Hindawi
Advances in Agriculture
Volume 2022, Article ID 6902503, 12 pages
https://doi.org/10.1155/2022/6902503

*Research Article*

# Analysis of Downstream Dairy Value Chain in Ziway-Hawassa Milk Shed Areas of Ethiopia

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Received 9 April 2022; Revised 18 June 2022; Accepted 23 July 2022; Published 2 September 2022

Academic Editor: Laszlo Vasa



The increasing demand for raw milk cannot be met with the current inefficient production and marketing systems; designing a sustainable dairy value chain has the potential to increase the availability and affordability of milk for poor consumers and reduce poverty. Therefore, this study aimed to characterize the downstream dairy value chain and evaluate the relationship among the chain actors and their share of profit margin in Ziway-Hawassa milk shed areas of Ethiopia. The downstream chain has several links and is operated by a number of actors. In this study, the upstream part of the chain includes the input supply and production of raw milk at the farm level, and the rest parts of the chain are considered. Producers, collectors, and consumers channel was reported as the dominant milk route in the Ziway-Hawassa milk shed. The results showed that the downstream chain was controlled and monopolized by a few large-scale collectors and processors. Milk collectors took the highest gross margin in fresh milk, but the value share was higher for producers. In general, milk collectors and processors sourced milk directly from producers. Unlike the gross margin, the value share for collectors on fresh milk was less than the share of producers which implies that chain sustainability is under question. Therefore, fair value addition and share must be maintained across each actor of the chain.

## 1. Introduction

The Ethiopian dairy sector is operated by smallholder farmers, weak milk cooperatives, and very few private small- and large-scale processors [1]. The dairy value chain starts with an input supply for the production of the raw milk at the farm level and ends with consumers who make a choice decision to either buy or not the final product. The dairy value chain, in Ethiopia, has several links that connect producers to consumers and are operated by numerous actors who involve in activities such as procurement (collection), transportation, processing and packaging, storage and distribution, retailing, and food services [1, 2]. The milk producers sell their surplus milk to neighbors in the informal marketing channel, to dealers, or to milk cooperatives that may deliver to a milk-collecting center [2]. They select their buyers based on the ultimate share in the profit, trust-based relationships, and lack of alternatives to access another buyer. Also, price, delivery convenience, and business relationships were indicated as some criteria in the buyer selection decision [3].

In Ethiopia, about 6.8% of the milk produced by smallholder farmers is marketed and channeled to consumers through both formal and informal chains [4]. About 95% of the marketed milk is channeled through the informal chain. Unlike the formal marketing system, the informal system is characterized by the absence of an operation license, low cost of operation, high producer prices, and no instruction of operation [5]. The informal marketing channels are of low cost and use short-cut marketing routes between the producer and consumers and are, thus, believed to be more efficient than the formal marketing systems [2]. However, the hygienic condition of milk and milk products channeled through this system is poor. This is mainly due to

the prevailing situation where producers have limited knowledge of dairy product handling coupled with the inadequacy of dairy infrastructures such as cooling facilities and the unavailability of clean water in the production areas [6]. As a result, raw milk dominates fluid milk consumption and mostly reaches consumers through informal marketing channels [7]. Out of marketable milk, a few proportions of milk are processed (into pasteurized milk, reduced-fat milk, butter, cheese, and yogurt), whereas another significant share of milk is directly sold and consumed in its raw state [7]. Informal retail outlets rely on embedded local quality standards such as color, taste, smell, and fat level.

In the formal chain, the loss of milk due to spoilage is minimal. When milk is collected at the cooperative or private milk collection centers and transported to processing plants, milk quality tests are performed on delivery, thereby assuring the quality of milk. This quality measurement has encouraged the producers to improve the hygiene conditions, storage, and transportation of the milk to avoid rejection of the product on delivery to the collection center [6, 7]. The development of formal value chains offers an opportunity for both women and men to establish businesses to supply feed and health inputs or engage in milk trading [8]. The dairy business engages both men and women in different segments of the value chain. Improving the dairy business will benefit the whole family in terms of nutrition and additional income. In rural Ethiopia, the female bargaining position within the more commercially oriented dairy households' slightly improved and dietary diversity and nutritional status of children under five proved to be better guaranteed [9]. Therefore, this signifies that the development of a formal dairy chain that assured gender participation has positive effects on the food and nutritional security status of farm households.

Improving the dairy value chain from the supply side implies that substantial investments need to be made for increasing the productivity of dairy farming and for enhancing the quality of milk. While most efforts are usually devoted toward increasing the total supply volume of fresh milk and some controls are in place to ascertain safety, far less attention is given to quality upgrading [7]. In the Ziway-Hawassa milk shed, the main problem is high milk spoilage/loss due to the dominance of the informal chain that leads to the inconsistent supply of milk to the formal chain. As evidence, [10] reported that in Shashemene-Hawassa areas only limited volumes of milk could be collected, processed, and marketed by small private and cooperative processing facilities. The effect of the problem is severely affecting the profitability of chain actors and leads to inefficient utilization of resources throughout the channel. Therefore, analyzing and revealing the existing situation has paramount importance to support the sustainability of the dairy value chain in the area. Hence, the objectives of the study were to examine the functions and existing relationships among downstream chain actors and the role of gender in collecting and processing functions and to evaluate the distribution of gross margins and value share across actors involved in milk collection and processing and retailing functions.

## 2. Materials and Methods

*2.1. Study Area Description.* The study was conducted in southern Ethiopia. It covered six districts such as Dugda, Adami-Tullu, Arsi-Negelle, Shashemene, Kofele, and Hawassa city (Figure 1). The study area stretched 141.8 km from Dugda to Hawassa. The districts are found in the Mid-Rift Valley of Ethiopia. The altitudes of the study areas range from 1,500 to 2,600 meters above sea level and have a semiarid type of climate. The Mid-Rift Valley has an erratic, unreliable, and low rainfall averaging between 500 and 1,300 mm per annum. The temperature also varies from 12 to 27°C [11–13]. The areas are famous for milk production and are one of the major milk sheds in the country [11].

*2.2. Research Units.* A stakeholder meeting and a preliminary assessment were employed to identify and map the available milk collection points/traders and processing units throughout the milk shed. Then, 32 milk collection points were randomly selected, and all processing units were considered for further redefining the study unit. One respondent per collection point (32), and one respondent per processing unit (totally four) was selected for the survey study. Besides, six participants were selected randomly among milk collectors and processors in the milk shed for focus group discussion (FGD). For the economics study, one milk and milk products retailer per district (6) was randomly selected within the milk shed.

*2.3. Data Collection Methods and Tools.* A semistructured questionnaire was used to generate both qualitative and quantitative data. The survey was held with help of a language translator (Afan Oromo and Amharic speaker). Close-ended part of the questionnaire was prepared in a way that can help estimate gross margins and value share of the downstream chain actors. Similarly, open-ended parts of the questionnaire were used to describe the milk collection and distribution procedures, the roles of gender in the downstream chain, marketing channel, and relationships among actors. Direct observation was conducted by using a checklist to triangulate the validity of the data obtained through the questionnaire. Also, the collection points and processing units were observed about the arrangement of the operating system for product quality and involvement of gender. A stakeholder meeting was held with a group of milk collectors and processors to collect some qualitative data. One FGD per study district was held. In each discussion session, about six participants (three female and three male) from milk collectors and processors were involved. A checklist for an interview and participatory tools such as mapping of milk collection and distribution procedures was used for the discussion. The checklist was prepared and applied in a way that can help get in-depth information about milk collection and distribution procedures, operating system of chain actors, quality assurance mechanisms, and the existing relationships among chain actors.

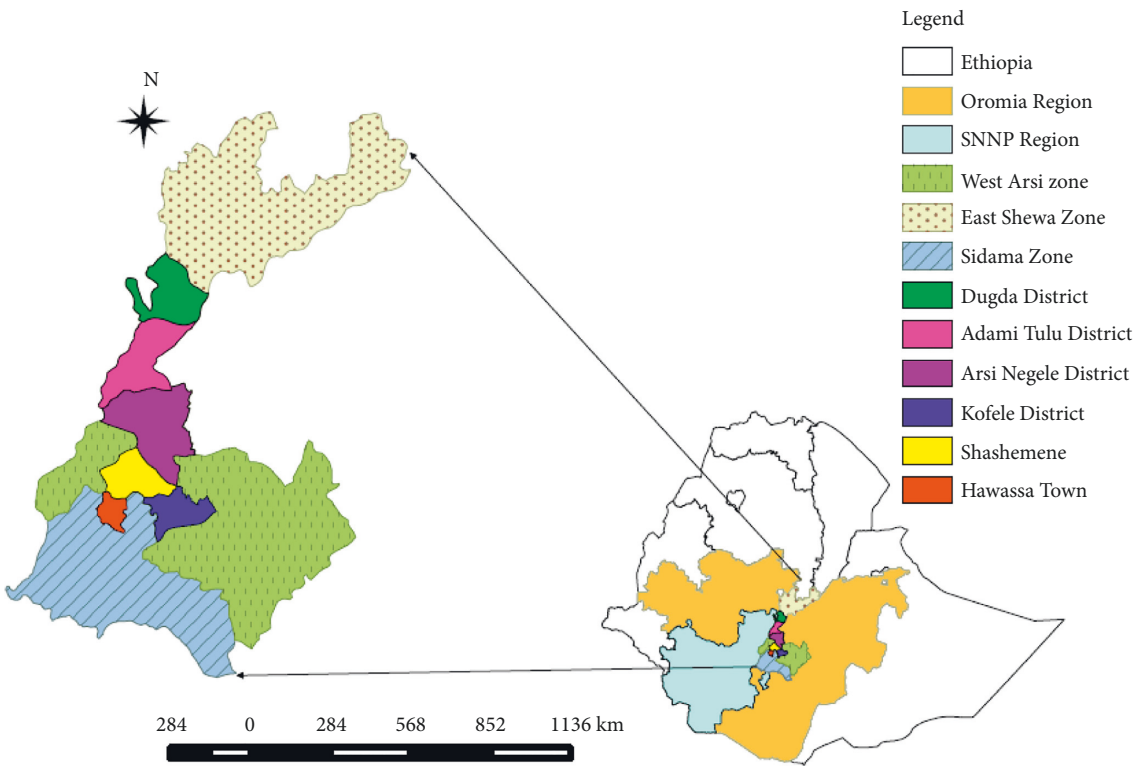


Figure 1: Map of study areas.

*2.4. Data Analysis.* Different analytical tools were employed for qualitative data. Mapping and stakeholder matrix was used to visualize and describe the chain actors, especially those who played a role in the collection, processing, and distribution functions. Statistical Package for Social Science (SPSS, version 20) was used to process and produce frequency tables, graphs, and average values for different variables involved in the study. In this study, collectors were clustered into two groups based on the volume of milk collected per day. Those who collect a high volume of milk (greater than and/or equal to 150 liters per day) were grouped as large-scale collectors. And those who collect a low volume of milk (less than 150 liters) were grouped as small-scale collectors. Accordingly, 13 collectors were grouped into large-scale collectors, whereas the rest was considered small-scale collectors. Independent samples *t*-test was applied to know the statistical differences in means of cost and revenue for the two established clusters. An economic parameter such as gross margin was used to analyze the benefit share and added value of collectors, processors, and retailers along the milk value chain in the shed. The gross income for each actor was estimated by subtracting the cost price of the product/unit from the sale price (revenue) of that product.

Gross income = Revenue− Variable cost (KIT and IIRR, 2008). A gross margin (GM) shows the percentage of the actor's revenue that is the gross profit per unit of produce and was calculated as follows:

$$\text{GM} = \left(\frac{\text{Grossincome}}{\text{Salesprice (revenue)}}\right) * 100 \,(\text{KIT and IIRR, 2008}). \quad (1)$$

Added value is the amount of value that each actor in the chain adds. It is the difference between the price the actor pays for the produce and the price she or he sells it for. It was calculated as follows:

$$\text{AddedValue} = \text{Pricereceivedbyactor} - \text{Pricepaidbyactor}\,(\text{KIT and IIRR, 2008}). \quad (2)$$

Like gross margins, the size of the value share also reflects the number of costs and risks that appear in the chain by that actor. Value share was estimated by using the following formula:

$$\text{ValueShare} = \left(\frac{\text{Addedvalue}}{\text{Finalretailprice}}\right) * 100\,(\text{KIt and IIRR, 2008}). \quad (3)$$

## 3. Results

*3.1. Proportion of Licensed and Unlicensed Milk Collectors.* In the Ziway-Hawassa milk shed, most of the sampled respondents had a legal license to operate a milk collection and processing business. However, in the Kofele district, unlicensed milk traders were more dominant than licensed collectors. In the Dugda district, an equal number of licensed and unlicensed milk collectors were identified. But, in Shashemene and Hawassa, all sampled milk collectors and processors were licensed to run their businesses (Figure 2).

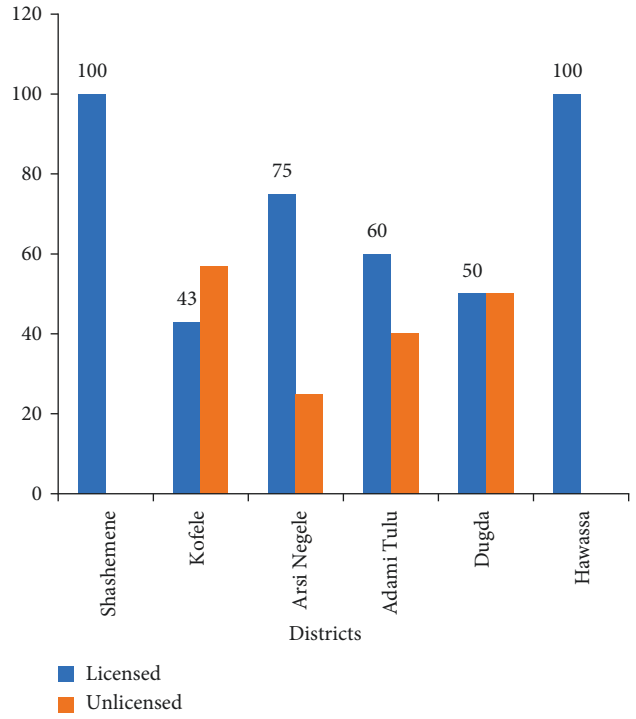


Figure 2: Proportion of licensed and unlicensed milk collectors in the shed.

*3.2. Reasons for Engaging in Milk Collection and Processing Business.* Most of the milk collectors and processors believed that milk trading is the right way of money-making business in the Ziway-Hawassa milk shed. As indicated in Table 1, 56% of the respondents stated that milk collection and processing is the only source of their income. The remaining proportion of the respondents had other income sources along with the milk trading business. Based on their report, the area has a high potential for milk production, and even the communities have a high demand and habit to purchase and consume milk and milk products. Some respondents also reported that they engaged in milk collection and processing business because of personal interest or hobby and lack of another alternative (Table 1).

*3.3. Milk Collection and Distribution Procedures in Ziway-Hawassa Milk Shed.* Milk was sourced from urban and peri-urban dairy farmers and then distributed to large- and small-scale collectors, processors, and consumers. As indicated in Figure 3, processors monopolize the chain starting from milk-producing up to retailing functions. The support and services of most chain supporters were limited at the producers and input suppliers' levels. That means there was no strong support for milk collectors and processors. Only the Ethiopian meat and dairy industry development institute (EMDIDI) has been providing some training for very few collectors and processors.

Milk is transported from producers to collectors and/or consumers by carts, on-foot, via public transport, or private transportation trucks. Except for a few large volume collectors that use their own milk transportation truck, the Bajaj (small three-wheel vehicle) was mainly used for the collection of milk within the town. However, across districts such as from Arsi-Negelle or Kofele to Shashemene, either public or private transportation trucks were used. Some respondents (33%) also indicated that a mixed transportation system (public transport from one area, on foot from another area, and/or private truck from somewhere) was used for milk collection (Table 2). Therefore, in the Ziway-Hawassa milk shed, the major portion of milk was transported by using vehicles.

Within the town, Bajaj was used for the distribution of milk to consumers and/or retailers, which are located somewhat far distance and required a relatively large volume of milk per day. Large volume collectors mainly used their own transportation trucks for distribution of milk to institutional consumers such as prisoner's corrective institutions, health centers, and some known hotels and restaurants. Table 2 shows that 55% of milk collectors distributed milk on foot to the consumers. Because most collection points have been established near high population density sites, milk can be purchased throughout the day. Therefore, due to the proximity of consumers, on-foot distribution is most effective and profitable. Moreover, it is an emission-free means of transportation.

Table 1: Income source and reasons for engaging in the business.

| S. no. | Parameter | *N* | Percent |
|---|---|---|---|
| *Source of income* | | | |
| 1 | Only milk trade | 20 | 56 |
| | Milk and other sources | 16 | 44 |
| | Total | 36 | 100 |
| *Reasons for engaging in milk trade* | | | |
| 2 | Good money-making business | 23 | 64 |
| | Personal interest | 7 | 19 |
| | Absence of other alternative | 6 | 17 |
| | Total | 36 | 100 |

*3.4. Milk Marketing Channel.* Since the study focused on the collectors and processors level, a channel that leads to the direct flow of milk from producers to consumers was not included. Therefore, three lines of milk pathways were identified throughout the Ziway-Hawassa milk shed. The major route of milk distribution to the consumers in all study districts was producer ⟶ collector ⟶ consumer (Table 3) because most collectors performed milk collection and retailing functions at the same time and place.

*3.5. Relationships among Chain Actors (Chain Governance).* For the sake of continuous supply of milk, collectors and processors have devised different mechanisms with producers, such as a simple contract agreement, incentive-based system, creating fair value share, and building trust (Figure 4). A simple contract agreement was reported as a main

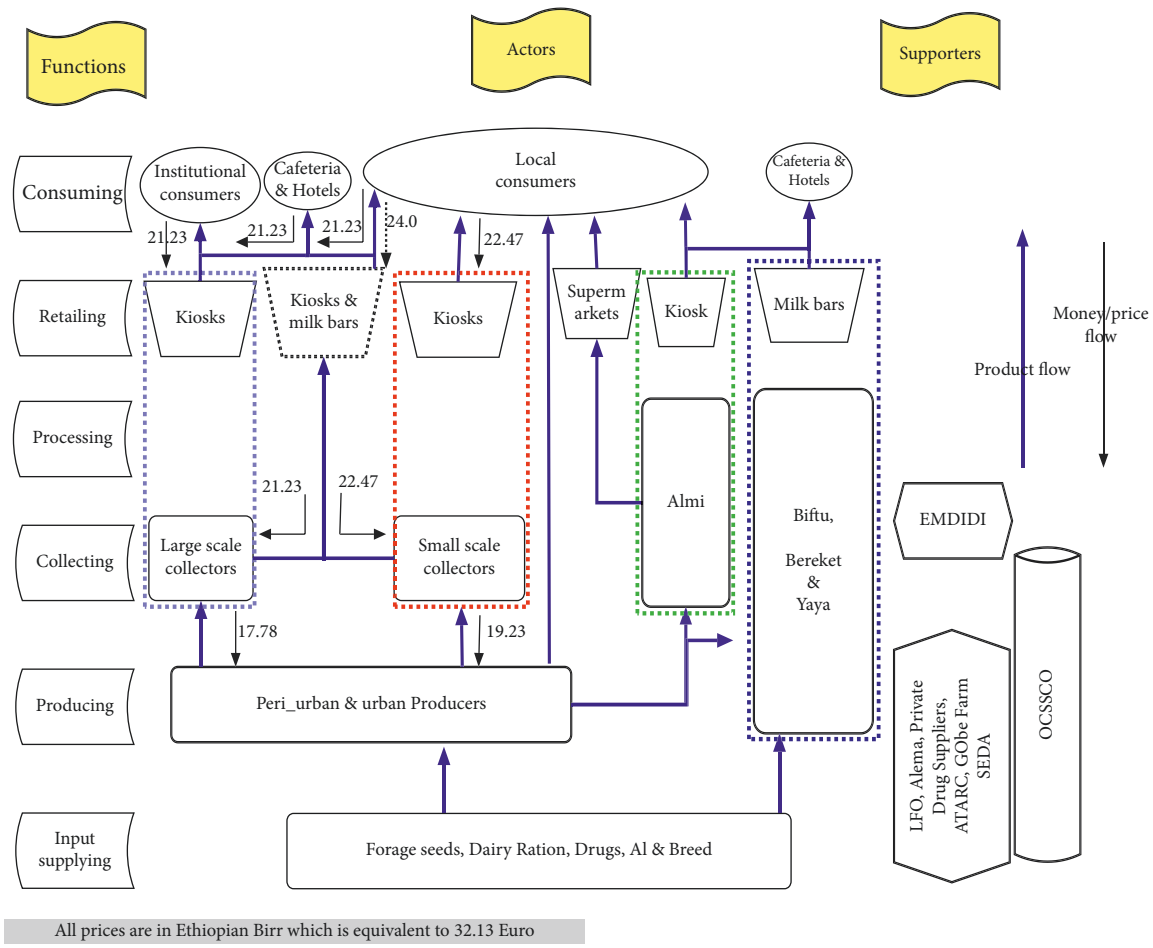


Figure 3: Dairy value chain map in Ziway-Hawassa milk shed.

Table 2: Means of milk transportation during collection and distribution.

| S. no. | Means of transportation | During collection | | During distribution | |
|---|---|---|---|---|---|
| | | *N* | Percentage | *N* | Percentage |
| 1 | On-foot | 9 | 25 | 20 | 55 |
| 2 | Public transport | 3 | 9 | 5 | 14 |
| 3 | Own transportation truck | 12 | 33 | 5 | 14 |
| 4 | Mixed | 12 | 33 | 4 | 11 |
| 5 | Carts (donkey + horse) | — | — | 2 | 5 |
| ’ | Total | 36 | 100 | 36 | 100 |

Table 3: The channel of milk distribution to the consumer (percentage).

| Milk distribution routes | Districts | | | | | Total ($N = 36$) |
|---|---|---|---|---|---|---|
| | Shashemene | Kofele | Arsi-Negele | Adami-Tullu | Dugda | |
| Producer ⟶ collector ⟶ consumer | 46 | 72 | 67 | 50 | 75 | 62 |
| Producer ⟶ processor ⟶ retailer ⟶ consumer | 8 | 14 | 17 | — | — | 8 |
| Producer ⟶ collector ⟶ retailer ⟶ consumer | 46 | 14 | 17 | 50 | 25 | 30 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

milk procurement strategy of milk collectors, particularly in the Shashemene and Adami-Tullu districts. The contract agreement used by milk collectors and producers in the Ziway-Hawassa milk shed lacks quantity and quality information. This form of agreement promotes side selling during high-demand season when the price goes up.

In the Ziway-Hawassa milk shed, only an adulteration test by using a lactometer was practised by 55% of milk

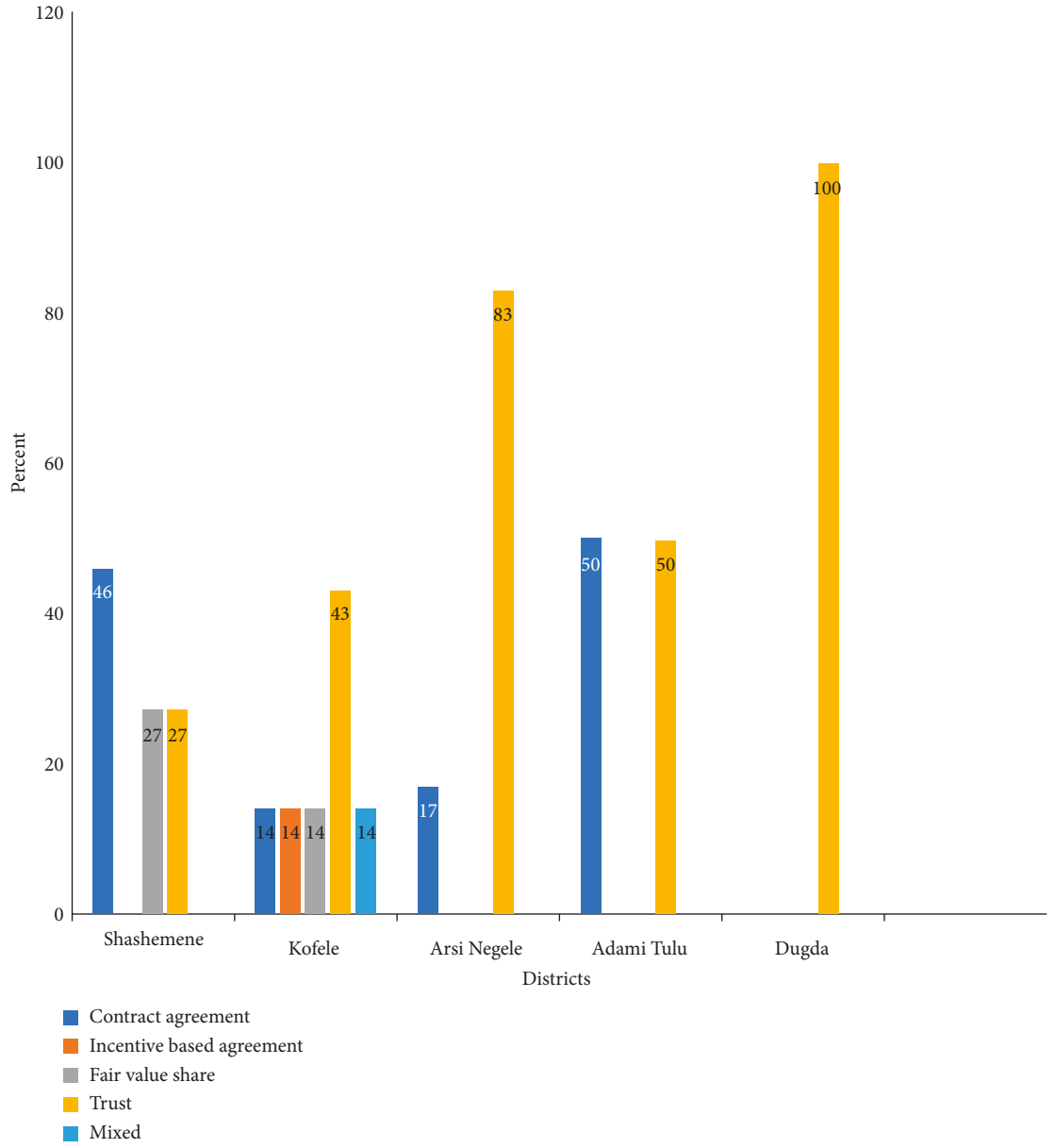


Figure 4: Milk procurement strategies in Ziway-Hawassa milk shed.

Table 4: Quality testing practices and decisions for bad milk quality.

| Parameter | | *N* | Percentage |
|---|---|---|---|
| Quality testing practices | Lactometer | 12 | 33 |
| | Lactometer and alcohol | 8 | 22 |
| | Traditional test | 2 | 6 |
| | No test at all | 14 | 39 |
| | Total | 36 | 100 |
| Decision for bad quality milk | Reject | 15 | 83 |
| | Purchasing with warning/advising | 3 | 17 |
| | Total | 18 | 100 |

collectors (Table 4). There was no such convincing and robust milk quality test for bacteria load and fat and protein content. But the milk collectors had a high interest to have the testing equipment and provide good quality tested milk to their customers.

In the Ziway-Hawassa milk shed, the lactometer was mainly used for testing milk quality at a collection point (Figure 5). Some collection points practised a combined quality testing method (lactometer with alcohol) for better-quality assurance (Table 4).

Figure 5: Milk quality controlling system of collectors at the collection point (lactometer).

Those who showed quality measurements reported two decisions on their tests. The majority of them (83%) preferred to reject the milk with quality defects (Table 4). Meanwhile, a chance was given to the suppliers to observe their milk quality defects at that moment. On the other hand, some respondents purchased the defective milk by providing a warning or advice to the suppliers, and then the milk would not be used for human consumption; instead, it would be used for pet animals or added to biogas pits. According to FGD participants, this was done to maintain the established relationship with the suppliers. However, for repeated cases, the suppliers would be registered on the blacklist.

*3.6. The Role of Gender in Downstream Dairy Value Chain.* In the Ziway-Hawassa milk shed, family labor was more common than employed labor in milk purchasing activity. Notably, the male from the family was given the responsibility to purchase raw milk. Besides, males were mainly assigned for milk transportation activity. According to the focus group discussion participants, milk transportation requires more energy that is the reason why males were assigned to it. Females were more active and dominant in milk reception and selling activities at the collection point. As indicated in Figure 5, either from family or employed, females were principally assigned for milk reception and quality control tasks. Therefore, in the Ziway-Hawassa milk shed, the gender roles in the downstream dairy value chain were balanced and significant. In the present study, females' involvement in the processing of milk was reported to be 49% (Figure 6). Similarly, at the collection point, females' roles in the reception of purchased milk, quality control, and cleaning activities were stronger than males.

## 4. Economic Analysis

*4.1. Average Purchasing and Selling Price of Milk.* In the Ziway-Hawassa milk shed, a relatively high average selling price of milk was reported. Even the purchasing price of milk for large- and small-scale collectors varied. On average, large-scale collectors purchased by ETB 17.78 per liter of milk, whereas small-scale collectors purchased by ETB 19.23 for a liter of milk (Table 5). This difference occurred because of the potential for bargaining power. Large-scale collectors had strong relations with producers throughout the year. They collect the usual quantity of milk both during the fasting and nonfasting seasons at a stable price. However, some small-scale collectors break their relations with the suppliers during the fasting season, or they want to reduce the purchasing price or purchased quantity of milk. After the end of a fasting season, producers increased the milk price for collectors that started to source milk from them. In general, the price of milk reported in the Ziway-Hawassa milk shed ranged from ETB 16 to 22 per liter (Table 5). The average purchasing and selling price among large- and small-scale collectors showed the same trend.

*4.2. Revenue and Variable Cost.* The revenue generated by large-scale collectors from a liter of milk was slightly lower compared to that of small-scale collectors. Even though small-scale collectors had a better revenue, their gross income per liter of milk was inversely lower compared to large-scale collectors because small-scale collectors had higher average variable costs per liter of milk than large-scale collectors (Figure 7). Estimation of the average variable cost includes purchasing price of milk, cost of transportation, labor, electricity, water, detergents, and government tax.

*4.3. Gross Margin, Added Value, and Value Shares.* All the downstream chain actors had the same cost items such as transportation, labor, water and electricity, detergents, and government taxation costs. Moreover, processors had extra processing and packaging costs. For large-and small-scale collectors, the average value of costs was considered for further analysis as indicated in Table 6.

The gross margin of milk collectors at the producers-collectors-retailers-consumers channel was reported at 13% (Table 7). In the present study, pasteurized milk, butter, and yogurt were the dominant products processed by milk processors. The gross margin and value shares of chain actors varied among the different milk products. In pasteurized milk and yogurt, processors had the highest gross margin compared to other chain actors. However,

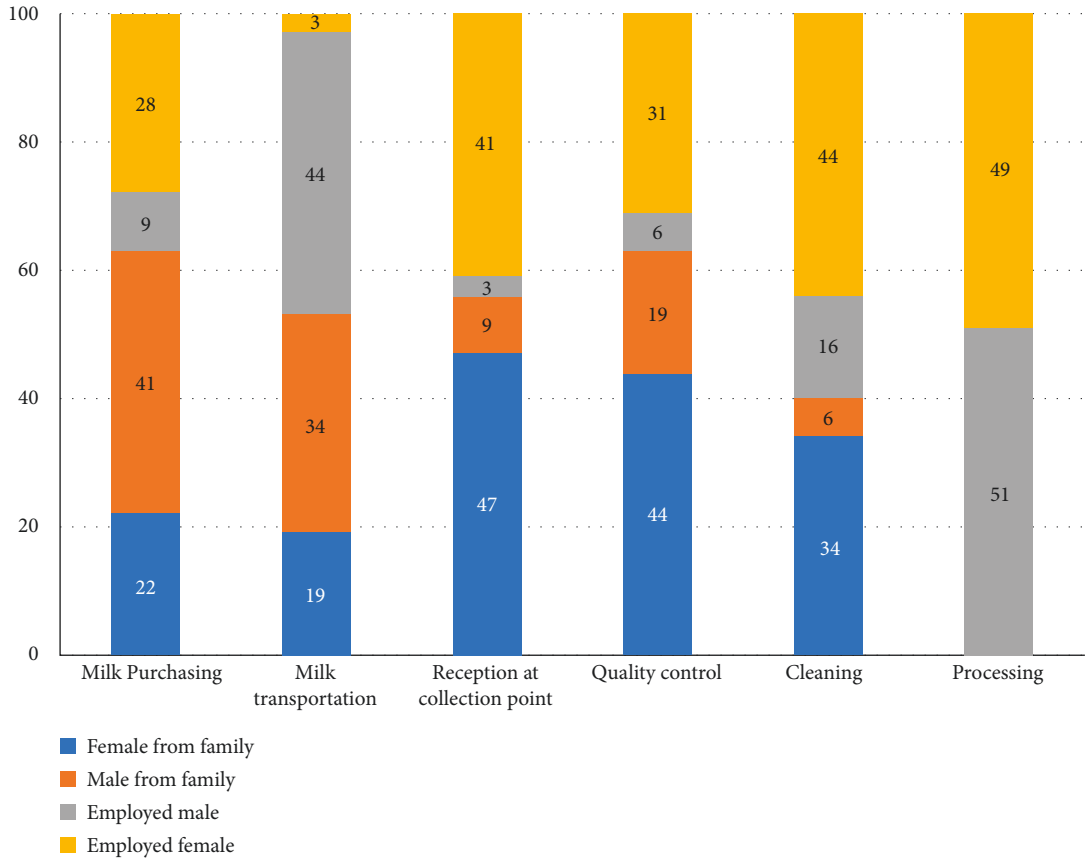


Figure 6: Gender involvement in the downstream dairy value chain (percentage).

Table 5: Average milk purchasing and selling price.

| S. no. | Parameter | Large-scale collectors Mean ± std. deviation | Small-scale collectors Mean ± std. deviation | $P$ value (CI = 95%) |
|---|---|---|---|---|
| 1 | Purchasing price/liter | 17.78 ± 2.00 | 19.23 ± 2.10 | 0.06 |
| 2 | Selling price/liter | 21.23 ± 1.70 | 22.47 ± 2.04 | 0.07 |
| 3 | Transportation, labor, and related costs/liter | 0.53 ± 0.43 | 0.49 ± 0.53 | 0.82 |

value addition and share were higher for producers (Table 7).

The producer's value share in all products was higher than the other actors. As indicated in Table 7, collectors had a low-value share (16%) but a better gross margin (13%) than producers in raw milk, whereas producers had a 75% value share and only 7.02% gross margin. Value share for yogurt was distributed in a proportional manner among producers, processors, and retailers (Figure 8).

## 5. Discussion

In the Ziway-Hawassa milk shed, almost all collection points collect milk directly from milk and are transported by using vehicles. A study in the central highland of Ethiopia also showed that different means of transportation were used both in rural and urban areas. Similarly, reports in Pakistan also reported that milk collectors used vehicles to collect milk from the farmers, so producers supply milk directly to the people in the vehicle [14]. In the Ziway-Hawassa milk shed, on-foot and carts (donkey + horse) were also common means of milk transportation (Table 2). Consequently, most (90%) milk transporters used on-foot and/or horse or donkey; sometimes, bicycles are also used [15]. In the Ziway-Hawassa milk shed, all collectors distributed milk directly to retailers and/or consumers. On contrary, [16] in Kenya reported that most milk collectors collect and sell milk to processors and sometimes to other traders. Only a few collectors sold the collected milk directly to consumers.

In the current milk shed, milk processors controlled the chain starting from milk-producing to retailing functions. All milk processors had milk and milk product retailing shops (Figure 3). In agreement with this report, [8] reported that some processors in and around Addis Ababa have also established their own retail outlets in strategic urban centers. In the present study, pasteurized milk, butter, and yogurt were the dominant products processed by milk processors (Table 7). Likewise, in and around Addis Ababa, the small-

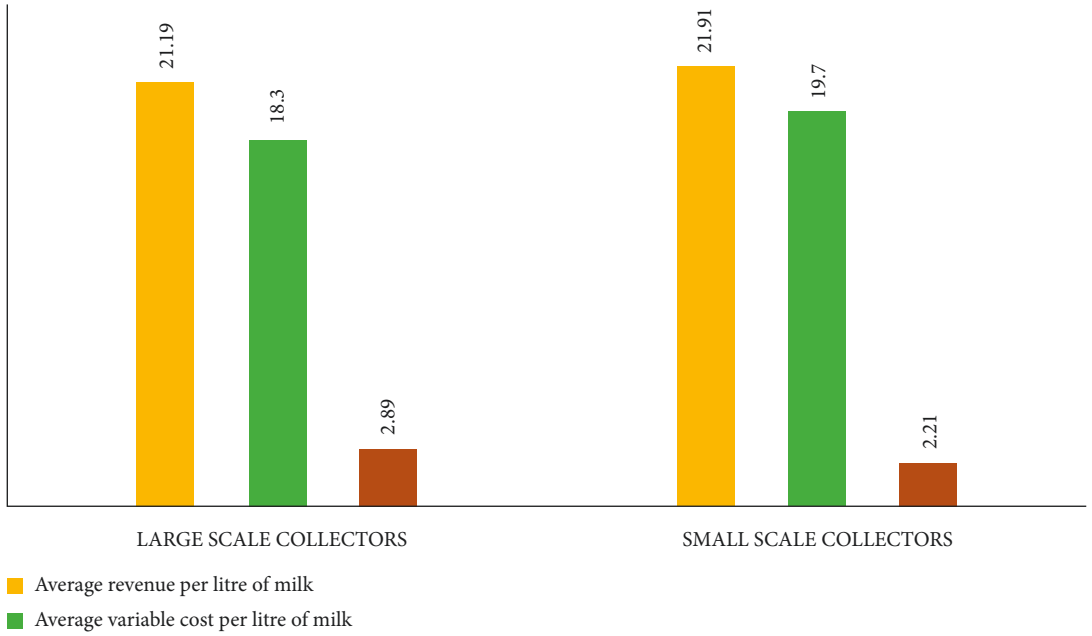


Figure 7: Average revenue and gross income of milk collectors.

Table 6: Average cost and selling price of milk and milk products.

| Items (measured ETB/liter) | Collectors | Processors | Retailers |
|---|---|---|---|
| (1) Purchasing price of | — | — | — |
| Fresh milk | 18.50 | 18.50 | 21.85 |
| Pasteurized milk | — | — | 28.00 |
| Yogurt | — | — | 34.00 |
| Butter/kg | — | — | 221.3 |
| (2) Processing and packing cost | — | 2.00 | — |
| (3) Transport cost | 0.16 | 0.32 | 0.15 |
| (4) Labor | 0.25 | 0.45 | 0.12 |
| (5) Cost of electricity, water, detergent, and tax | 0.10 | 0.28 | 0.10 |
| Total cost price/unit | — | — | — |
| Fresh milk | 19.01 | — | 22.22 |
| Pasteurized milk | — | 21.55 | 28.37 |
| Yogurt | — | 21.55 | 34.37 |
| Butter (10 liter milk = 1 kg of butter) | — | 215.5 | 221.67 |
| Sale price/unit | — | — | — |
| Fresh milk | 21.85 | — | 24.00 |
| Pasteurized milk | — | 28.00 | 30.00 |
| Yogurt | — | 34.00 | 47.00 |
| Butter | — | 221.30 | 225.00 |

scale processors produced and sold principally two types of products butter and yogurt [16].

For the sake of a continuous supply of milk, collectors and processors have devised different mechanisms with producers. In the central part of Ethiopia, particularly Wolmera and Ejere districts, written contract agreements, trust-based relationships, and benefit from profit share were developed and used by milk sellers and buyers [16]. The current study identified four types of strategies that were used in the milk procurement procedures and helped maintain the existing relationships between collectors and producers, such as a simple contract agreement, an incentive-based system, creating fair value share, and building trust (Figure 4). According to [3], in the Oromia region and the southern part of Ethiopia, hardly any formal contractual agreements exist between milk collectors and producers. Everything was based on trust, and there were no formal contractual agreements and advanced payments. However, a simple contract agreement was reported as a main milk procurement strategy of milk collectors, particularly in the Shashemene and Adami-Tullu districts. The contract agreement used by milk collectors and producers in the Ziway-Hawassa milk shed lacks quantity and quality information. On contrary, milk collectors have formal contract agreements and made payments to milk producers either every two weeks or sometimes on a monthly basis in the

Table 7: Gross margin and value shares of dairy value chain actors.

| Products | Actors | Cost price | Sale price (revenue) | Gross income | Added value | % gross margin | % value share |
|---|---|---|---|---|---|---|---|
| Fresh milk | Producers | 16.69 | 17.95 | 1.26 | 17.95 | 7.02 | 74.79 |
| | Collectors | 19.01 | 21.85 | 2.84 | 3.90 | 13.00 | 16.25 |
| | Retailers | 22.22 | 24.00 | 1.78 | 2.15 | 7.42 | 8.96 |
| Pasteurized milk | Producers | 16.69 | 17.95 | 1.26 | 17.95 | 7.02 | 59.83 |
| | Processors | 21.55 | 28.00 | 6.45 | 10.05 | 23.04 | 33.50 |
| | Retailers | 28.37 | 30.00 | 1.63 | 2.00 | 5.43 | 6.67 |
| Yogurt | Producers | 16.69 | 17.95 | 1.26 | 17.95 | 7.02 | 38.19 |
| | Processors | 21.55 | 34.00 | 12.45 | 16.05 | 36.62 | 34.15 |
| | Retailers | 34.37 | 47.00 | 12.63 | 13.00 | 26.87 | 27.66 |
| Butter | Producers | 166.9 | 179.50 | 12.60 | 179.50 | 7.02 | 79.78 |
| | Processors | 215.5 | 221.30 | 5.80 | 36.30 | 2.62 | 16.13 |
| | Retailer | 221.67 | 225.00 | 3.33 | 3.70 | 1.48 | 1.64 |


Figure 8: Value share of actors in raw milk and yogurt.

Addis Ababa milks shed [16]. Likewise, [15] reported in a peri-urban area of the central highlands of Ethiopia, most milk collection centers pay their suppliers every two weeks by the already settled agreements.

In the Addis Ababa milk shed, all actors engaged in milk collection and processing conduct at least one or more types of milk quality analysis (adulteration test, microbial contamination test, and milk compositional test) during the buying and selling process [16]. However, in the Ziway-Hawassa milk shed, only the adulteration test by using a lactometer was practised by 55% of milk collectors (Table 4). There was no such convincing and robust milk quality test for bacteria load and fat and protein content. This agrees with [15] who reported that in the central highlands of Ethiopia, the payment for raw milk was only based on quantity, as there were no facilities to test the milk fat and protein content and to pay for quality. Because, in Ethiopia, the major testing equipment found and used at most milk collection centers includes lactometers, alcohol tests, filters by sieve, and visual observation [15]. In the Ziway-Hawassa milk shed, the gender roles in the downstream dairy value chain were balanced and significant. In the present study, females' involvement in the processing of milk was reported to be 49%. This is supported by a study conducted in Kenya, which showed that females play a significant role in the home-processing of dairy products for sale in informal channels [17]. Similarly, in Kiambu County of Kenya, rural women have become successful milk traders by using the relatively well-developed public transport system. In Bungoma and Nandi counties, some women own motorbikes and hire men to use them. Tasks are allocated according to traditional gender roles, causing work-load disparities between men and women [18]. In agreement with this, the involvement of males in the milk transportation system was dominant in the current study. But, at the collection point, females' roles in the reception of purchased milk, quality control, and cleaning activities were stronger than males.

In the Addis Ababa milk shed of the Wonbera district, the producer sales price of milk varied by the type of collectors. It, however, ranged between 10 and 15 ETB per liter in the terminal market [16]. In the Ziway-Hawassa milk shed, a relatively high average selling price of milk was reported. Even the purchasing price of milk for large- and small-scale collectors varied. On average, large-scale collectors purchased ETB 17.78 per liter of milk, whereas small-scale collectors purchased ETB 19.23 for a liter of milk (Table 5). This difference occurred because of the potential for bargaining power. Large-scale collectors had strong relations with producers throughout the year. They collect the usual quantity of milk both during the fasting and nonfasting seasons at a stable price. However, some small-scale collectors break their relations with the suppliers during the fasting season, or they want to reduce the purchasing price or purchased quantity of milk. After the end of

a fasting season, producers increased the milk price for collectors that started to source milk from them. In general, the price of milk reported in the Ziway-Hawassa milk shed was higher (ETB 16 to 22 per liter). Even a lower purchasing price of milk was also indicated by [19] in the Dessie Zuria district. In connection with this, the same author showed that the costs of milk collectors for transportation, labor, and related costs were the same compared to the average costs of the small-scale (ETB 0.49/liter) collectors in the current study (Table 5).

The gross margin of milk collectors at the producers-collectors-retailers-consumers channel was reported at 13% (Table 7). In the milk channel that has the same arrangement, a relatively higher (15.13%) gross margin was reported by [19] in the Dessie Zuria district. Based on the same author's finding, retailers had a better gross margin than collectors, which was 28.87% on the same channel. But, in the current study, retailers had a lower gross margin, which was 7.4%. In and around Addis Ababa, there was a high-value addition at the processing stage; for example, the family processing factory in the Degem value chain buys milk at ETB 10.5 per liter and sells pasteurized milk at ETB19.5, adding 85% to the value of liquid milk [8]. Similarly, in the Ziway-Hawassa milk shed, processors purchased milk by ETB 17.95 per liter and process it into pasteurized milk and sold it by ETB 28, adding 56% to the value of raw milk (Table 7). Between the processor and final retail point in Addis Ababa, 5–26% of the value was added, whereas in the Ziway-Hawassa milk shed, it was only 7%. Besides, between 1 and 20% of the value can be added through the collection in Addis Ababa [20], but a relatively higher (22%) value was added by milk collectors in the Ziway-Hawassa milk shed. In agreement with the present study, almost similar value addition (23%) by collectors was reported in the Lemu-Bilbilo district in the Arsi Highlands of Ethiopia [21].

## 6. Conclusion

The structure of the existing downstream milk value chain in the Ziway-Hawassa milk shed was operated by different large- and small-scale collectors, processors, and one supporter. In the collection process, males were principally assigned for milk transportation, whereas milk reception, selling, and quality control activities were mainly given to females. However, few large-scale collectors and processors performed all functions of the chain starting from producing up to retailing to the consumers. The milk procurement strategies of milk collectors and processors in the shed were simple contract agreements, creating fair value share, providing a different form of incentives, and building trust. The gross margin of milk collectors for fresh milk was higher than that of producers and retailers. Value share for collectors on fresh milk was less than the share of producers but greater than from retailers in the chain. A relatively proportional share of value was observed among producers, processors, and retailers of yogurt.

## Abbreviations

CSA: Central Statistics Authority
ETB: Ethiopian birr
EMDIDI: Ethiopian Meat and Dairy Industry Development Institutes.

## Data Availability

The data and materials presented in this manuscript can be made available as per the editorial policy of the journal. All data and information are generated and organized by the authors.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

## Authors' Contributions

GM collected, analyzed, and interpreted the data. YD and GM helped draft the manuscript. All authors read and approved the final manuscript.

## Acknowledgments

This research was funded by the Netherlands Fellowship Program (NFP) financed by Nuffic and the project "Inclusive and Climate Smart Business Models in Ethiopia and Kenyan Dairy Value Chains (CSDEK)" financed by the Netherlands Organization for Scientific Research (NOW). The authors would like to thank the Netherlands Organization for Scientific Research for financial support. The authors are very grateful for all assistance, knowledge, and experiences they have received from the producers, collectors, and other chain supporters in the Ziway-Hawassa milk shed areas of Ethiopia.

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