

# Whole-Milk Marketing Channels and Determinants of Market Participation: The Case of Bishoftu Town, East Shewa Zone, Oromia Regional State, Ethiopia

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## *Abstract*

*The aim of this paper was to analyze fresh whole-milk marketing channels and determinants of market participation in Bishoftu town. Using random sampling techniques, 141 smallholder milk producer households were selected and 76 milk traders from different marketing actors were involved in the sample. The required data were collected from both secondary and primary sources and analyzed using descriptive and econometric methods of data analysis. The core fresh whole-milk marketing actors identified in the study area were input suppliers, producers, collectors, wholesalers, processors, retailers, and consumers. Marketing margin among the actors was analyzed across the main milk marketing channels. The benefit share of producers ranges from 28.42% (in channel 3) to 100% (in channel 1). Regarding traders, cafes /hotels were the highest benefited market actors for the share of GMM in channel 3 (62.1%). To analyze the determinants of smallholder milk producer household's milk market participation decision and their level of participation, Tobit regression model was used. The results of the Tobit regression model revealed that out of thirteen independent variables, about seven independent variables significantly affected the probability and level of participation of smallholder milk producers in milk market supply. . These variables were education level of the household, land holding size, the volume of milk allocated for home consumption, access to credit, experience in milk production, distance from market centers and the amount of milk produced.*

**Keywords:** Marketing Channels, Marketing Margin, Market Supply, Tobit Regression Model

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## Introduction

Naturally endowed with various agro-ecological zones and conducive environmental conditions, Ethiopia is a home for different livestock species and is suitable for livestock production. According to CSA (2013), Ethiopia has the highest livestock inhabitant in Africa. An estimate shows that Ethiopia is home to about 25.5 million sheep, 53.9 million cattle, and 24.06 million goats. Of the overall cattle inhabitants, 98.95% are local breeds and the rest are exotic breeds and hybrids. The subsector contributes about 35.6% of the agricultural and 16.5% of the national GDP (Metaferia *et al.*, 2011). It also shares 30% of agricultural employment and 15% of export income (Behnke, 2010). By the year 2025, human population in Ethiopia is expected to reach 140 million and the portion of the population living in urban will rise to 40 million. It is, therefore, obvious that milk will be in short supply without both horizontal and vertical expansions of the dairy industry sector (Azage *et al.*, 2004).

Ethiopia did not have a clear livestock development policy until the establishment of the Livestock Marketing Authority (LMA) in 1998. In Ethiopia, milk and milk products serve as a source of income, employment, health, and nutrition for the smallholder producers. Increasing market participation of smallholder producers to promote the wellbeing of them from the growing demand for milk and milk products is a better choice of action that should be taken into consideration by policymakers since the participation of producers in milk market supply is an important strategy for poverty reduction and ensuring food security in developing countries (Shapiro *et al.*, 2015).

In Ethiopia, smallholder dairy farmers produce about 98% of milk. On the other hand, only 5% of the milk produced in the country is sold in markets

while the rest of 95% is processed and consumed at home (CSA, 2012). Whereas in the year 2011, from the total production of milk, butter, and cheese in rural Ethiopia, about 6.55%, 36.58%, and 14.35% were sold in the commercial market, respectively (CSA, 2011). On the other hand, about 97% of the country's total annual milk production is produced by the traditional and backward milk production system, which is dominated by native breeds of low genetic origin potential for milk production (Feleke *et al.*, 2010).

According to (Kuma *et al.*, 2013) a number of factors such as the use of old technologies, lack of input supply, lack of enough extension service, poor marketing support and market information, poor credit services, lack of producer's organizations, and degradation of natural resources have contributed to un-exploitation of dairy potential. In addition, policy decisions on the certainty of quality and standards, and product marketing, among others taken in the lack of vital information on how they affect the overall value chain (Taye *et al.*, 2017). (Zelalem *et al.*, 2011) reported that the lack of strong linkages between the different actors in the dairy value chain is some of the essential factors that contribute to the poor development of Ethiopia's dairy sector. Accordingly, many studies were conducted on determinants of the milk market (Woldemichael, 2008; Meryem, 2013; Berhanu *et al.*, 2014; Bedilu *et al.*, 2014; Ali, (2017)). Despite that, none of these studies has been done so far in the study area to gather milk value chain information.

Market distortions are the common characteristics of market intermediaries in price settings. Milk is not creating time value due to its perishable nature. This allows market intermediaries to cut price, which moreover decreases producers' bargaining power to sell their products at a price convenient for them. Under such circumstances, a study that focused on the analysis of milk

market chain actors and channels can play an essential role in the improvement of the existing market problems. Even though milk is economically and socially crucial, key milk marketing actors and channel and their functions have not been studied and analyzed well for the target study area, where the high potential for milk production exists. Having these facts in mind, the basic research questions of this study are: Who are fresh whole-milk marketing actors? What is their function? And what do marketing margins along the chain look like? What factors determine smallholder milk producer household's milk market supply participation's decision and level of participation? The main objective of the study was to analyze fresh whole-milk marketing channels and determinants of market participation in the case of *Bishoftu* town at smallholder milk producer's level to find out the following specific objectives.

1. To identify fresh whole-milk marketing actors, their functions, and marketing margins along the chain; and
2. To analyze the determinants of smallholder milk producer household's milk market supply participation decision and their level of participation.

## **Methodology**

### **Description of the Study Area**

The study was conducted in the central highlands of Ethiopia that fall in the administrative territory of *Oromia* Regional State, Ethiopia. Data were collected from *Bishoftu* town. This area was selected based on the production potential, availability of dairy farming, and marketing practices of milk. A brief description of the study area is presented below.

***Bishoftu Town:*** is located at a distance of 45 km South East of *Addis Ababa* and is very close to the other major urban centers like *Adama* and *Mojo*. The town is located in the East *Shewa Zone* of *Oromia Regional State* and it lies between the longitudes of 38°51' to 39°04' East and the latitudes of 8°46' to 8°59' North covering a land area of 1750 km<sup>2</sup>. Most of the land (90 %) is plain highland. It has an annual rainfall of 866 mm of which 84% is in the long rainy season (June to September) and the remaining in the short rainy season extending from March to May. The dry season extends from October to February. The mean annual maximum and minimum temperatures of the area are 26°C and 14°C, respectively, with a mean relative humidity of 61.3%. Mixed farming system is practiced in the area. These agro-ecological conditions provide a favorable environment for dairy products and it is also well known for high agricultural potential, with good access to the market for quality agricultural products, including milk products. In the areas, there is fast-growing dairy production and many households are engaged in dairy production for their income and consumption. Availability of feed processing plants, veterinary services, and also access to the market help them to expand their dairy production.

### **Sample Size and Sampling Technique**

The primary data for this study was collected from the actors in *bishoftu* Town. Those actors are producers, wholesalers, processors, local collectors, retailers' hotels/cafes and restaurants and consumers.

From the nine *Kebeles* of *Bishoftu* town, the researcher selected three *Kebeles* based on their current milk production level. From those three high milk producer *Kebeles*, 141 smallholder milk producers were randomly selected. The total population size where samples were drawn was 1,427.

Finally, the probability proportional to size method of calculation was used to distribute the total sample size for each of those three *Kebeles* in *Bishoftu* Town. The sample size of milk producers selected from the total population for this study was calculated by using the formula of Yamane (1967) given as:

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

Where:  $n$  = sample size,

$N$  = Population size  $e$  = sampling error/ level of precision = 8% level of precision were used to reduce sample size because the households in the area have relatively homogeneous characteristics.

To collect data from milk traders, sample frames were taken from the records kept by tax and revenue collection and administration offices of *Bishoftu* town. Out of the total 19 registered milk traders (4 wholesalers, 7 milk retailers, 4 collectors, and 6 processors), all of them were selected since their number is small. The sample sizes of hotels/cafes & restaurants selected by using: Yamane (1967 were 54.). All of the legal milk traders were included in the probability of the sample selection process to have an equal chance of being selected.

Determining the number of consumers is difficult to identify, so a total of 15 households were randomly selected from the study area. Generally, the total sample size of 232 was used for this study including producers, traders, and consumers.

## **Data Type and Methods of Data Collection**

Both primary and secondary data types were used in the study under investigation. Primary data were collected using two types of structured questionnaires, one for milk producer farmers and the other for milk traders. Primary data collected from households were focused on factors affecting milk market participation decisions and level of participation and general behavior of different fresh whole-milk marketing channel actors. Secondary data will also be collected from journals, books, CSA, Zonal Agricultural Office, and other organizations.

## **Methods of Data Analysis**

### **Descriptive Analysis**

Descriptive statistics such as means, ratios, percentages, and standard deviations were used to analyze demographic and socio-economic characteristics of smallholder milk producers.

**Value Chain Map:** Mapping of value chain enables to visualize the flow of the products from input suppliers up to consumers through various actors. It helps to identify the different actors involved in the milk value chain and to know their functions and linkages (McCormick and Schmitz, 2002). Thus, the map of fresh whole-milk marketing channels was carried out by presenting the various actors of the chain, their linkages, and all operations of the chain from inputs supply up to end user.

**Market Performance Analysis:** Describes market performance as to how well the market accomplishes certain private and social objectives. For the reason that exact costs are frequently challenging to determine in various

agricultural marketing chains because costs are frequently cash and imputed, the total gross marketing margin (TGMM) is required to be calculated (Scott, 1995). It is expressed as a percentage of the difference between the end buyer and first seller prices (Mendoza, 1991).

$$TGMM = \frac{\text{End buyer price} - \text{First seller price}}{\text{End buyer price}} \times 100 \quad \dots (2)$$

Where, TGMM=Total gross marketing margin.

The producer's margin is calculated as a difference:

$$GMP = \frac{\text{End buyer price} - \text{Gross marketing margin}}{\text{End buyer price}} \times 100 \quad \dots (3)$$

Where GMP = the producer's share in consumer price or

$$NMM = \frac{\text{Gross margin} - \text{Marketing cost}}{\text{Consumer price}} \times 100 \quad \dots (4)$$

Where NMM = Net marketing margin

### **Econometric Analysis**

Tobit model was used to analyze the determinants of smallholder milk producer household's milk market participation decision and their level of participation. Since, many smallholder milk producers in the study area participated in milk market supply; however, the level of participation among the participants differs. In a situation when the two groups of participants and non-participants differ with a large gap in their size and interdependence among the two decisions is assumed, the Tobit model is the desired model. The dependent variable in the Tobit model is censored; this means that Tobit models set parameters around it. Tobit models also address problems of data due to measurement or data set that is not taking all the information.



## **1. Results and Discussion**

### **The Results of Descriptive Analysis**

#### **Socio-economic and Demographic Characteristics of Sample Households by Categorical Variables**

From the total 141 sample smallholder milk producer households, about 121 (86%) sample households were found to be fresh whole-milk market supply participants and the rest 20 (14%) were not participate in fresh whole-milk market supply. The reason presented by the sample respondent households was as a result of their participation in value-added dairy market.

**Sex of Household Head:** Out of 141 and 79 sampled smallholder milk producers and traders, 79.43% and 20.57% and 67% and 33% were male and female household respondents, respectively. On the other hand, of the 121 (86%) milk market supply participants, about 95 (78.51%) and 26 (21.49%) were milk market supply participants of male and female households. This result implies that the majority of milk producer and traders in the study area was a male household head.

**Marital Status of Household Head:** Based on the survey result, the marital status of sample households was 9.92% single, 75.89% married, 8.5% divorced and 5.68% widowed. This result implies that the majority of milk producer household in the study area was married.

**Annual Income Source:** Regarding the major annual income source, about 66.67%, 25.53%, and 7.8% of respondents said that their major income was from crops, sales of livestock and livestock products, and off-farm activities,

respectively. This result implies that the majority of sample respondent producer households in the study area were engaged in crop production.

**Educational Level of Household Head:** The mean educational level of the sample households was 5.31 years. The mean educational level of the sample households for participants and nonparticipant 5.51 and 4.09, respectively.

### **Socio-demographic Depiction of Sample Households by Continuous Variables**

**Age of Household Head:** The average age of sample household heads was 49.18 years. The average household head age of the market participants was 49.23 and for nonparticipants was 47.2.

**Family Size Household Head:** The average family size of the sample household heads was 5.68. Bigger family size has supported to boost the volume of supply in the study areas to impact better participation in markets. Thus the existence of a larger family sizes has positively affected the supply of marketable surplus mainly due to a lower dependency ratio and reduced cost of input, especially for labor.

**Distance from the Market Center:** The average distance from the market center of sample household heads was 6.83. The mean distance from the home of sample milk market participants and nonparticipant households to the milk market center was 6.35, 9.77 km.

**Experience of Household Head:** The average value of milk production experience of sample households was about 13.14 years. On the other hand, the average household head experience of market participants and nonparticipants was 13.41 and 11.45, respectively.

## **Resources Owned, Cow Productivity, and Milk Allocation of Households**

**Land Holding Size/Household:** The average value of landholding size per household in the study area was 0.87 hectares. On the other hand, the average landholding size/household of market participant and non-participant was 0.87 and 0.85, respectively.

**Total Milking Cows/Household:** The average total milking cows per household were 1.37 liters. On the other hand, the average landholding size/household of market participant and nonparticipant was 1.41 and 1.1, respectively.

**Milk Yield/Cow/Day:** The average total milk yield per cow per day was 4.35 liters. On the other hand, the average milk yield/cow/day of market participants and nonparticipants was 4.6 and 2.8, respectively.

**Milk Allocation/Week /Household:** From the total per household weekly produced milk (44.76liters), the average volume of milk allocated for market supply and home consumption was 10.78 liter (24%) and 26.74 liters (59.74%) respectively. Besides, about 16.26% per household per week was processed into different milk products. This result implies that the largest volume of milk produced was allocated for home consumption.

### **Access to Different Enabling Factors**

**Information Access:** About 22% of sample households have got access to market information while 78% have not got. Out of 22% of sample households who accessed market information, all of them were milk market

supply participants and none of the non-participants accessed market information.

**Credit Access:** The main sources of credit in the study area were banks, credit and saving institutions and microfinance institutions. The findings indicated that 17.44% of milk market supply participants and 28.57% of nonparticipants have got access to credit.

**Membership to Milk Producer's Cooperative:** In the case of membership to milk producer's cooperative, the result of this study shows that 3.49% of milk market supply participant households were member of milk producers cooperative.

## **Chain Actors, Functions, and Relationships**

### **Fresh Whole-milk Value Chain Map**

Milk passes through different marketing agents before reaching the end users. The main functions of fresh whole-milk marketing channel are input supply, production, collection, wholesaling, processing, retailing, and consumption whereas the major actors in fresh whole-milk marketing channels are input suppliers, producers, processors, traders (collectors, wholesalers, retailers, and Cafe/Hotel owners), and consumers. Based on the roles and functions, the major fresh whole-milk marketing channel actors and their relationship in Bishoftu Town are shown below by using value chain mapping (Figure 4.1).

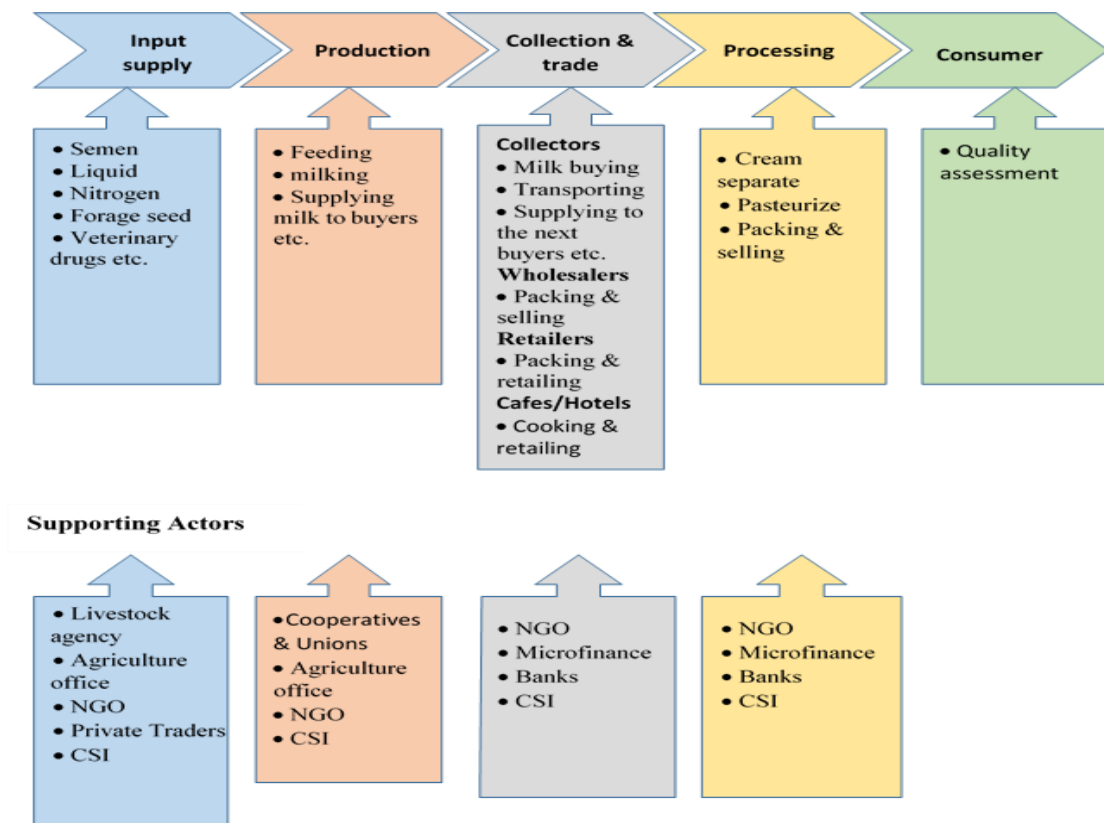


Figure 1: Fresh whole-milk value chain map

**Source:** Computed from survey data (2022)

## Fresh Whole-Milk Market Chain Actors

### Primary Actors

**Input Suppliers:** The value chain function starts from inputs used to produce milk products. The main inputs used by milk producers in the study area include semen (including sexed semen), estrus synchronizing hormone, heifers, bulls, forage seeds, veterinary drugs, water, land, and house (shelter). Currently, the main agricultural input suppliers that were directly or indirectly involved in the study area were the Office of Agriculture (at different levels), traders, NGOs (LIVES project, FAO, etc.), and farmers'

own sources. The inputs; house, water, and land are provided by the farmers themselves. In the study area, the house/shelter/ was constructed together with human shelter without separating it and was not well designed with feeding troughs and canals for waste disposal. The source of water for cattle was local watering points from the springs and ponds found in the area and it was managed by the cattle owners. Of the inputs supplied, forage seeds are provided by all actors of the suppliers mentioned above. The heifers, bulls, and estrus synchronizing hormone were also supplied by NGO (EAAP and LIVES project) and heifers and bulls were supplied by farmers' own sources whereas veterinary drugs and semen were supplied by the government via Agricultural Offices.

**Producers:** Producers perform plenty of activities within the production stage. Among these functions milking and selling, feeding cows, harvesting, housing, and taking cows to veterinary center when medication is considered to be important. Hygienic care of milk during and after milking was practiced by the milk producers to keep the neatness of the milk. But, as the respondents said, there was a storage problem to store fresh milk safely and minimizing the loss of milk due to its perishable nature especially when there was no market access during fasting time. Instead, producers process their milk using the traditional methods into different milk products since there was no innovative technology for milk processing at the smallholder milk producers' level. Out of the total milk produced weekly (44.76 liters), about 16.26% per household per week was processed into different milk products. The milk producer households who participated in the milk market used human labor to transport their milk to the market.

The growing demand for milk and milk products created an opportunity for milk producers to exploit the available market access and increase their

income level. However, producers were not encouraged in getting better benefits due to unfair consumer price share for the milk they produce and because of the perishability nature of milk mainly during fasting time. As indicated in (Table 4.2), the highest share of gross marketing margin was obtained by the cafes/hotel owners in channel 3 (62.1%). According to the survey result, the cafe/hotel owners were the key value chain governors in the study area and milk producers had no bargaining power and agreed to sell their milk at the price set by cafe/hotels owners.

**Collectors:** They collect a surplus milk from smallholder milk producer households in rural areas to resell it in the nearby urban milk market center for the wholesaler, processors, and retailers. They use their traditional and practical knowledge to differentiate the milk quality whether it is fresh or not before they buy. They consciously prioritize the areas where there was sufficient supply to assemble enough volume of milk they require and the number of processors found in the study area was four. On average, they collect 5,955 liters of milk from smallholder producers and reselling to their respective wholesalers, processors, cafes/ hotels, or retailers in the study area. Collectors packed the milk they bought using plastic vessels and used horse carts and Bajaj for transportation to nearby market centers in Bishoftu town to resell the milk for their respective buyers.

**Wholesalers:** Wholesalers are those actors who purchase a large volume of fresh raw milk directly from producers or through local milk collector and finally sell it mainly to milk retailing shops/kiosks and very rarely to milk processing enterprises, organizational consumers like hospitals, cafeterias/hotels and?. Depending on the demand and supply, by using refrigerators they also store milk that they purchase usually for about three days. There are about four wholesalers in the study area and all wholesalers

are located in *Bishoftu* town, hence, they had better storage facilities, access to transport, and communication than any other traders except processors.

**Processors:** These are actors who are using processing technology and mostly produce skimmed milk, pasteurized packed milk (prepared for selling in different volumes of containers), butter, and cheese. The number of processors found in the study area was six and all of them have their processing technology (such as cream separator, churner, refrigerator, etc.) and processing houses and thereby process different volumes of milk per day and they pack processed milk into different volume for reselling mainly to retailing shops and very rarely to cafes/hotels owners, supermarkets and wholesalers and consumers.

**Retailers:** Retailers are those who include milk retailing shops/kiosks, cafes/hotels, and supermarkets. Most of the time, the retailers buy milk from collectors, processors, wholesalers, or directly from producers and they sell mostly to urban consumers. The number of legal retailing shops/kiosks in the study area was seven and their main activities are done by them include buying processed (from processors) or unprocessed milk (from producers or collectors), testing milk quality using their traditional knowledge, lactometer, and transport to their retailing shops and selling to consumers. The retailers also prepare a large amount of milk into retailing volume and provide it for selling to consumers in small pack containers. They retail either unprocessed (raw milk) or processed (skimmed and pasteurized milk) which is packed in different volumes by the different processing centers. These actors are the end intermediary connector of consumers with other intermediaries when the marketing chain goes via retailers.



**Brokers:** Brokers are middlemen who acted as intermediary between the sellers and buyers to negotiate with each other for successful agreement among them in relation to selling and buying the milk. Brokers are more important especially when the supply is greater than demand such as during fasting time. However, the brokers facilitate the transaction and are sometimes involved in price fixing and gain more benefit by persuading the milk producers to sell their milk to cafes/hotels, wholesalers, processors, or retailers by the price they set. They are mostly involved cafe/hotel owners and milk producers. Generally, their influence in the study area was limited.

**Consumers:** In the study area, consumers are those actors who purchase milk and milk products for their consumption purpose only. Consumers could consume milk in their homes and cafes/hotels. According to consumers' responses, on average they consume 0.25 liters of milk per day per household. The trend of milk buying of consumers indicated that they were buying directly from producers or cafes/hotels and retail shops. However, consumers and collectors blame the quality of milk provided by producers which were considered by consumers and collectors as adulterated and non-fresh milk. On the other hand, producers strongly complained to consumers and cafes/hotel owners, especially during Orthodox fasting time for their low milk demand and price.

### **Supporting Actors**

Supporting actors are those actors that provide support services such as extension, information, financial, research and development services, etc. Office of Agriculture, Micro Finance, Research Centers, Office of Cooperatives Society Promotion, and NGO were the main supporting actors in the study area that provide such important services.

**Extension Services:** The survey results indicated that about 66% of the respondents obtained four times and above service contact frequency of extension from development agent of the livestock sector whereas about 44% of respondents obtained 3 times and below contact, of which 26% have no received contact of extension service. Furthermore, the survey results showed that the monthly average value of service contact frequency of extension of sample households with development agents was 3.67 times. However, the value of this variable for milk market participants and non-participants was 3.88 and 2.36 times per month, respectively. The structure of the Office of Agriculture is stretched up to the *Kebele* level and given training and extension services by appropriate technocrat staff.

**Financial Services:** Bank, credit and saving institution, microfinance imitations, Office of Cooperatives Society Promotion, relatives, and individual lenders were found to be major sources of credit for sample households. The survey findings showed that of the total sample households, about 19% said that they do have access to credit from a financial institution, and of these institutions, credit and saving institution was found to be the potential creditor than others for all actors while the rest 81% of respondents said that they did not have access to credit service. Among those 19 respondents with access to credit, 15 (79%) and 4 (21%) of them were milk market participants and non-participants.

## **Fresh Whole-Milk Market Channels and Marketing Margins**

### **Fresh Whole-Milk Marketing Channels**

According to the survey findings, six alternative main fresh whole-milk marketing channels were identified with an average supply of 9,629 liters of raw milk per month by sample respondent households. Based on the channel

comparison made, the volume of milk passed via channels indicated that the main purchaser of fresh raw milk from producers were collectors, retailers, and consumers with the estimated percentage share of volume of milk to be 61.85%, 19.63%, and 18.52%, respectively.

The channel that conveys the highest volume of raw milk was channel 3 (producer, local collector, cafes/hotels, consumers) followed by channel 2: (producer, retailers, consumer) and channel 1 (producer, consumer) with an average percentage volume of milk estimated in each to be 20%, 19.63% and 18.52% of milk, respectively.

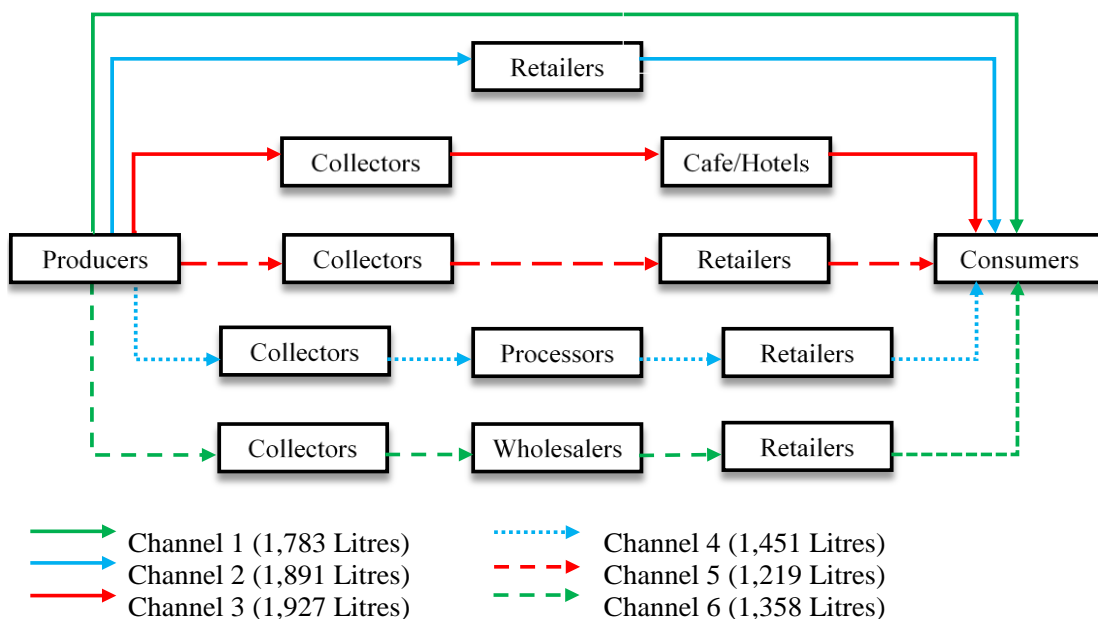


Figure 4.1: Fresh whole-milk marketing channels

**Source:** Computed from survey data (2022)

## Performance of Fresh Whole-Milk Market

**Milk Marketing Costs:** the cost incurred from the production stage of a commodity up to it reaches the end user referred as marketing cost.

Table 4.1: Marketing cost of fresh whole-milk actors (Birr/liter)

Items	Actors					
	Producers	Collectors	Retailers	Cafes/hotels	wholesalers	Processors
Production cost	12.00					
Marketing cost						
Labor cost	0.45	0.20	0.2	5.90	0.95	0.10
Transport cost		0.90			0.75	0.10
Loss due to perishability	0.40	0.25	0.60	0.50	0.13	0.25
Info cost/telephone	0.05	0.07	0.10	0.10	0.05	0.05
Processing cost				7.00		1.3
<i>Jerican</i> cost	0.05	0.05	0.04	0.75	0.05	0.27
Overhead costs			0.35	2.00	0.60	0.35
Tax		0.02	0.02	0.15	0.05	0.05
<b>Total cost</b>	12.95	1.49	2.31	16.40	2.58	2.47

**Source:** Computed from survey data (2022)

**Milk Marketing Margin:** as indicated in (Table 4.2), the producers' share of consumers price (GMMp) and net marketing margin (NMM) in milk market channels 1 and 3 were 62.62%, 100%, and 12.68%, 28%, respectively which indicate that the net marketing margin and share of the end buyer price by producers was very high in channel 1 than other channels since producers contacted directly with the end consumers whereas lower in other channels such as in channel 3 when other marketing actors involved between producers and end consumers. According to the result of survey findings indicated in (Table 4.2), the total gross marketing margin (TGMM) and producers share (GMMp) of consumers price in channel 1, 2, 3, 4, 5 and 6 was 0%, 28.89% 71.58%, 40.00%, 41.3%, 40% and 100%, 71.12%, 28.42%, 60.00%, 58.7%, 60.00%, respectively. Accordingly, it is possible to say that producers have got the highest share of consumers price in channel

1 followed by channel 2, and the lowest share in channel 3. Regarding GMM, the highest share of consumers' price by milk traders was captured by cafes/hotels in channel 3 (62.1%), retailers in channels 2 (28.88%), and 4 (21.11%), collectors in channel 6 and 5 (18.22% and 17.83%) respectively. whereas the lowest GMM was obtained by collectors in channel 3 (9.48%) followed by retailers in channels 5 and 6 (10.87% and 10 %) respectively.

Concerning NMM, the highest profit share of consumers' price in channel 1 (62.62%) and channel 2 (37.89%) was captured by producers whereas Cafes/Hotels obtained about 44.48% in channel 3 and retailers got 23.75% and 15.97% in channel 2 and channel 4, respectively. On the other hand, the lowest share of profit margin from consumers' price was obtained by retailers in channel 5 (5.84%) and channel 6 (4.86%) followed by processors in channel 6 (6.04%) and wholesalers in channel 5 (7.23%).

Table 4.2: Performance of fresh whole-milk marketing in different channels

Marketing actors	Particulars	Fresh whole-milk marketing channels					
		Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	Channel 6
Producers	Production cost	12.00	12.00	12.00	12.00	12.00	12.00
	Marketing cost	2.95	2.95	2.95	2.95	2.95	2.95
	Selling price	40	32	27	27	27	27
	GMMp (%)	100	71.12	28.42	60.00	58.7	60.00
	NMMp (%)	62.62	37.89	12.68	26.78	26.19	26.79
Collectors	Buying price	-	-	27	27	27	27
	Marketing cost	-	-	1.49	1.49	1.49	1.49
	Selling price	-	-	36	35.50	35.20	35.20
	GMMc (%)	-	-	9.48	18.89	17.83	18.22
	NMMc (%)	-	-	7.09	15.78	14.58	14.91
Cafes/Hotels	Buying price	-	-	36	-	-	-
	Marketing cost	-	-	16.40	-	-	-
	Selling price	-	-	95	-	-	-
	GMMhc (%)	-	-	62.1	-	-	-
	NMMhc (%)	-	-	44.48	-	-	-
Wholesalers	Buying price	-	-	-	-	-	35.20
	Marketing cost	-	-	-	-	-	2.58
	Selling price	-	-	-	-	-	40.50
	GMMws (%)	-	-	-	-	-	11.78
	NMMws (%)	-	-	-	-	-	6.04

Marketing actors	Particulars	Fresh whole-milk marketing channels					
		Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	Channel 6
Processors	Buying price	-	-	-	-	35.20	-
	Marketing cost	-	-	-	-	2.47	-
	Selling price	-	-	-	-	41	-
	GMMpr (%)	-	-	-	-	12.6	-
	NMMpr (%)	-	-	-	-	7.23	-
Retailers	Buying price	-	32	-	35.50	41	40.50
	Marketing cost	-	2.31	-	2.31	2.31	2.31
	Selling price	-	45	-	45	46	45
	GMMr (%)	-	28.88	-	21.11	10.87	10
	NMMr (%)	-	23.75	-	15.97	5.84	4.86
TGMM (%)		00.00	28.89	71.58	40.00	41.3	40.00
GMMp (Producers Share) (%)		100	71.11	28.42	60.00	58.7	60.00
GMMp +TGMM		100	100	100	100	100	100

**Source:** Computed from survey data (2022)

### Results of Econometric Analysis

This section contains the results of an econometric analysis of determinants of participation decision and level of participation in milk market supply. The data was analyzed by using Tobit regression model and the results were set in (Table 4.3) indicating that about seven variables affected significantly the decision of participation and level of participation of smallholder milk producer households in milk market supply and the results are discussed as follows:

Table 4.3. Results of Tobit regression model for determinants of milk market supply

Variable	Marginal effect for E (y*/y>0)	Std. Err.	z	P>z	Marginal effect for Pr(y>0)	Marginal effect for E(y/y>0)
Sex	-0.3365	6.3445	-0.04	0.993	-0.0026	-0.0809
Age	0.0531	0.0159	0.57	0.252	0.0017	0.0718
Edu	0.0745	7.0846	4.73	0.000***	0.3780	0.8766
Acexsn	-0.0369	0.7386	-0.05	0.878	-0.0004	-0.0298
Incpro	-0.5823	5.8759	-0.63	0.702	-0.0403	-0.9061
Lanhs	-0.4804	5.6722	-3.82	0.008***	-0.2598	-0.8749
Hconsump	-0.0034	0.0022	-4.04	0.031**	-0.00024	-0.0027
Exp	0.3409	7.0282	7.46	0.000***	0.57372	0.7970
Acc	0.0892	7.9369	2.86	0.092*	0.2353	0.9769
Ainfo	-0.8612	9.1241	-2.34	0.541	-0.2596	-0.1327
Dismar	-0.3682	0.6294	-0.61	0.000***	-0.0042	-0.92674
Fs	0.3119	0.21291	2.11	0.527	0.0036	0.2631
Amntp	0.9803	0.8658	3.59	0.024**	0.0347	0.4673

Number of Obsn = 141, left-censored observations =20, uncensored observations =121, right censored observations = 0, Prob > F = 0.0000, LR chi<sup>2</sup> (13) = 146.96 with Prob > chi<sup>2</sup> = 0.0000, Log likelihood = -546.12519, Pseudo R<sup>2</sup> = 0.283, \_cons = 0.062 the value \*\*\*, \*\* and \* represents level of statistical significance at 1%, 5% and 10%, respectively.

Tobit model was used to identify determinants of probability and level of participation in milk market supply. Diagnostic tests for multicollinearity and heteroscedasticity were conducted during analysis using the variance inflation factor test (VIF) and Breusch-Pagan/Cook-Weisberg test, respectively. Accordingly, there was no multicollinearity problem since the results of VIF for continuous variables and write it in full (CC) for dummy variables were less than 10 and 0.75, respectively. However, the tests of Breusch-Pagan/Cook-Weisberg test showed that there was a heteroscedasticity problem in the model and therefore, the robust standard error was employed as a correction measure of the problems since the robust standard error can produce the estimates with the smallest possible standard errors. On the other hand, the fitness and significance of the model were

tested using LR  $\chi^2(13) = 146.96$ ,  $\text{Prob} > \chi^2 = 0.0000$  which shows the fitness of the model at less than a 1% significance level. The log-likelihood = -546.12519 revealed that the assumption of the null hypothesis of all independent variables involved in the model is collectively equal to zero to be rejected at a probability level of less than 1%.

The results of the Tobit regression model (Table 4.3) revealed that out of thirteen independent variables, about seven independent variables affected significantly the probability and level of participation of smallholder milk producers in milk market supply are discussed as follows:

**Education Level of the Household:** As prior expectation, it influenced probability and intensity of participation in milk market supply positively at less than 1% significance level. The marginal effect for the education level of the household indicated that, as the education level of a household increases by one year of formal schooling, the probability and intensity of participation of smallholder milk producer households in the milk market supply increases by 37.8%, and 7.45%, respectively. Similarly, the volume of marketed supply of milk conditional on the decision to participate in milk market supply increases by 87.7% if the education level of a household increases by one year of formal schooling. This implies that as the education level of a household increases by one year of formal schooling, the volume of milk supplied to the market increases. This result is in line with the study of Kumar (2010) and Tadele *et al.*, (2014).

**Landholding Size of the Household:** As prior expectation, it influenced probability and intensity of participation in milk market supply negatively at a 1% significance level. The marginal effect of land holding size of the household indicate that a hectare increase in land holding size of the



household decreases the probability and intensity of participation of sample milk producer respondents in milk market supply by 25.98% and 48.04%, respectively. The actual quantity of milk supply is conditional on the decision to participate in the market also decreases by 87.49% if the land holding size increases by a hectare. This implies that as landholding size increases, the tendency of households in investing the resources and labor force for crop cultivation also increases which in turn decreases the resource and labor force allocation for milk production and thereby leads to a decrease in the quantity of milk produced and supplied to the market. This result is in line with Berhanu (2012).

**The Volume of Milk Allocated for Home Consumption:** As prior expectation, it influenced probability and intensity of participation in milk market supply negatively at 5% significance level. The marginal effect of the volume of milk allocated for home consumption indicated that, a liter increase in the volume of milk allocated for home consumption decreases the probability and intensity of participation of sample milk producer respondents in milk market supply by 0.024% and 0.34%, respectively. The quantity of marketed supply of milk conditional on the decision to participate in the milk market supply decreases by 0.27% if the volume of milk allocated for home consumption increases by a liter. The implication is to mean that as the smallholder milk producer households' volume of milk allocated for home consumption increases, their attention to sufficiently engaged in the dairy development sector decreases, as a result, milk market supply also decreases. This result is in line with Ali (2017).

**Access to Credit:** As prior expectation, it influenced probability and intensity of participation in milk market supply positively at less than 10% significance level. The marginal effect of access to credit indicated that, the

probability and intensity of participation of milk producer households in milk market supply with access to credit increased by 23.53% and 8.92%, respectively. Although, the intensity of the marketed supply of milk conditional on the decision to participate in the milk market increases by 97.7% if milk producer households get access to credit. This implies that as the milk producer households get access to milk market-related credit, their probability and intensity of participation in the milk market supply also increases. This result is in line with Anwar (2019).

**Experience of Household in Milk Production:** As prior expectation, it influenced probability and intensity of participation in milk market supply positively at less than 1% significance level. The marginal effect of experience of household in milk production indicated that an increase of household experience in milk production increases the probability and intensity of participation of smallholder milk producer households in milk market supply by 57.4% and 34.09%, respectively. Similarly, the volume of marketed supply of milk conditional on the decision to participate in the milk market increases by 79.7% if the experience of household in milk production increases by a year. This result is in line with Ali (2017).

**Distance from Market Centers:** As prior expectation, it influenced the probability and intensity of participation in milk market supply negatively at less than 1% probability level. The result of marginal effect indicated that as the distance from market centers increases by a kilometer, the probability and intensity of participation of sample milk producer respondents in milk market supply decrease by 42% and 36.82%, respectively. Keeping other variables constant, the actual quantity of milk supply conditional on the decision to participate in the market also decreases by 92.74% if the

distance from market centers increases by one kilometer. The same result was reported by Kumar A.(2010) and Berhanu (2012).

**The Amount of Milk Produced:** as expected, it influenced the probability and intensity of participation in milk market supply positively at less than a 5% significance level. The result of the marginal effect indicated that, when the amount of milk yield per day increases by a liter, the probability and intensity of participation of smallholder milk producer households in milk market supply also increase by 3.47% and 98%, respectively. Although, the intensity of the marketed supply of milk conditional on the decision to participate in the milk market supply, increases by 46.7% if the amount of milk yield per day increases by a liter. This implies that as the amount of milk yield per day in liter increases, the probability and intensity of milk market supply also increases. The same result was reported by Anwar (2019).

## **Conclusions and Recommendations**

### **Conclusions**

The mapping of fresh whole-milk marketing channels showed the main milk value chain actors, their functions, and support services. The main fresh whole-milk chain actors identified in the study area were input suppliers, milk producers, milk processors, collectors, wholesalers, cafes/hotels, retailers, and consumers. Accordingly, six main fresh whole-milk market channels were identified and of which the producer-collectors-cafes/hotels consumers' channel (channel 3) carried out the highest volume of milk transactions than other channels and cafes/hotels were the leading benefited market actors. The main agricultural input suppliers that were directly or indirectly involved in the study area were the Office of Agriculture (at

different levels), traders, NGOs (LIVES project, FAO, etc.), and farmers' sources. From the result of milk marketing margins and market channels identified, it was concluded that fresh whole-milk marketing actors were not supported well and there was the disproportionate distribution of benefit or margins among actors.

On the other hand, to analyze factors determining milk market supply participation and level of participation, Tobit regression model was applied. Accordingly, the result of the Tobit regression model revealed that out of thirteen independent variables seven independent variables significantly affected the probability and level of participation of smallholder milk producers in milk market supply. These variables were education level of the household, land holding size of the household, the volume of milk allocated for home consumption, access to credit, the experience of household in milk production, distance from market centers and the Amount of Milk Produced..

### **Recommendations**

- The cooperative structures should make a strong institutional arrangement. Cooperatives should be effective in dealing with information asymmetries and easily achieve competitive advantage. 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 are established voluntarily without any form of external imposition. Once the decision is made to implement the cooperative structure as a means of dairy development, government policies may be used to support milk supplier cooperatives.

- Office of Cooperatives Society Promotion should pay attention to optimizing the benefit share and minimizing disproportionate margins of milk marketing among the market actors via efficient extension service by providing input, access to market information, and organizing producers to have strong bargaining power and value chain linkage.
- Government sectors (more appropriately agricultural sector) should give technical support to specialization approach of the dairy sector for those milk producer farmers having hope to fully engage in milk production via specialization.
- Awareness creation focused on market-oriented dairying should be provided by agricultural extension workers for those milk producers who allocated a greater amount of milk for home consumption.

Strengthening and promoting the education level of the milk producers via formal schooling should get attention of the government sector for capacity building to enhance their participation in milk market supply and thereby increase their income level and self-sufficiency in food security.

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