al., 2014).

Experience in dairying: This variable is measured in terms of the number of years of experience in dairying of the household head; it has a positive effect on marketing participation

Extension service: Extension service, access to research and training services, and access to dairy production extension service would use as by proxy for availability of training services. (Shamsuddoha & Edwards, 2008).quated to (Tewelde Halefom Gebremariam and Dr. Tesfatsion Sahlu Desta, 2015) agree on it.

Credit access the household head: Financial support or credit facilities to smallholder farmers who intend to enter into commercial dairy farming are very much limited. The
importance of establishing credit facilities is a crucial step to the country’s dairy sector as indicated in the livestock development master plan (GRM International BV, 2007).

Source of market information: yes=1, No=2 it is dummy variable for whether the household has any source of information on poultry market or not

Time required to the market: kilometers of market access from smallholder dairy farmers. The one-kilometer increase in milk market distance from the dairy farm owner reduces the probability of participation decision in milk market Embaye (2010)". Similarly, a study conducted by Holloway et.al. (2002) and Gizachew (2005) quoted to (Benyam, et al., 2016) found the negative relationship between distance to market and the probability of participation in the milk market.

The price of milk per liter: Price of milk per liter in the local market is direct affect smallholder dairy farmers market participation to milk and milk products.

Financial income from non-dairy Sources /Off-farm income/: The variable represents income originating from different sources other than dairy obtained by household head, spouse and other household members. Through improving liquidity, this income makes the household to expand production and or/ purchase from the market. It also strengthens the household position in coping with different forms of risks (Benyam, et al., 2016)
CHAPTER FOUR

4. RESULTS AND DISCUSSION

The main objective of this study was identifying constraints of market participation of farmers for the dairy product. To achieve the statistical analysis have done by STATA12 for that analysis purpose. Descriptive statistics has used to assess the existing situation of market participation of farmers in the Woreda. Whereas, binary logit regression based on to investigate the relationship between market participation and the set of variables predictor.

4.1 Descriptive Statistics

The first step in data analysis is to summarize information about variables in the data set. Descriptive statistics was used to summarize statistical features of a set of observation in order to communicate as much as simple. The collected data from 322 smallholder dairy farmers was analyzed to describe the relevant demographic, social and economic features of the dairy farmers.

From Table 4.1 it is found that average age of the household head is 50.57 years with a maximum of 79 years and minimum of 25 years. The average level of education of farmers in the study area is writing and reading standard with a minimum of no education and the maximum of grade 12. The average number of family members is found to be 5 persons per household with a maximum of twelve persons and minimum of one person.

From Table 4.1, it is found that the average total land size of the samples dairy farmers 2.027Hec with the maximum of 5Hec and minimum 0.5Hec. Similarly, the average total grazing land in the table shows that 0.422Hec the maximum of 2Hec and minimum 0. From the table 4.1, the average milk yields per cow 2.42liter the maximum of 7.5liter and the minimum 0.25lit. From the table, it is found that the average experience of the sample farmers is 13.85404 years, whereas the minimum zero year of experience and maximum year of experience is 42 years. The time required by the smallholder dairy farmers to
reach the central market from the table show that an average of 65 minute and the maximum of 180 minute and minimum 1minute.

Table 4.1:- Summery Statistics for Continues Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of household head</td>
<td>322</td>
<td>50.57764</td>
<td>11.90756</td>
<td>25</td>
<td>79</td>
</tr>
<tr>
<td>Education level of household head</td>
<td>322</td>
<td>2.686335</td>
<td>2.612765</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Family size of the household</td>
<td>322</td>
<td>4.621118</td>
<td>1.783879</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Total land size of the household</td>
<td>322</td>
<td>2.02764</td>
<td>.8668506</td>
<td>.5</td>
<td>5</td>
</tr>
<tr>
<td>Total grazing land</td>
<td>322</td>
<td>.4220807</td>
<td>.3623896</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Milk yield per cow</td>
<td>322</td>
<td>2.420652</td>
<td>1.410834</td>
<td>.25</td>
<td>7.5</td>
</tr>
<tr>
<td>Experience in dairying</td>
<td>322</td>
<td>13.85404</td>
<td>8.743514</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>Time required to the market</td>
<td>322</td>
<td>65.4882</td>
<td>36.4713</td>
<td>1</td>
<td>180</td>
</tr>
</tbody>
</table>

Source: Own survey result (2017)

4.1.1 Market Participation of Smallholder Dairy Farmers
Analysis of household market participation indicates that the households in the study area have low market participators. A statistical summary of smallholder dairy farmers has shown in table 4.2. It indicates that from a total of 322 smallholder dairy farmers sample households, 121 (37.58%) were market participants as they sold some forms of dairy product at the time of the survey, while the rest 201 (62.42%) did not participate in the sale of any dairy products. Total female households in the sample were 66 (20.5%) whereas, the total numbers of male's households were found to be 256 (79.5%).

In the study area, 180 (55.90%) households have no accesses for market information of the dairy product. From the table 4.2, 142(44.09%) of the respondents have obtained about information access. Only73 (22. 67%) of the respondents have replied that they have dairy marketing extension services. Whereas, 249 (77.32 %) of the respondents have no extension services on the marketing of dairy products in the year preceding the survey.
Accordingly, 189 (58.69%) of them said that the price of milk per liter is inappropriate in the study area. Whereas 133 (41.30%) of the respondents replied that the price of milk per litter is appropriate in the study area.

The survey indicated that 186 (57.76%) of the respondents have no any non-dairy income sources. Whereas the survey results show that, 136 (42.23%) respondents have a non-dairy income source.

Table 4.2: 
*Summary Statistics for discrete/ (dummy) Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Discrete</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market participation</td>
<td>No</td>
<td>201</td>
<td>62.42</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>121</td>
<td>37.58</td>
</tr>
<tr>
<td>Sex of household head</td>
<td>Female</td>
<td>66</td>
<td>20.50</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>256</td>
<td>79.50</td>
</tr>
<tr>
<td>Credit access</td>
<td>No</td>
<td>54</td>
<td>16.77</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>268</td>
<td>83.23</td>
</tr>
<tr>
<td>Information access</td>
<td>No</td>
<td>180</td>
<td>55.90</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>142</td>
<td>44.10</td>
</tr>
<tr>
<td>Appropriateness of price of milk per litter</td>
<td>No</td>
<td>189</td>
<td>58.69</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>133</td>
<td>41.30</td>
</tr>
<tr>
<td>Extension service</td>
<td>No</td>
<td>249</td>
<td>77.32</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>73</td>
<td>22.67</td>
</tr>
<tr>
<td>Non diary income source</td>
<td>No</td>
<td>186</td>
<td>57.76</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>136</td>
<td>42.23</td>
</tr>
</tbody>
</table>

Source: Own Survey Result (2017)
The figure below shows that, smallholder dairy farmers market participant and non-market participant.

The blue part of the circle is a portion of the non-market participant (37.58%) and the red part is the share of market participants (62.42%).

Source: Own Survey Result (2017)

Figure 3: - market participation of dairy farmers on dairy market

4.2. Econometrics Analysis

In this section, the determinants of smallholder dairy farmers' market participation were identified. Logit regression was applied to analyze the effect of fourteen explanatory variables (eight continues and six discrete) on the participation status of smallholder dairy farmers.

However, prior to running the final regression analysis, the existence of Multicollinearity both for continuous and discrete explanatory variables have checked through variance inflating factor (vif) and contingency coefficient (cc) methods, respectively. As a result, the explanatory variables were free from the problem of Multicollinearity and all of them were included in the model. Rule of thumb VIF >10 was indicated need remedial action.
However, the result of mean vif 1.78 this is indicated that multicollinearity not a problem. Similarly, if contingency coefficient greater than 0.75 indicates that there is multicollinearity among qualitative variables. However, the largest result of contingency coefficient indicated that .2959 this shows that multicolinearity, not a problem. Checkered specified that in Table4.1 and Table 4 .2. respectively.

The result of model adequacy test in Table 4.4 indicated that pr\text{y hat} value is .000 it is highly significant and pr\text{y hat} value is .624 it is insignificant then the model is satisfactoriness. The results of the goodness of fit test in Appendix I Table 4.5 show that the pr 1 then the model is healthy.

Once the assumptions have checked logit regression model was carried out and the result was presented in the Appendix I Table 4.3 below. The table shows that the pseudo-R-square value of 0.8726, which implies that about 87% of the model, was explained by the set of predictor variables. In addition to that, the estimated probability greater than chi-square value (Prob > chi-square = 0.0000), suggest that the overall model is highly significant.
4.2.1. Significant Explanatory Variables from log it Regression

Appendix I in Table 4.3 indicates that out of the total included explanatory variables, nine variables were found a significant effect on the likelihood of smallholder dairy farmers of participating in the market. Namely, Educational level of house holds head, family size, Milk yield per cow, Experience of diary production, Extension service , information accesses and Appropriate price of milk per liter positively influence the dairy farmers decision to participate in the milk and milk product market. On the other hand, ‘sex and non-diary income source have a negative significant effect on the decision of the smallholder dairy farmers to participate in the market.

The logit estimation results in the table reveals that the variable ‘Extension service’ is statistically significant at 1% of the level of significance and has a positive influence on the decision for milk and milk product market participation of smallholder dairy farmers. This means that the dairy farmers who get extension service have a greater chance of participation than that of farmers who do not have the service. This result is in line with (D.Bardhana, et al., (2012) Bedilu Demissie, et al., (2015), Leykun Birhanu Demeke and Jemma Haji, (2014) and Berhanu Kuma, et al., (2013). This could be due to the role of extension service in boosting total production level and thus sales of surplus produce. Moreover, smallholder dairy farmers have gotten extension service giving them a better position to participate in the milk and milk product market. From the FGD and Key informant interview indicated that Extension services was concerned mostly with livestock production, natural resource conservation, crop production, and health. In this regard, the respondents replied that most of the sample household head have the service. From group dissection, the participant replied that they were not getting enough and relevant market extension services. Similarly, during the FGD the participant informed that, extension services related to livestock feed and health and look for services such as artificial insemination, provision of vaccine to prevent different animal diseases and treatment of different diseases for their cattle and with the aim of improving poorly performing local dairy cows. Even though the service they got is not adequate.

Family size is another important variable that has a positive effect on the decision of smallholder dairy farmers to participate in milk and milk product markets. It is statically
significant at less than 5% level of significance, which indicates smallholder dairy farm that has more family members more likely to participate than small family members. These implication families with more household members tend to have more labor than production in general and marketable surplus, in particular, is a function of labor. This result is similar to Bultossa Terefe and Adeba Gemechu, (2016).

The Logit regression also shows that access to information significant at 5% level of significance and has a positive effect on the smallholder dairy farmers decision to participate in the milk and milk product market. The sign of the coefficient implies that if smallholder dairy farmers have more access to information regarding the milk and milk product market their probability of making the decision to participate in the milk and milk product market increases. This result is consistent with James K.Mutura, et al., (2015). From FGD participant sound that, the shortage of dairy market information access a large amount of dairy product to be lost out economic value.

Milk yield per cow and appropriate price of milk per liter are another important factors, which is statistically significant at 5% level of significance and have a positive effect on the decision of smallholder dairy farmers’ decision to participate in milk and milk product market. That is, smallholder dairy farmers with a high level of milk yield per cow has more likely to participate in the milk and milk product market than lower milk yield per cow. The same to that the price of milk per liter increase appropriately the smallholder dairy farmers likely to participate milk and milk product market.

Educational level of household head of the smallholder dairy farmer is another important factor, which is significant at 5% level of significant and has a positive effect on the decision of smallholder dairy farmers to participate in the milk and milk product market. It implies that household heads with more education level to have more likely to participate in the milk and milk product market than those with lower or no education at all. This finding is similar to the finding of Bedilu Demissie, et al., (2015), as well as Leykun Birhanu Demeke and Jemma Haji, (2014).

The logit regression result shows that Experience of dairy production another factor, which is significant at 10% level of significant and has a positive effect on the decision of smallholder dairy farmers to participate in the milk product market. It shows that
experienced smallholder dairy farmers household head educated though different training and extension service to improve milk market participation.

Moreover, the variables such as sex of the smallholder dairy farmers head and non-dairy income source have negative and statistically significant effect at 1% and 5% level of significance respectively on smallholder dairy farmer decision to participate in milk and milk product market. It is indicated that the smallholder dairy farmers household head if female they do have more likely to participate than a household with male headed smallholder dairy farmers. From the FGD and Key informant interview information, in the study area female smallholder dairy farmers milk and milk product handling, processing and managing system to give more attention than male smallholder dairy farmers. This suggestion, similarly women household head contribute more labor input in areas of feeding, cleaning of barns, milking, butter and cheese making and sale of milk and milk products (Tanga et al., 2000). In addition to that, the regression result shows the dairy farmers who have no non-dairy income source are more likely to participate in milk and milk product market than those who have a non-dairy income source. From the FGD in the Woreda income originating from different sources other than dairy obtained by household head, spouse, and other household members. The smallholder dairy farmers do not support appropriately dairy market extension service due to that, the smallholder dairy farmers prefer subsistence income source rather than a sustainable income source.

Contrary to earlier expectations, the variable distance to market, credit accesses, age and total land size have a negative sign and total grazing land has positive sign. Smallholder dairy farmers have an insignificant effect on the decision of towards market participation. Moreover, the direction of influence of some is found the opposite to our expectation. For example, credit accesses is found to have an unexpected negative sign. The possible explanation for this might be the fact that most of the smallholder dairy farmers might use the credit for another purpose rather than for the development dairy farm production. On the other hand, sex of the households head, male-headed dairy farmers are less participant in milk and milk product market than female headed.

To facilitate interpretation of the estimation results presented in Appendix I Table 4.3. Then marginal effects of each variable on the predicted probability of smallholder dairy
farmers' market participation, evaluated at the means of the explanatory variables. In reported Appendix, I in Table 4.3 provides the probability estimation for the likelihood of market participation of smallholder dairy farmers given the statistically significant variables. Such as ‘education level of the household heads,’ ‘family size,’ ‘extension service’, ‘milk yield per cow’, 'experience of dairy production', 'information accessed’, 'appropriate price of milk per liter', 'sex of the household head and 'non-dairy income source'.

The marginal effect of the variable extension service reported of the logit regression in Table 4.3 indicates that being the smallholder dairy farmers' household head that had contacted extension agent, the probability of participating in milk and milk product market increased by 73.84%. This indicated that increment of dairy farmers' participation in the milk and milk product market as they get an extension service, at its mean value.

Similarly, the marginal effect of the variable information access shows that being informed smallholder dairy farmers' household head, the probability of milk and milk product market participation increased by 32.49%.

The marginal effect of the variable appropriateness price of milk per liter shows that the price of milk being appropriate the probability of smallholder dairy farmers milk and milk product market increased by 31.44%.

If the yield of milk per cow increased by one liter, the probability of smallholder dairy farmers participating in milk and milk product market on average increased by 11.89%. And the marginal effect of the education level the smallholder dairy farmers show that if education attainment of smallholder dairy farmers household head increased by one school year, the probability of participating in milk and milk product market on average increased by 7.68%. The marginal effect shows that if the family size increased by one active household labor force, the probability of participating in milk and milk product market on average increased by 19.03%.

The table below shows the marginal effect after logistic regression of the determinants of market participation decision by smallholder dairy farmers.
Table 4.3: *Marginal effects*
Marginal effects after logistic output.

\[
y = \text{Pr} (\text{mp}) \text{ (predict)} = .1086432
\]

| Variables                                           | dy/dx    | Std. Err. | Z      | P>|z|    | [95% Conf. Interval] | X          |
|-----------------------------------------------------|----------|-----------|--------|--------|----------------------|------------|
| Sex***                                               | -.7494177| .14503    | -5.17  | 0.00   | -1.03368             | .46515     | .795031    |
| Age of household head                                | -.0048667| .00683    | -0.71  | 0.47   | -0.018249            | .00851     | 50.5776    |
| Educational level (School grade of household head)** | .0768631 | .03166    | 2.43   | 0.015  | .014807              | .138919    | 2.68634    |
| Family size***                                       | .190332  | .07567    | 2.52   | 0.012  | .042013              | .338651    | 4.62112    |
| Total land size                                      | -.0050159| .06039    | -0.08  | 0.93   | -0.123374            | .11334     | 2.02764    |
| Total grazing land                                   | .0234899 | .1165     | 0.20   | 0.84   | -.204839             | .25181     | .422081    |
| Milk yield per cow**                                 | .1189148 | .06273    | 1.90   | 0.058  | -.004038             | .24186     | 2.42065    |
| Experience of diary production (in years)*           | .018366  | .00999    | 1.84   | 0.066  | -.00122              | .037952    | 13.854     |
| Extension service***                                 | .7384034 | .17226    | 4.29   | 0.00   | .400783              | 1.0760     | .226708    |
| Credit access                                        | -.2907384| .17872    | -1.63  | 0.10   | -.641031             | .05955     | .832298    |
| Information access**                                 | .3249239 | .15108    | 2.15   | 0.032  | .028814              | .621034    | .440994    |
| Distance to market                                   | -.001217 | .00117    | -1.04  | 0.29   | -.003512             | .00107     | 65.4882    |
| Appropriate Price of milk per litter**               | .3144748 | .13962    | 2.25   | 0.024  | .040832              | .588117    | .413043    |
| Non diary source of income**                         | -.2208222| .11238    | -1.96  | 0.049  | -.441085             | -.00055    | .42236     |

Source: Own survey regression result (2017)

Note: ***, ** and * indicated that 1%, 5% and 10% Level of Significance
Finally, the marginal effect report of the logit regression in Table 4.3 shows that, if the smallholder dairy farmers being the male household head, then predicate the probability of smallholder dairy farmers participating milk and milk product market decreased by 74.94%. Similarly the marginal effect shows that being the smallholder dairy farmers that has a non-dairy income source, predicate the probability of participating in milk and milk product market decreased by 22.08%.
CHAPTER FIVE
5. CONCLUSIONS AND POLICY IMPLICATION

5.1. Conclusion
The objective of the study initiated with identifying constraints of the market participation for smallholder dairy farmers in the study area. To achieve this objective a sample of 322 has taken. The descriptive result of the study shows that about 37.58% of the smallholder dairy farmers have participated on dairy market the rest 62.42% have not participate in dairy market. From the total female household head respondents about 45.45% and from the total male household head respondents about 35.54% of them have participated on dairy market.

The binary logit regression part of the study shows that sex of the household head, education level of the household head, family size, milk yield per cow, experience of dairy production, extension service delivered, appropriate price of milk per liter and information accesses, and non-dairy income source have a significance effect on market participation of farmers on dairy product. From which education level of the household head, family size, milk yield per cow, experience of dairy production, extension service delivered, information accessed and appropriate price of milk per liter have a positive effect where as the sex of household head and non-diary income source have a negative influence. Households who have to get extension service, large family size members, appropriate price per liter and information access have a greater probability of participating on dairy market. Similarly, when milk yield per cow and educational level of households increases the chance of households participating in dairy market also increase. Households with female head have a greater probability of participating in dairy market than households with a male head. In addition, households who have a non-diary source of income have less probability of participation in dairy market than households who have no, the non-diary source of income.

5.2. Policy Implication
Based on the finding of the study the researcher recommends the following points. To enhance participation of smallholder dairy farmers in milk and milk product market,
extension service, information access, education level and appropriate price of milk per liter finding of the study. Dairy production marketing extension service was a peripheral issue in the extension scenario so would need to be brought to center stage and production needs to be significantly dictated by market requirements.

The cooperative structures should make a strong institutional arrangement. Cooperatives should be very successful in dealing with both information asymmetries and easily attainment competitive edge. They do this through using collective action, pooling resources and lowering the unit cost of transactions. Members should widely understand the cooperative and its objectives, which is established voluntarily without any form of external imposition. Once the decision is taken to adopt the cooperative structure as a means of dairy development, government policies may be used to support dairy cooperatives.

The producer and Agent of cooperative on satisfying should be committed to consumer preferences and to advising him on the proper method of processing for marketing, storing, packaging, handling and transporting. This can improve the quality of the production to secure a better return from the small firm. Market information is one of the factors for smallholder dairy farmers to participate and sell their milk and milk product for good offering buyers. Therefore, the local government especially the Animals development office and other agencies should train both men and women smallholder dairy farmers in various aspects of marketing which will be able to have access to updated pricing information, finding good offering market available to dairy farmers on time.

Farmers those are to be educated participating more likely to milk and milk product market. The local governments especially the Animals development office and other agencies have to support farmers to educate with formal and informal education institutions, such as open formal and informal education institutions very near to the farmers, facilitate education teachers, skilled experts and provide dairy market and how to resist the existing dairy market challenge.
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### Appendix I

Table 4.1. Checking Multicollinearity for Continuous Predictor Variables (Variance Inflation Factor)

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>I/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>3.13</td>
<td>0.319652</td>
</tr>
<tr>
<td>Experience</td>
<td>2.74</td>
<td>0.365306</td>
</tr>
<tr>
<td>Education</td>
<td>1.52</td>
<td>0.658438</td>
</tr>
<tr>
<td>Family size</td>
<td>1.58</td>
<td>0.632199</td>
</tr>
<tr>
<td>Milk Yield per cow</td>
<td>1.34</td>
<td>0.748091</td>
</tr>
<tr>
<td>Total land size</td>
<td>1.53</td>
<td>0.653778</td>
</tr>
<tr>
<td>Total grazing land</td>
<td>1.36</td>
<td>0.736683</td>
</tr>
<tr>
<td>Time required to the market</td>
<td>1.05</td>
<td>0.954832</td>
</tr>
</tbody>
</table>

Mean VIF = 1.78

Source: Own survey regression output vif test result (2009ec)

Table 4.2. Checking Multicollinearity for Categorical Predictor Variables (contingency coefficient)

<table>
<thead>
<tr>
<th></th>
<th>sex</th>
<th>cra</th>
<th>ifa</th>
<th>ndis</th>
<th>ets</th>
<th>appmpl</th>
</tr>
</thead>
<tbody>
<tr>
<td>sex</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cra</td>
<td>0.0192</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ifa</td>
<td>-0.1068</td>
<td>-0.0031</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ndsfi</td>
<td>0.0759</td>
<td>0.0977</td>
<td>-0.1010</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ets</td>
<td>-0.0007</td>
<td>0.0842</td>
<td>0.2959</td>
<td>-0.1627</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>pmpl</td>
<td>-0.0740</td>
<td>-0.0455</td>
<td>0.0425</td>
<td>-0.2704</td>
<td>0.0580</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Source: Own survey regression output cc test result (2017)
### Table 4.3: Final Result of logit Regression Mode

**Logistic Regression**

Number of obs = 322  
LR chi2 (14) = 374.29  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.8726

Log likelihood = -26.004977  

| Variables | Significance | Categories | Odds Ratio | Std. Err. | Z     | P>|z| | [95% Conf. Interval] |
|-----------|--------------|------------|------------|-----------|-------|------|----------------------|
| Sex***    | significance | Male       | 0.0126964  | 0.0162903 | 3.40  | 0.001 | 0.0010269            |
|           |              | Female (Ref.) | -         | -         | -     | -    | -                    |
| Age of household head | ------ | Continues | 0.9509866 | 0.0671477 | -0.71 | 0.477 | .8280802          |
| Educational level** | significance | Continues | 2.211593  | 0.5557647 | 3.16  | 0.002 | 1.351455           |
| Family size** | significance | Continues | 7.137977  | 3.01744   | 4.65  | 0.000 | 3.117069           |
| Total land size | ------ | Continues | 0.9495224 | 0.593046  | -0.08 | 0.934 | 0.2791694          |
| Total grazing land | ------ | Continues | 1.274513  | 1.55232   | 0.20  | 0.842 | 0.1171132          |
| Milk yield per cow** | significance | Continues | 3.41423   | 1.740538  | 2.41  | 0.016 | 1.25707            |
| Experience of diary * | significance | Continues | 1.20883   | 0.117650  | 1.95  | 0.051 | 0.9988984          |
| Extension service*** | significance | Yes | 79.1388   | 107.229   | 3.23  | 0.000 | 0.9988984          |
|           |              | No(Ref.) | -         | -         | -     | -    | -                    |
| Credit access | ------ | Yes | .1495166  | .150591   | -1.89 | 0.059 | .0207669          |
|           |              | No(Ref.) | -         | -         | -     | -    | -                    |
| Information access ** | significance | Yes | 15.43393  | 16.10783  | 2.62  | 0.009 | 1.995758          |
|           |              | No | -         | -         | -     | -    | -                    |
| Distance to market | ------ | Continues | .987511   | .011275   | -1.10 | 0.271 | .9656576          |
| Appropriate price of milk per litter** | significance | Yes | 13.04138  | 13.45182  | 2.49  | 0.013 | 1.72716            |
|           |              | No (Ref.) | -         | -         | -     | -    | -                    |
| Non-diary income source** | significance | Yes | .0917028  | .0913211  | -2.40 | 0.016 | .0130234          |
|           |              | No(Ref.) | -         | -         | -     | -    | -                    |
| Constant |  | 2.91e-06  | .0000124  | -2.99     | 0.003 | 6.77e-10 | 0.0124934 |

Note: ***, ** and * indicated that 1%, 5% and 10% Level of Significance

Source: Own Filed Survey data output result(2017.)
Table 4.4 model adequacy test

Logistic regression

Number of obs = 322

LR chi2(2) = 374.50
Prob > chi2 = 0.0000

Log likelihood = -25.900811 Pseudo R2 = 0.8785

|       | Coef.     | Std. Err. |      z  |   P>|z|   | [95% Conf Interval] |
|-------|-----------|-----------|---------|--------|---------------------|
| _hat  | 1.011735  | 0.1996194 | 5.07    | 0.000  | 0.6204884 to 1.402982 |
| _hatsq| -0.023302 | 0.0476281 | -0.49   | 0.624  | -0.1166796 to 0.0700192 |
| _cons | 0.082885  | 0.3979051 | 0.21    | 0.835  | -0.6969948 to 0.8627647 |

Note: 14 failures and 0 successes completely determined.

Source: Own survey result (20017)

Table 4.5 goodness-of-fit test

Logistic model for mp, goodness-of-fit test

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>number of observations</td>
<td>= 322</td>
<td></td>
</tr>
<tr>
<td>number of covariate patterns</td>
<td>= 322</td>
<td></td>
</tr>
<tr>
<td>Pearson chi2(307)</td>
<td>= 104.44</td>
<td></td>
</tr>
<tr>
<td>Prob &gt; chi2</td>
<td>= 1.0000</td>
<td></td>
</tr>
</tbody>
</table>

Source: Own survey result (20017)
Appendix II

Questionnaire for small holed dairy farmer

Dear respondents

This questionnaire is prepared to identify determinant of small holed dairy farmer's market participation in Angolelateraworeda rural kebele for the partial requirement of a master of science in applied developmental economics from Bahirdar University.

The aim of this study is to explore the major determinant of small holed dairy farmers market participation in Angolelatera Woreda. The study also will be made possible recommendation standing from the findings that get from collected data. The study only uses for academic purpose, so that I ask the respondents strongly, the questioners are filled based on small holed dairy farmers. The individual information collected by the researchers is placed in a secret manner and the questionnaire itself cannot show the respondent's identity. For interested persons that require the result of the study, I am happy to send to you a brief outcome of the study after the finishing point of the research.

**General Directions to Respondents:**

- Please, do not write your name
- Indicate your positions of agreement /disagreement by using (√), where appropriate,

Thank you in advance for the valuable information you provided.

Birhanu Taye

Mobile: - 0911017983

**Respondent code**

woreda

kebele
Got..........................

Date of interview

A. Household Demographic characteristics

1. sex: male = 1 female = 0
2. Age (in years)
3. Educational level of household head (in years of schooling)
4. Number of total family members
5. Number of active labor in-household members aged between 15 and 64 years full time farm activity

<table>
<thead>
<tr>
<th>Year</th>
<th>Age</th>
<th>0 - 14</th>
<th>15 - 64</th>
<th>65 and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of active labor force family members</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of non-active labor force family members</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Is your family member adequate for farm activities 1 = yes 2 = No

7. Total Land size (in hectare)

8. Land size suitable for milk production (in hectare)

9. Did you involve in land renting activity in 2015/2016 production year? 1= Yes 2= No

10. If your answer to question # 9 is "yes" are you 1= Rented out 2= Rented in
B. Source of small holed farmers income

1. From where did you get the income you used to cover all family expenditures?
   1 = crop sales  2= milk and milk product sales  3 = livestock sales  4= credit
   5 = labor sales  6 = others (please specify............)

2. would you rank your income sources from major to minor (use the above code):
   1st................  2nd .................... 3rd ......................... 4th ...............5th ...........6th....

3. would you list: 1. number of cow...........
   2. quantity of yield per day, per liters................
   3. Amount of solid liters........................................
   4. Price per liter (Birr)...........................................
   5. Value solid (in Birr)...........................................

4. Livestock ownership

<table>
<thead>
<tr>
<th>Livestock Number owned</th>
<th>Cows</th>
<th>Oxen</th>
<th>Sheep</th>
<th>Goats</th>
<th>Poultries</th>
<th>Heifers</th>
<th>donkeys</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you planned to sell in 2008</td>
<td>1=yes</td>
<td>1= yes</td>
<td>1= yes</td>
<td>1= yes</td>
<td>1= yes</td>
<td>1= yes</td>
<td>1= yes</td>
<td>1= yes</td>
</tr>
<tr>
<td>2=No</td>
<td>2=No</td>
<td>2=No</td>
<td>2=No</td>
<td>2=No</td>
<td>2=No</td>
<td>2=No</td>
<td>2=No</td>
<td></td>
</tr>
</tbody>
</table>

5. Did you participate in milk and milk production in any years of the last two years
   1=yes  2=No, if your answer "yes" how many years experienced from dairy production?
6. What direction had the formed gate milk product show in these two years?
   1= increased  2=decreased  3= remain the same
7. Your cows are: 1=cross beard 2= Local beard
8. Amount of milk production in 2008 E.C ...............(in liter)
10. Amount of milk consumed in home
11. Time of sale  1= every day morning and night  2= a weak  3= not have permanent time

12. How did you sell your milk and milk product?
   1= direct to the purchaser  2= through brokers  3= others.

13. Where did you sell mostly your milk and milk product?
   1= local buyers (collectors)  2= cooperatives  3= trader at primary market  
   4= others

14. If you get from sale of milk and milk product sell in the market,
   1. Fluid milk .....................
   2. milk product ..................
      If your answer number 2, explained the case(..................)

15. Are you a member of any rural cooperative  1=yes  0=No

16. Do you have access to credit or loan? 1= yes  0= No

17. Do you participate in non-dairy income generating activities? 1= yes  0= No

18. Do you produce sufficient food for your family for the whole year? 1= yes 0= No

19. Do you have enough labor for dairy production activity? 1= yes 0 = No

20. Traveling time from home to nearby markets...............................(in minutes)

21. Do you have transport access to the nearest market? 1=yes  0= No

22. How did you transport your milk and milk product from home to marketplace?
   1= head/ back loading  2 = pack animals  3= vehicles  4= others (...)

23. Do you has marketing contracts for any agricultural product with any organization?
   1= yes 0=No

24. If you have a contract, for what? 1= milk and milk product 2= Livestock 3= food crops
       4= others (...)

25. Did you receive advisory services on milk and milk product marketing?  1=yes 0= No

26. Traveling time from home settlement to extension services.................(in minutes)

27. Did you participate in milk and milk product market in any year of the last two years?
28. What direction had the farm gate price of milk and milk product show in this two years? 1= increased 2= decreased 3= remain the same

29. Was there any milk and milk product market failure in any of these years? If you yes, what are the source of such failures?

30. The grazing land you used for cow feeding 2008 E.C 1= owned land 2= rented land

31. Are you enough to your cow feeding grazing land? 11=yes 0=No

32. If your answer to question #31, "No" what is the solution?
   1= due to decreased number of cow  2= cone does not participate dairy farm
   4= others..........................

33. Selling of your milk and milk product from whom you get a better price?
   1= local consumers 2= cooperatives  3= trader at primary market 4=others
   (...)

34. Are there any problems created by any marketing agents? 1= yes 0= No

35. If your answer to question #34 is yes 1= weight /scale cheating  2= limit client
   3= other

36. Du, you face difficulty in finding milk and milk product buyers? 1=yes 0=No

37. If your answer to question #36"yes" is it due to 1= in accessibility of market
   2= low price of offer 3= lack of price information 4= others

38. The price of milk per liter in your local appropriate? 1 yes 2 No

39. What is the price of milk per liter at nearby market?..............................................

40. Who set your selling price? 1= yourself 2= market  3= Buyers 4 = negotiations 5= others...

41. Do you have market information? 1= yes 0 = No

42. From where did you get market information? 1= local trader 2= neighbor 3= cooperatives
43. Did you know the nearby market price before you transport to your milk and milk product market? 1 = yes 0 = No

44. Did know AddisAbeba after price before you sold your milk and milk product? 1 = yes 0 = No

45. Do you have training for milk and milk product market activity? 1 = yes 0 = No

46. If your answer to question # 45 "yes" where did you get market activity training?
   1 = from kebele extension employment 2 = cooperative employment 3 = others (....)

47. Are you confident enough in your buyers? 1 = yes 0 = No

48. What is the farm gate price milk per liter last year, 2008 E. C...................Birr

49. What is the amount of total income you earned from milk and milk product?
   1. 2007E.C.............. 2. 2008E.C.............................

50. What is your milk and milk product market participation about the coming year
   1. increase 2. decrease 3. remain the same 4. no idea

51. What do you think to be done improve milk and milk product market participation?

52. If your answer to question #27 is "No" what are the main reasons that limit you from market

<table>
<thead>
<tr>
<th>No.</th>
<th>Possible reasons</th>
<th>1 = serious problem</th>
<th>2 = minor problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
53. If you have any comment please lest here

### Appendix III

**Key informant interview with selective woreda and kebele dairy sector experts.**

Prepared by: Birhanu Taye Kebede  Bahir Dar University College of business and economics  Department of Economics.
Purpose: This questionnaire is prepared to collect data pertaining to market participation smallholder dairy farmers in Angolelatera woreda, North Shoa Zone Amahara. It will provide a major input for a master's thesis research purely conducted for academic purpose. Therefore, the respondent is kindly requested to provide us his/her valid responses to the set of questions included in the questionnaires. All your responses remain confidential.

We thank you in advance for your cooperation.

A. personal background.

1. What is your job responsibility?

2. How long have you served in this woreda /kebele/? In what capacity?

B. Market participation and dairy farm characteristics.

1. What are the primary means of livelihoods the people in this woreda /kebele/?

2. What are the main dominant means of income in this woreda/kebele/?

3. What services and assistance do the farmers get from your office?

4. What efforts are done to integrate the small holder dairy farmers with the market?

5. What are the major non-farm activities in your woreda/kebele/ mainly engaged in?

6. There is enough land size for a dairy farm in your woreda/kebeele/?

7. What portion of land allocated for dairy farm activity?

8. Who is the primary buyer dairy farm production?

9. Are there any marketing cooperatives in this woreda/kebele/?

10. If so, is milk and milk product traded through these cooperative?

Appendix IV

Focus group Discussion Questions

BAHIR DAR UNIVERSITY COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS
Part One: Verbal Consent

Dear Discussant,

The purpose of this discussion is to gather information on the determinant of smallholder dairy farmers' market participation in Angolelatera woreda for the partial fulfillment of master’s degree in applied development economics. I am interested in understanding about the practice, experience and barriers of the community about smallholder dairy farmers market participation.

The researcher believes, this study will help to improve smallholder dairy farmers' market participation, which is provided in the Woreda. The reliability of the information that you provide me is very curtail for the success of the study. Therefore, the researcher is very much grateful for the sacrifice you pay to this end and you are kindly requested to participate in this study and provide information required from you. Your participation in this study is completely on voluntary basis and you have a right to refuse to join the discussion. But the information that you will respond to me is quite useful to improve.

Smallholder dairy farmers market participation provided in the Woreda. For the sake of accuracy and efficiency, we will take notes and tape recording this session, unless anyone has any objections. This discussion is for academic purpose only and respondents are assured of utmost Confidentiality. The researcher has promised all information obtained from you; will be kept confidential. Any reporting of data will be anonymous. The researcher will not use your name in any reports. Before beginning the discussion, we would like to request you to introduce yourself to the rest of the group. Let us start with the research team (Name, age, education status). Kindly requested to tell me your name, age, how long you have lived in this area and your job.

Thank you in advance!

Name of Facilitators: Name of Note Taker:

Kebele name: Date of discussion:

Time discussion started: Time ended:
Number of Participants: Women, Man, and youth

1. What is your opinion about the smallholder dairy farmers’ market participation?

2. Do you believe that most smallholder dairy farmers attend their extension service? Why?

3. When smallholder dairy farmers participate in the market? Seasonally why do you think?

4. Do you have enough transport access your milk and milk product to the nearest market? If not, why?

5. Do you believe that most smallholder dairy farmers get market information? Where did they get information?

6. Do you have enough grazing land for a dairy farm in yours kebele? If you have to say problem How to solve it?

7. What are the determinants of smallholder dairy farmers' market participation? Why? Can you give some situation?

8. What are the barriers to smallholders' dairy farmer market participation? How? Can you give some examples?

9. In which agriculture product you participate in the market? Why? Can you give some reason?

10. What are the practices and experience of smallholders’ dairy farmer market participation? Do you think is that good?

11. Who is responsible for making decisions on the operation of smallholder dairy farmers' market participation?

12. What had been done here to improve smallholder dairy farmers' market participation?
Is there anything expected from community, government, and NGOs?

13. Are there any issues, questions, comments that you would like to raise or points that you want to add? If anyone would like to speak privately, you can talk to me after the meeting.

Thank you very much for your time and information!
Appendix V

Cerity Kebele FGD

Appendix VI

Chefanen Kebele FGD
Appendix VII

Burra Kebele FGD
Dairy farming
Dairy Marketing