

The Project of Resilient Livelihoods & Gender-Responsive Economic Opportunities for Women, Youth & Communities in Abyan and Lahj Governorates

Project Code: (K-Yem-2025-4032)

Milk Value Chain Analysis in Some Districts of Lahj and Abyan Governorates

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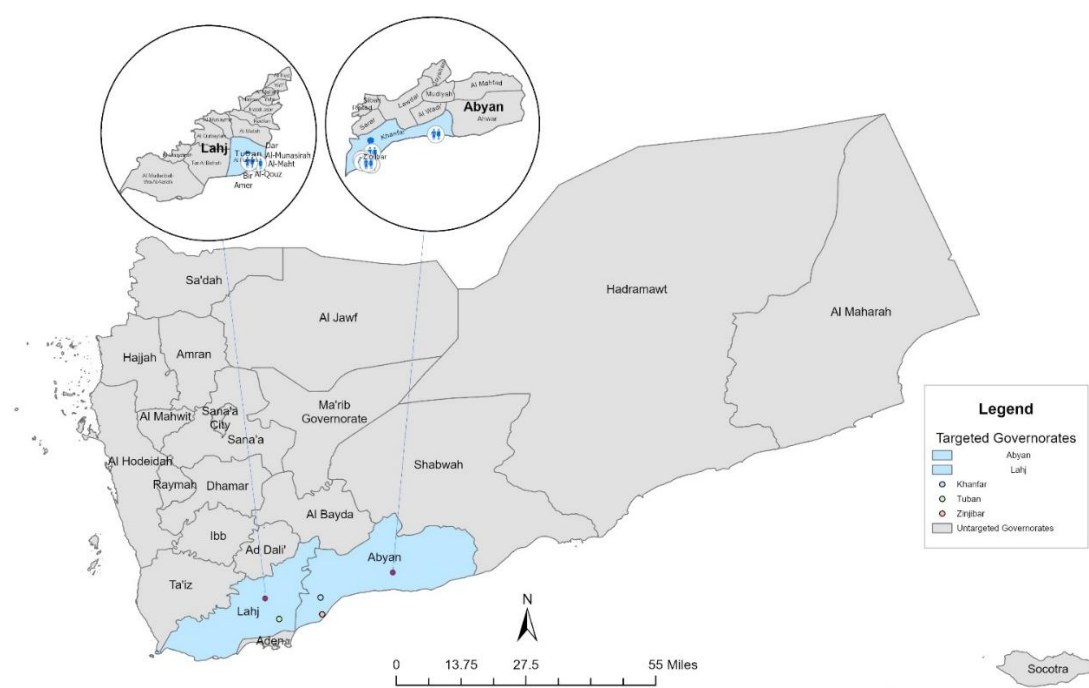
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Executive summary

Agriculture in Yemen faces diverse challenges including scarcity of natural resources, weak infrastructure, and marketing and export barriers. Value chain analysis represents a critical analytical tool for understanding structural constraints and development opportunities within the agricultural sector, particularly in fragile and conflict-affected contexts. In Yemen, the livestock and dairy sector remains one of the most important agricultural subsectors due to its direct contribution to rural livelihoods, household food security, and income generation.

This study presents a comprehensive analysis of the milk and dairy value chain in selected districts of Lahj and Abyan Governorates, conducted within the framework of the “Resilient Livelihoods and Gender-Responsive Economic Opportunities” project implemented by the Building Foundation for Development (BFD) in partnership with Diakonie Katastrophenhilfe (DKH). The assessment examines the structure, performance, and constraints of the value chain, from input supply and on-farm production to processing, marketing, and final consumption, with a focus on identifying opportunities for inclusive and sustainable economic development.

The study applied the FAO Value Chain Development Framework, integrating economic, social, environmental, and institutional dimensions. A mixed-methods approach was employed, combining quantitative surveys with qualitative tools, including key informant interviews and focus group discussions. Primary data were collected from 303 stakeholders representing all major actors along the value chain—livestock breeders, input suppliers, cooperative associations, traders, processors, retailers, service providers, and consumers—in the districts of Tuban (Lahj) and Zinjibar and Khanfar (Abyan).



Targeted Locations Map - DKH - Project Code: (K-YEM-2025-4032)

Structure and Performance of the Milk Value Chain

The milk value chain in Lahj and Abyan is structured as a linear system comprising six main stages:

1. input supply, 2) production, 3) collection and primary handling, 4) processing, 5) distribution and marketing, and 6) consumption.

While the chain includes multiple actors, it remains highly inefficient, characterized by fragmented coordination, asymmetric information flows, and weak financial linkages.

Key Performance Characteristics

Product flows move linearly from producers to consumers; however, the absence of cooling and storage infrastructure results in post-production losses estimated at 20–30% at the farm level. Information and price-setting power are largely controlled by intermediaries and traders, significantly weakening producers' bargaining capacity. Financial flows move in the opposite direction of products and are often delayed, forcing producers to rely on informal and high-cost financing mechanisms.

Key Findings

The analysis confirms the critical socio-economic importance of livestock and dairy production as a household-based livelihood activity, particularly among women, who represent more than half of livestock owners and constitute the backbone of dairy-focused cooperative associations. However, the sector remains predominantly small-scale, informal, and technologically underdeveloped.

Production systems are dominated by small ruminants with low average milk yields and near-total reliance on traditional practices. Across the study sample, 100 percent of producers reported no use of modern dairy production technologies. Limited access to energy, cooling facilities, and basic processing infrastructure constrains product quality and shelf life, forcing producers to sell primarily in low-value local markets.

The enabling environment for dairy value chain development is weak. More than 90 percent of livestock breeders operate outside cooperative membership, while existing cooperatives function largely as administrative or social entities rather than commercially oriented producer organizations. Their limited engagement in collective input procurement, marketing, and value addition leaves producers highly dependent on intermediaries who capture a disproportionate share of value.

Access to services and finance represents a major systemic constraint. Agricultural extension and veterinary services are largely absent at the local level, despite strong demand for technical support. Although microfinance institutions operate in the area, 93.5 percent of breeders are unable to access agricultural credit due to high interest rates, rigid loan conditions, and financial products poorly aligned with the seasonal

nature of livestock production. As a result, households rely predominantly on informal financing, limiting investment and growth.

Market analysis indicates strong and relatively stable local demand for milk and dairy products, with consumers prioritizing price, quality, hygiene, and freshness. While raw milk producers capture a significant share of value in fresh milk markets, processing stages generate the highest margins for value-added products such as yogurt, cheese, and ghee, highlighting clear opportunities for downstream upgrading.

The analysis also, reveals critical skills gaps across the dairy value chain, particularly in improved herd management, feeding practices, animal health, hygienic milk handling, and post-harvest loss reduction. These gaps stem from the absence of effective extension services and heavy reliance on traditional knowledge. Cooperatives also lack essential business and marketing capacities, including financial management, collective marketing, quality control, and basic processing skills

Strategic Challenges and Opportunities

The dairy value chain operates under conditions best described as structural neglect, where productive assets and market demand exist but are undermined by technological gaps, weak infrastructure, institutional fragmentation, limited access to finance, and an unconducive policy environment. These constraints collectively prevent the sector from transitioning beyond subsistence-oriented production.

At the same time, the study identifies substantial untapped potential. Priority opportunities include the introduction of low-cost, renewable-energy-based cooling and preservation technologies; strengthening cooperatives as commercially viable producer organizations; expanding value-added dairy processing; improving access to tailored financial products; and enhancing the economic participation of women and youth across the value chain. Also, the study underscores the need for practical, market-oriented training programmes, tailored to low-literacy contexts, with a strong focus on women and youth to enhance productivity, value addition, and long-term sustainability.

Overall Conclusion

The dairy value chain in the governorates of Lahj and Abyan in Yemen, highlighting the economic and social significance of livestock rearing and its vital role in enhancing livelihoods. The report reveals that the sector suffers from structural neglect and a significant technological gap, where production processes lack cooling systems, energy, and modern methods, leading to substantial waste in production. The study emphasizes the crucial role of women as a cornerstone of this activity, despite facing obstacles such as difficulty accessing finance, weak cooperative ties, and a lack of institutional support. The analysis also indicates promising investment opportunities if logistics infrastructure is developed, and the role of cooperatives as commercial partners is activated. The sources conclude with a set of strategic recommendations aimed at transforming this sector from a mere traditional subsistence activity into a sustainable and competitive economic system that supports local food security.

1. Introduction & Background

1.1 Introduction

Yemen continues to face one of the world's most complex humanitarian and economic crises, marked by prolonged conflict, institutional fragmentation, widespread poverty, and the collapse of essential public services. These challenges have severely undermined household resilience, restricted access to basic economic opportunities, and disrupted traditional livelihood systems across rural and urban areas alike. Communities in project-targeted regions, particularly women and youth, experience heightened vulnerability due to limited income sources, weak market structures, and inadequate access to skills development.

Within this fragile context, the “BFD–DKH Livelihoods and Early Recovery Project” aims to address critical socio-economic gaps by enhancing self-reliance, improving income-generation capacities, and supporting community-level recovery.

Women and youth face disproportionate barriers to economic participation, including limited mobility, weak access to finance, cultural constraints, and reduced access to training or employment pathways.

1.2 Description of the project

The aim of this project is to address critical socio-economic gaps by enhancing self-reliance, improving income-generation capacities, and supporting community-level recovery and enhance the productive and compliance capacities of relevant actors in the milk value chain in some districts in Lahj and Abyan Governorates of Yemen. The project will provide support to the small-scale Livestock farmers especially who production milk and dairy products across all the main actors of the milk value chain for increase the productivity and income of the households of small-scale Livestock farmers, an addition helps the decision making to creates a new opportunity in-come generated for the youth and women in the local communities of the districts target.

To increases their capacity to offer suitable services to the industry in a sustainable way and to introduce pilot application in collaboration with the industry on best practices in value addition and compliance for improved livelihoods of participants in the value chains, including food manufacturers and processors. This project is funded by DKH Foundation. DHK provides technical support to improve the quality and safety, value addition and productivity, which in turn can contribute to better marketability, higher profit, and access to high-end markets. The project will work on reducing milk losses and add more value to the dairy products through improvement of the value chain management which will lead to enhanced livelihoods, socioeconomic uplift and stability in the targeted Governorates. The long-term goal of this project in Yemen is to rejuvenate the livelihood of livestock value chain actors through the introduction of best practices in terms of compliance and value addition.

1.3 Background

Agriculture sector provides livelihood to more than 60% of the population of Yemen by contributing about 35% of the Food need and 85% of the labor force. Yemen's favorable climatic conditions and geography enables it to produce dairy products of high quality, therefore milk production and its derivatives have expanded significantly in Yemen in recent years, with production reaching approximately

Value chain studies are an important methodological tool that helps in understanding and analyzing the entire path of an agricultural product, from the production stage to reaching the final consumer. The importance of these studies lies in their ability to identify the strengths and weaknesses in different stages of the chain, and to determine the opportunities available to improve efficiency and increase value added, which contributes to enhancing the competitiveness of the product and improving the income of farmers and other actors in the chain.

In the context of the agricultural sector, value chain studies acquire special importance due to the multiple challenges faced by this sector, from limited natural resources and weak infrastructure to marketing and export challenges.

The livestock value chain for milk production in Yemen faces significant challenges, including inadequate infrastructure, limited access to finance, weak competitiveness in local and international markets, and marketing and distribution difficulties. This research aims to analyze the value chain for milk production in Lahj and Abyan governorates to identify opportunities for improving efficiency and increasing value-added. The study seeks to answer key questions: What are the main challenges facing the milk value chain in these governorates? How can efficiency be improved? What opportunities exist for increasing value-added and improving income for livestock breeders and stakeholders? This research provides a comprehensive analysis of the milk value chain in Lahj and Abyan, aiming to identify opportunities for efficiency gains and value-added enhancement. It offers practical recommendations to empower stakeholders to improve their income and productivity. The study's findings are crucial for policymakers and practitioners, shedding light on challenges and providing actionable solutions to enhance the sector's performance and contribute to sustainable development in Yemen.

1.4 Description of the Study Area

The study targeted the Tuban, Zunjibar and Khanfer districts in the Lahj and Abyan governorates, which are one of the largest governorates in Yemen. Abyan Governorate is a Yemeni governorate located to the south-east of the capital, Sana'a, and is 427 kilometers away from it. Its capital, Zunjibar, is connected to the east by Shabwa Governorate, to the west by the governorates of Aden and Lahj, and to the north by the governorates of Shabwa and Al Bayda, along with parts of Yafa' Al Olya. To the south,

it is bordered by the Arabian Sea, which Its beaches overlook it. The population of the governorate constitutes 2.2% of the total population of Yemen, and the number of its districts is 11 districts. The city of Zunjibar is the center of the governorate. Agriculture and fishing are the main activities for the residents of the governorate, as agricultural crops constitute 4.4% of the total agricultural production in the Republic, and the most important agricultural crops produced in the province are long-staple cotton, vegetables and fruits.

Lahj Governorate:

Lahij or Lahej (Romanized: Lahj), formerly called Al-Hawtah is a city, and an area located between Taiz and Aden in Yemen. From the 18th to the 20th century, its rulers were of the Abdali branch of the Al-Sallami tribe who trace their lineage to one of the 10 tribes of Yaffa called Kalad. Lahij was the capital city of the Sultanate of Lahej, a protectorate of the British Empire until 1967, when the sultan was expelled, and the city became a part of People's Republic of South Yemen. Now it is part of the Republic of Yemen. It is in the delta of the Wadi Tuban on the main trade route connecting Aden with Taiz, Ibb, and Sanaa. Lahj is an agricultural governorate and produces about 4% of the total agricultural production of the Republic of Yemen. The most important crops are vegetables and feed crops. Lahj produces construction materials for neighboring Aden and other parts of Yemen. Quarrying and clay mining are important economic activities. According to the 2014 local authority budget for Lahj, grants and central subsidies constituted 98% of the total revenue for the governorate, while local revenues accounted for only 2%. The most significant sources of local revenue were local shared revenues, income from the sale of goods and services, fines and penalties, leasing land, and selling quarries. These local revenues were negatively affected by the war, and the governorate faced major economic disruption as the site of an active front in the conflict, especially in 2015.

2. The Objectives of the Study:

The main objectives of this study were to address a various aspect of the milk value chain, including :

The general objectives

1. Conduct a comprehensive analysis of the milk value chain, evaluating the roles and challenges of smallholders of livestock, stakeholders, practices, proccing and marketing in the study area.

The specific objectives:

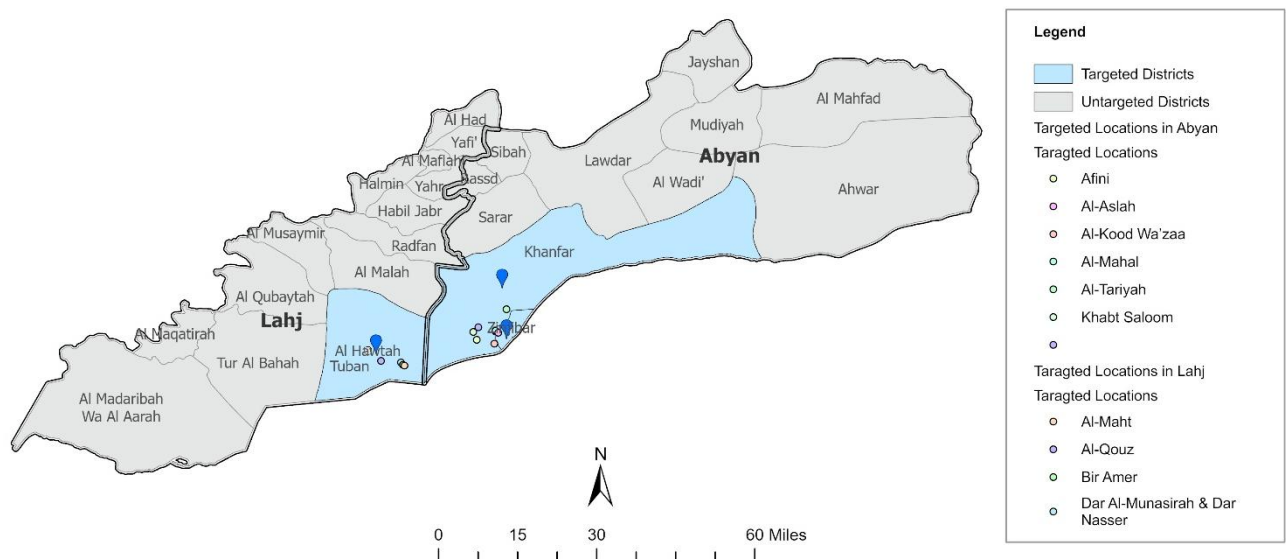
2. To Identify milk value chain actors and examine the Performance of actors in the chain
3. Identify key actors in the milk value chain, their roles, participation, opportunities, and challenges.
4. Assess processing, handling, extension services, storage facilities, and processing capacities to ensure efficiency of the milk value chain.
5. To describe important marketing channels and the actors involved on milk value chain.
6. Identify opportunities and constraints in the milk value chain, including product development, pricing strategies, and access to financial resource in the study area.
7. Analyze the costs, profits, and cash flows across the milk production value chain, providing a comprehensive examination of the financial dynamics within the entire chain.

3. Methods of the study

3.1 Scope of the Study

- **Geographical Scope:** The study covers several areas known for livestock farming and milk production in the governorates of Lahj and Abyan, includes the following areas :

1. Al-Qawz - Lahj Tuban
2. Al-Mahatt - Lahj Tuban
3. Bir Ammar - Lahj Tuban
4. Dar Al-Manasirah - Lahj Tuban
5. Bir Nasser - Lahj Tuban
6. Al-Aslah - Abyan Zinjibar
7. Al-Kariyah - Abyan . Zinjibar
8. Afini - Abyan . Zinjibar
9. Al-Tariyah - Abyan Khanfar
10. Khabt Al-Salum - Abyan Khanfar
11. Al-Khud - Abyan Khanfar
12. Abyan Zinjibar



- **Temporal Scope:** The study relies on data from the years (2015-2024), with reference to historical developments, when necessary, in addition to primary data on milk production and its derivatives for the year 2025.

- **Subjective Scope:** The analysis in this study, include all the stage and actors involved in the milk value chain, from the milk production to the end consumer in the value chain.

3.2 Methodology of the assessment

To understand the overall of the roles and activities across the milk value chain in the study area, the study adopted the framework used by the Food and Agriculture Organization (FAO) of the United Nations, which includes analyzing and developing the value chain to achieve food security, reduce poverty, and empower small-scale farmers. The analysis is conducted in a comprehensive and sustainable manner, focusing on the three dimensions of sustainability: economic analysis of profit margins and value-added, social analysis, environmental analysis, and SWOT analysis, in addition to institutional and organizational aspects.

This methodology was complemented with additional data science tools to identify current socio-economic status quo, including the situation of youth and women in the local value chain, and compliance practices among actors.

3.3 Types, Sources, and Methods of Data Collection

This value chain analysis combined primary and secondary data. The secondary data review preceded the primary data collection, and the secondary data served as good guidance in preparing the tools and shaping the methodology. Combining primary and secondary data sources aimed to thoroughly understand the milk value chain dynamics. The research team initially conducted a rigorous review of secondary data, including existing literature, reports, and relevant documents. This secondary data review served as a foundation, guiding the development of research tools and shaping the subsequent primary data collection process. These resources provided contextual information and further enriched the analysis, contributing to a comprehensive understanding of the milk value chain dynamics in the study governorates. A combination of random and purposeful sampling techniques was employed to ensure a comprehensive and representative sample. Random sampling allowed for an unbiased selection of participants, while purposeful sampling targeted key stakeholders within the milk value chain, such as farmers, input suppliers, wholesalers, retailers and end consumers. This dual sampling approach aimed to capture diverse perspectives and experiences within the value chain. The primary data collection phase involved in-depth interviews, focus group discussions, and consultation with the identified participants. These interactions facilitated valuable insights into the challenges, opportunities, and interdependencies across various stages of the milk value chain

3.3.1 Sampling Strategy

Stakeholders survey

The stakeholder's survey was conducted October 2025 and November 2025 (questionnaire Appendix). An interview schedule was used to interview the important stakeholders/key informants involve in milk value chain to obtain information about the challenges and opportunities of the milk value chain. A total of 303 respondents participated in the milk value chain assessment, these included Input suppliers, livestock breeders, Extension Services, wholesales, retailers and end consumers in both governorates (Lahj and Abyan), the details given in (Table 2).

Table 1. Distribution of the livestock value chain sample across all actors.								
GOV / District	HH of livestock breeders	Input Suppliers	Microfinance Institutions	Cooperative Association	wholesales,	retailers	Consumers	Extension Services
Abyan / Khanfar	21	2	3	2	3	12	26	0
Abyan / Zanzibar	19	3	8	22	0	20	45	3
Lahj / Tuban	27	12	8	6	6	14	38	3
Total	67	17	19	30	9	46	109	6

Focus Group Discussion (FGD) survey

2 Focus group discussion were organized in each group with 8-12 respondents, including (men and women) which involve in milk value chain, 2 semi structured questionnaires were designed by the Team Value Chain Expert, then 2 focus group discussions (FGDs) were conducted with the 2 group of women and men.

Government stakeholders

- MAI office – khanfar
- MAI office –Tuban
- Al Kawd Agriculture Research Centre

Business support stakeholders

- Input suppliers
- Wholesale buyer
- Retailers

3.4 Data Processing.

Data has been entered through online data entry platform called KoBo Toolbox. Supervisor has checked data at the field level by real time checking, spot checking and sudden checking mechanisms. On the other hand, the Data Management Expert made sure real time checking at the central level. The data generated by FGDs and has been recorded through questionnaire after taking the verbal permission of the respondents.

3.5 Data Analysis

Quantitative data from questionnaires survey was analyzed using SPSS, excel and power BI programs by which measures of frequency, cross tabulation, mean etc. were done and graphical presentation were used. Qualitative data from FGDs were transcribed, coded and then interpreted in line with the ToR of the assessment. To ensure validity and allow for generalization, data were triangulated across all quantitative and qualitative data collection tools to build consensus on the logical findings that were carried forward to formulate recommendations. Tables, graphs and charts will also be generated for analysis.

3.6 Value Chain Performance Analysis

This section aims to evaluate the performance of the value chain from multiple perspectives: economic, social, and environmental. This comprehensive evaluation helps in understanding the efficiency, effectiveness, and sustainability of the chain and identifying areas that need improvement.

- Economic Performance Analysis: Analyzing costs, benefits, and profitability at different stages of the chain.
- Social Performance Analysis: Examining the social impacts of the chain on stakeholders and communities.
- Environmental Performance Analysis: Assessing the environmental impacts of the chain and identifying opportunities for sustainability

Analyzing Value Chain Stages

The key stage of the value chain identified in the chain map. The goal is to understand the processes, stakeholders, costs, value-added, challenges, and opportunities associated with each stage.

- Input Supply Stage: Analyzing the supply of inputs and their impact on the chain.
- Agricultural Production Stage: Examining the production processes and challenges faced by farmers.
 - Collecting and Primary Processing Stage: Investigating handling, storage, and processing activities after collecting the Milk.
- Processing and Manufacturing Stage: Analyzing the transformation of raw products into final goods.
- Distribution and Marketing Stage: Examining the channels and strategies used to reach consumers.
- Consumption Stage: Understanding consumer behavior and preferences.

- Enabling Environment Analysis

Value chains do not operate in a vacuum; they are influenced by and impact a wide range of external factors that shape the "enabling environment." This section aims to analyze these factors and their impact on the performance and development of the agricultural product value chain under study.

- Policies and Regulations: Government policies and regulations affecting the chain.
- Institutions and Their Roles: The role of institutions in supporting or hindering the chain.
- Physical Infrastructure: The impact of infrastructure on the efficiency and effectiveness of the chain.
- Support Services: The availability and quality of services such as finance, extension, and logistics.

3.6 challenges & Limitations

During the data collection process, we encountered several limitations and challenges. Firstly, there were time constraints, which limited our ability to gather data comprehensively within the desired timeframe. Additionally, moreover, conducting five studies simultaneously added complexity and required careful management of resources. Furthermore, the data collection approach was qualitative-focused, involving engagement with stakeholders rather than widely targeting a sample of farmers for quantitative analysis. Despite these challenges, the credibility of the data was assured through triangulation with various stakeholders who confirmed the accuracy of the provided numbers

4 .Milk Value chain analysis Findings.

This chapter presents a comprehensive analysis of the value chain for milk production and its derivatives in Lahj and Abyan governorates of Yemen. The analysis includes mapping the chain, identifying key stakeholders, describing the different stages from production to consumption, and analyzing flows, relationships, and governance within the chain. The aim is to understand the current state of the milk value chain in the study areas, identify strengths, bottlenecks, and opportunities at each stage, and pave the way for developing effective strategies and interventions to improve chain performance and increase value-added.

4.1 Overview of Socio-economic livestock Importance

The livestock sector in Yemen stands as a cornerstone of the rural economy and a critical component of national food security. Serving as a primary source of income, savings, and nutrition for more than 75% of the rural population, it functions not only as a provider of animal protein but also as a driver of value chains linked to agro-processing and food industries. Within a fragile economic environment, livestock production has become an essential social safety net, sustaining livelihoods and mitigating poverty in rural communities.

Over the past two decades, livestock numbers have grown steadily, underscoring the sector's resilience. Sheep populations expanded from 6.19 million heads in 2000 to more than 10.5 million heads in 2022, while goats increased from 6.9 million to 10.28 million heads during the same period. Camels recorded the highest overall growth rate of 83%, rising from 253,000 heads to 463,406 heads, whereas cattle grew by 45.6%, reaching approximately 1.87 million heads. These figures highlight both the quantitative expansion of herds and the qualitative challenges of managing veterinary services and logistical systems to sustain such growth.

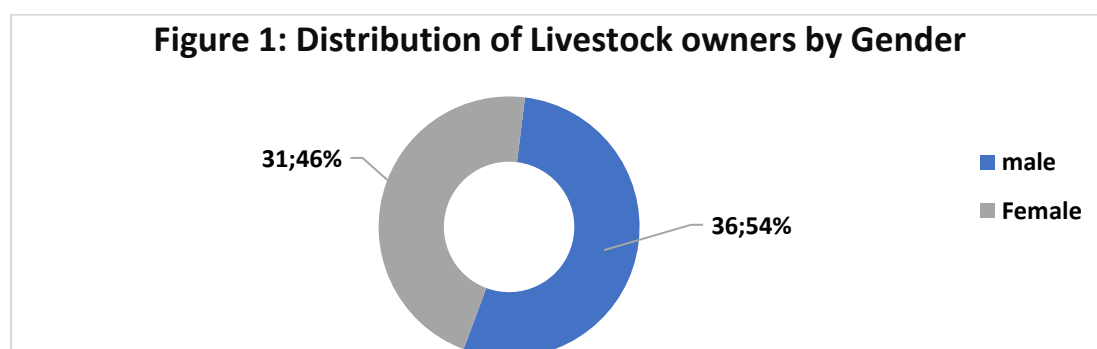
Parallel to herd expansion, domestic production of dairy products demonstrated notable progress. Cheese output nearly doubled, increasing from 12,934 tons in 2000 to a peak of 24,072 tons in 2021, with an annual average of 18,170 tons. Butter and ghee production rose by 62.2%, reflecting gradual improvements in processing techniques. Meanwhile, powdered milk and yogurt production experienced significant fluctuations, peaking at 169,015 tons in 2008 (a 79% increase compared to 2000) before stabilizing at 132,199 tons in 2022. These trends reveal both the sector's adaptive capacity and its vulnerability to input costs and geopolitical instability .

Despite these gains, foreign trade dynamics expose a widening gap between domestic supply and national demand. Dairy imports surged from USD 78.39 million in 2000 to USD 434.06 million in 2021, representing a 453% increase, before slightly declining to USD 374.38 million in 2022. In contrast, exports collapsed after reaching a peak of USD 33 million in 2014, plummeting to just USD 906,000 in 2022, a loss of 97% of export capacity. This imbalance has contributed to a chronic trade deficit, which rose from an average of USD 82 million (2000–2004) to more than USD 389 million in 2021–2022 .

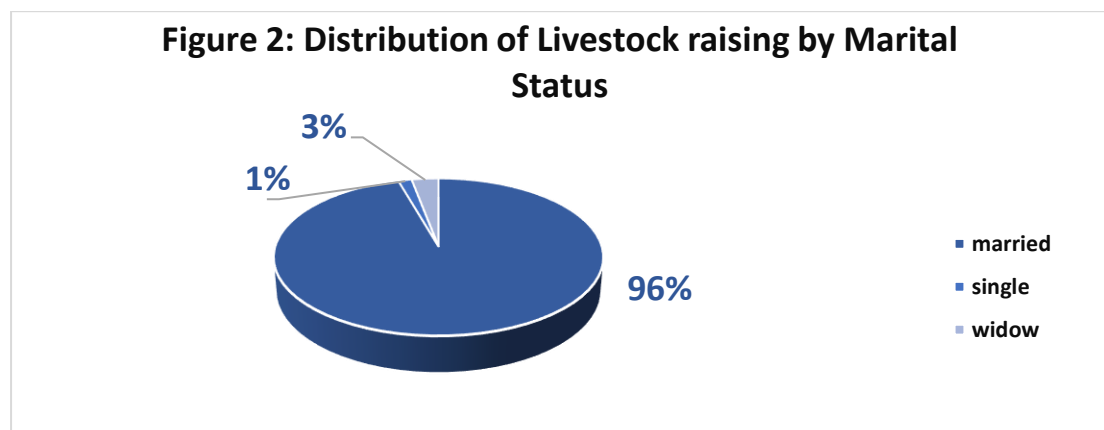
The persistence of this deficit reflects structural challenges: limited investment in modern dairy facilities, rising feed and fuel costs that inflate production expenses, and the predominance of small-scale holdings that hinder efficient collection and marketing. These constraints underscore the urgent need for strategic interventions to transform livestock husbandry from subsistence-based activity into a competitive sector.

4.2 Socio-economic and demographic profile of livestock farmers.

This section presents a comprehensive analysis of the livestock value chain for dairy production, based on survey data from key districts in Lahj and Abyan governorates. The analysis focuses on the socio-economic profiles of actors, production characteristics, and market structure to identify critical constraints and opportunities. Distribution of Livestock Owners by Gender, the data in figure 1 indicates a near-equal distribution of livestock ownership between genders, with females representing the majority at 54% (36 individuals) and males at 46% (31 individuals). This highlights the significant role of women in the livestock sector within the surveyed communities. This also indicates a relatively inclusive sector for women as asset owners.



Regarding, the marital status of livestock raisers, most livestock owners are married, accounting for 96% of the total. The remaining small percentages are split between widows (3%) and single individuals (1%). This strong correlation suggests that livestock raising is predominantly a household-based and integral to family livelihoods and economic activity.



The result in Figure 3 shows the distribution of livestock owners by education level, the education profile of livestock owners is relatively low, with the largest single group being illiterate at 27%. This is matched by those with preparatory education (27%) and those with primary education (27%). Individuals with secondary education account for 12%, while those with a university degree or higher represent the smallest segment at 6%. The data suggests a need for educational and technical training programs accessible to individuals with limited formal schooling. Also, this highlights a potential barrier to adopting modern techniques and accessing formal information.

Figure 3: Distribution of Livestock owners by Education Level



Figure 4 shows the distribution of livestock owners by age, the data shows that livestock ownership is heavily dominated by older demographics, with 84% of owners being over the age of 31. Specifically, the 31–40 and 41–60 age groups each hold an equal share of 42%. In contrast, young adults (aged 18–30) represent a significant minority at only 16%. The livestock sector currently relies on the experience and capital of older generations, highlighting a critical need for youth-targeted initiatives to ensure the future sustainability and renewal of the industry.

Figure 4: Distribution of Livestock owners by age

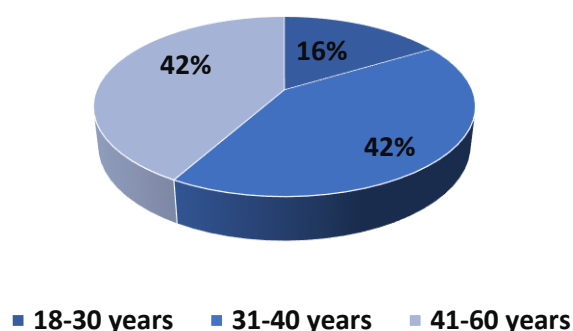
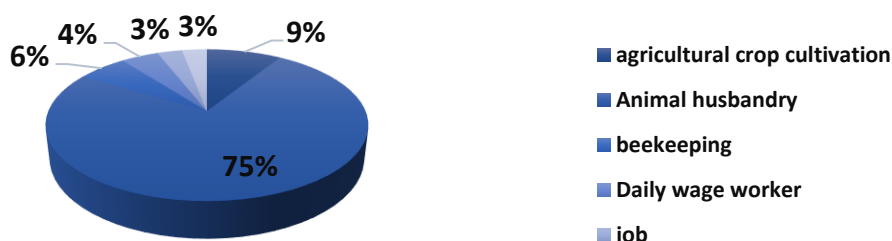


Figure 5 indicates that the primary source of income for livestock owners is a job, accounting for a dominant 75%. Animal husbandry is the second most common source at 9%. Other sources include daily wage worker (6%), beekeeping (4%), and agricultural crop cultivation (3%). This indicates that livestock raising is largely a supplementary activity for the most of households, rather than the sole or primary source of livelihood.

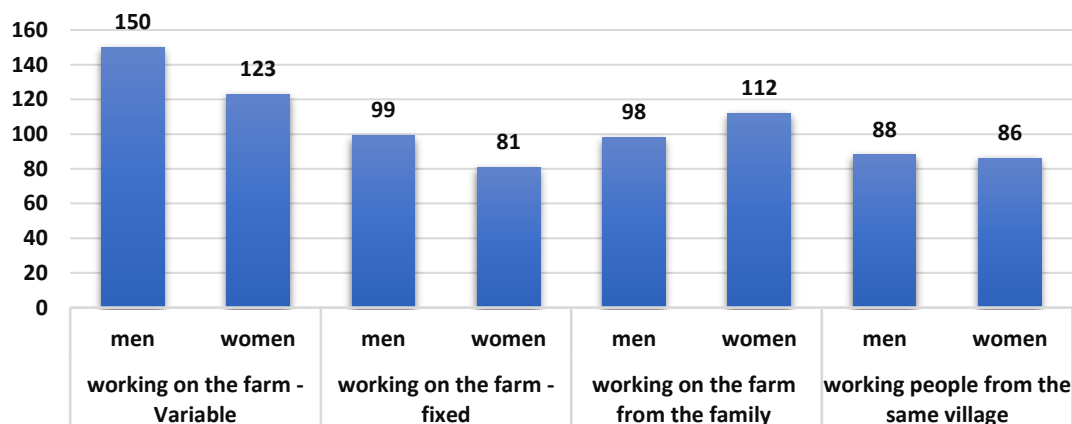
Figure 5: Distribution of Livestock owners by Income Source



This indicated that the income is diversified. While animal husbandry is a primary source, many households also rely on agricultural crop cultivation and daily wage work, indicating vulnerability and a need for resilience-building in livestock income.

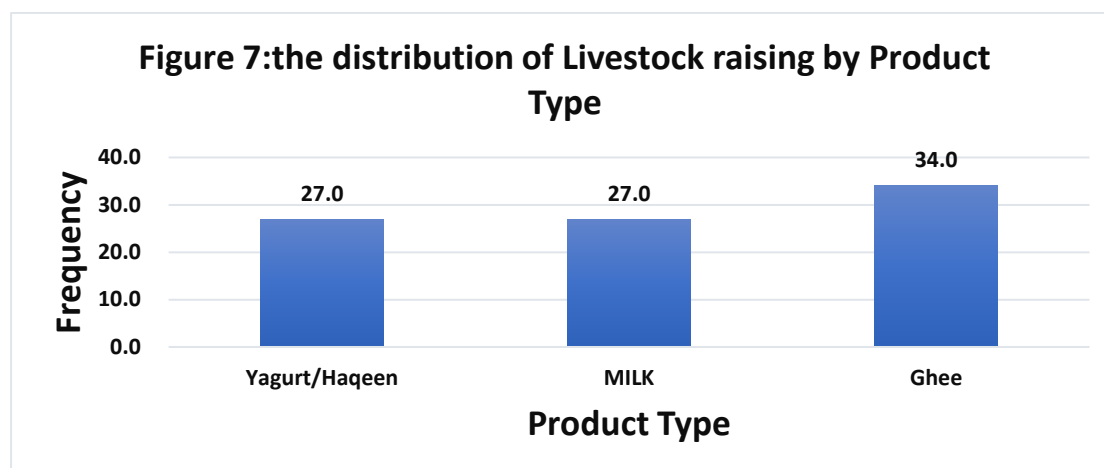
Based on the results in figure 6, the labor force analysis distinguishes between fixed and variable labor, and family versus community labor. Men working on the farm from the family constitute the largest fixed labor group at 150 individuals, closely followed by women from the family at 123. For variable labor, men from the family total 112, and women from the family total 99. Labor from the same village is also significant, with men at 98 and women at 81. The data underscores the critical role of family labor, with men contributing slightly more to both fixed and variable categories.

Figure 6 :The number of Labor Forces in the farm

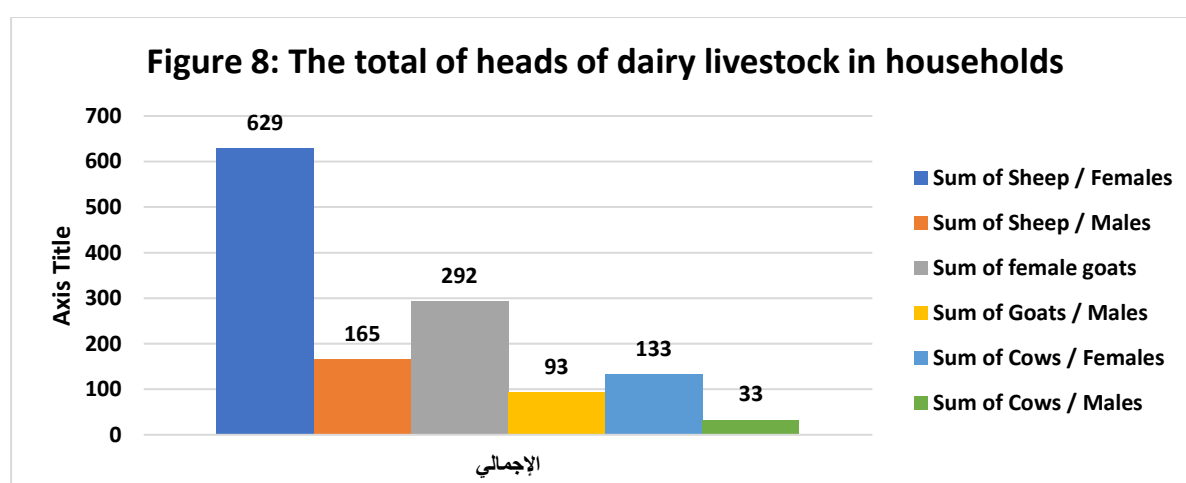


Labor is gendered: men dominate both variable and fixed paid work, while women constitute a major portion of unpaid family labor. This suggests women's critical yet often undervalued role in daily herd management.

The study's results in Figure 7 shows that milk is the primary product (34%), followed equally by Yogurt/ Hageen and Ghee (27% each). This shows a focus on fresh and lightly processed dairy, with potential for further value addition.



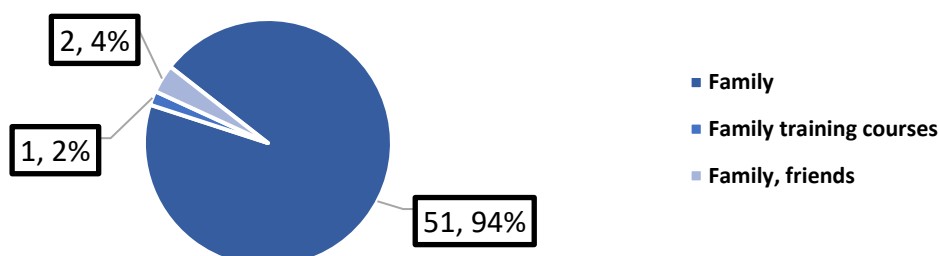
Regarding of the herd composition by species and sex of the livestock breeders, the following graph (figure 8) shows that the herd composition is skewed toward small ruminants, sheep and goats, with a clear emphasis on female animals for milk production. The total number of livestock heads is dominated by female sheep (629), followed by female goats (292). Male sheep (165) and male goats (133) are present in smaller numbers. Female cows (93) and male cows (33) represent the smallest proportion of the dairy herd. The composition of the herd clearly shows a preference for small ruminants (sheep and goats) over cattle for dairy production. The number of cattle is notably lower, suggesting a focus on smaller, more manageable herds.



Based on the result of sources of farmer's experience in livestock rearing and Dairy production in figure 9, the experience is overwhelmingly acquired through family, accounting for 94% (51 individuals). A small fraction is gained through family and friends

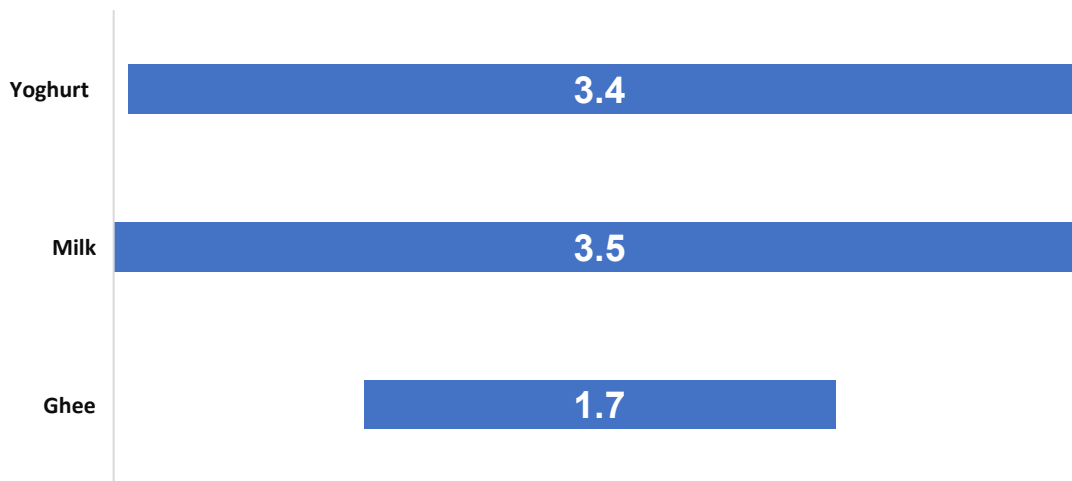
(4%) (2 individuals), and an even smaller fraction through training courses (2%) (1 individual). This reliance on traditional, family-based knowledge transfer highlights a potential gap in formal training and extension services.

Figure 9: The sources of Farmer's experience in livestock rearing and dairy production



The average daily production volume is highest for Milk at 3.5 kg/L. Yogurt production is slightly lower at 3.4 kg/L. Ghee production is significantly lower at 1.7 kg/L. This difference reflects the processing required for Ghee, which concentrates the product and reduces the volume compared to fresh milk and yogurt Figure 10.

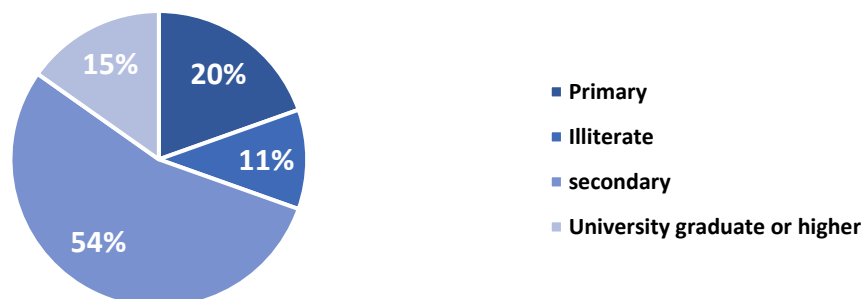
Figure 10: The Average of Daily production volume (kg/L)



Regarding the socio-economic and demographic characteristics of retailers in milk value chain, they have been addressed in (Figures 12, 13, 14)

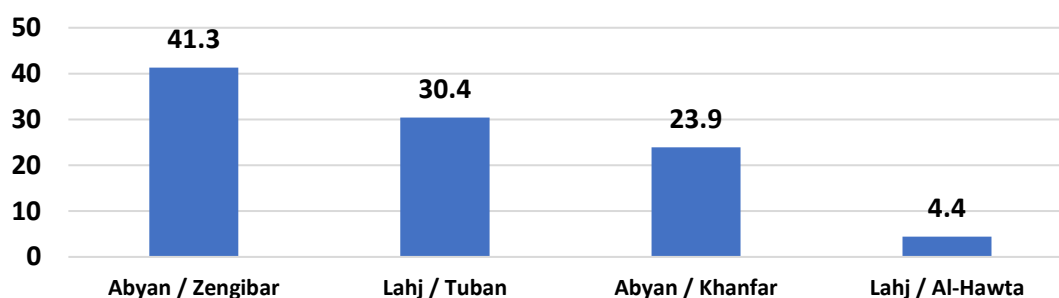
The results in Figure 11: shows that the education profile of retailers is higher than that of the farmers. The largest group has secondary education (54%), followed by those with primary education (20%). Illiterate retailers account for 15%, and those with a university degree or higher are 11%. This suggests that the retail segment of the value chain requires a higher level of formal education or literacy compared to the production segment.

Figure 11: Distribution of the Retailers Actor of the livestock value Chain by Education Level



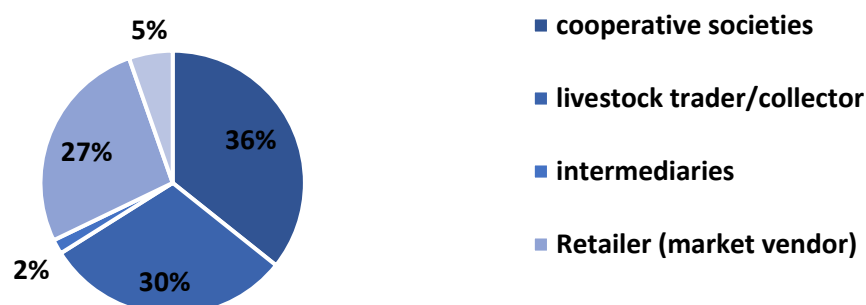
Also, the finding in Figure 12: indicate that the most of retailers are concentrated in Abyan / Zengibar (41.3%), followed by Lahj / Tuban (30.4%) and Abyan / Khanfar (23.9%). The lowest concentration is in Lahj / Al-Hawta (4.4%). This regional distribution reflects the market centers and population density within the two governorates, while other districts have less developed retail networks.

Figure 12: Distribution of the Retailers in livestock Value Chain by Region



Regarding to the role of the retailers in livestock value chain the data in Figure 13: shows that the primary role of retailers is as retailer (market vendor), accounting for 36%. This is closely followed by livestock trader/collector (30%) and intermediaries (27%). Cooperative societies (5%) and processors and manufacturing industries (2%) play a very minor role in the retail segment. This structure indicates a fragmented value chain dominated by individual traders and intermediaries, with minimal involvement from formal institutions or large-scale processors.

Figure 13: The Role of the Retailers in Livestock value chain



Retailers are not a homogeneous group; they also act as collectors, traders, and intermediaries. This multiplicity of roles suggests a fragmented value chain where intermediaries capture significant margins, potentially at the expense of producers.

In summary, the sector is characterized by a high degree of female asset ownership and household-based operations. However, low education levels among farmers and limited access to formal training are significant constraints. Production is small-scale, based on small ruminants, and relies on traditional knowledge passed through families. Labor is heavily gendered, with women providing substantial unpaid work. The retail segment is concentrated in specific districts and is characterized by actors playing multiple intermediary roles, which may lead to inefficiencies and reduced producer profits. Households depend on multiple, often insecure, income sources, making them vulnerable to shocks. Also, the retail segment is dominated by individual market vendors, traders, and intermediaries (93% combined), with minimal participation from formal cooperative societies or large-scale processing industries. Retailers generally possess a higher level of formal education (54% secondary education) compared to the producers.

4.3 Enabling environment of Milk Value Chain.

This section analyzes the "enabling environment"—the critical framework of policies, infrastructure, institutions, and support services that determines the efficiency and growth potential of the livestock value chain. Data reveals systemic gaps that constrain productivity, market access, and resilience.

4.3.1 Access to Input and equipment Supplies

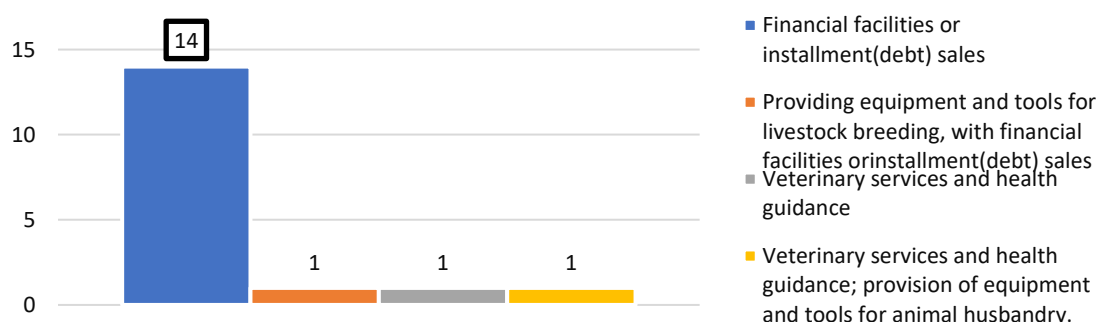
The input supply market is dualistic data in Figure 14 indicate that the majority (60%) of suppliers act solely as input sellers, while 40% combine this role with retailing in the marketplace, indicating a degree of vertical integration but also potential conflicts of interest.

Figure 14: The Role and Activities of Input Suppliers in the Livestock value chain



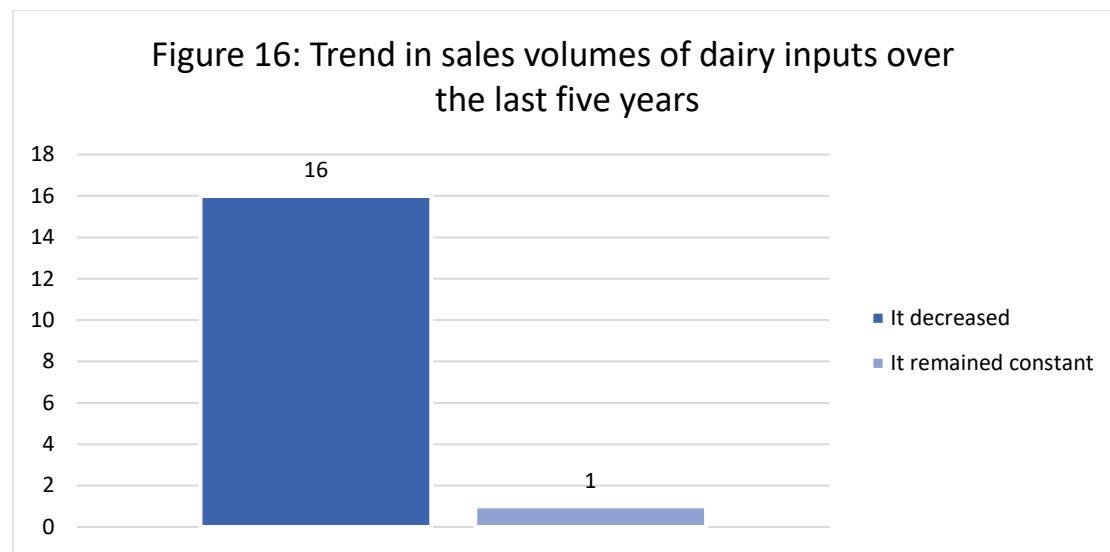
The data in Figure 15 illustrate the services provided by input suppliers are rudimentary and heavily skewed toward sales facilitation. Fourteen suppliers offer financial facilities (installment sales), while only one provides each of the following: veterinary services, equipment sales on credit, or a combined package. This highlights a critical lack of technical advisory services embedded in the supply chain.

Figure 15 : Services offered by input suppliers to livestock Farmers

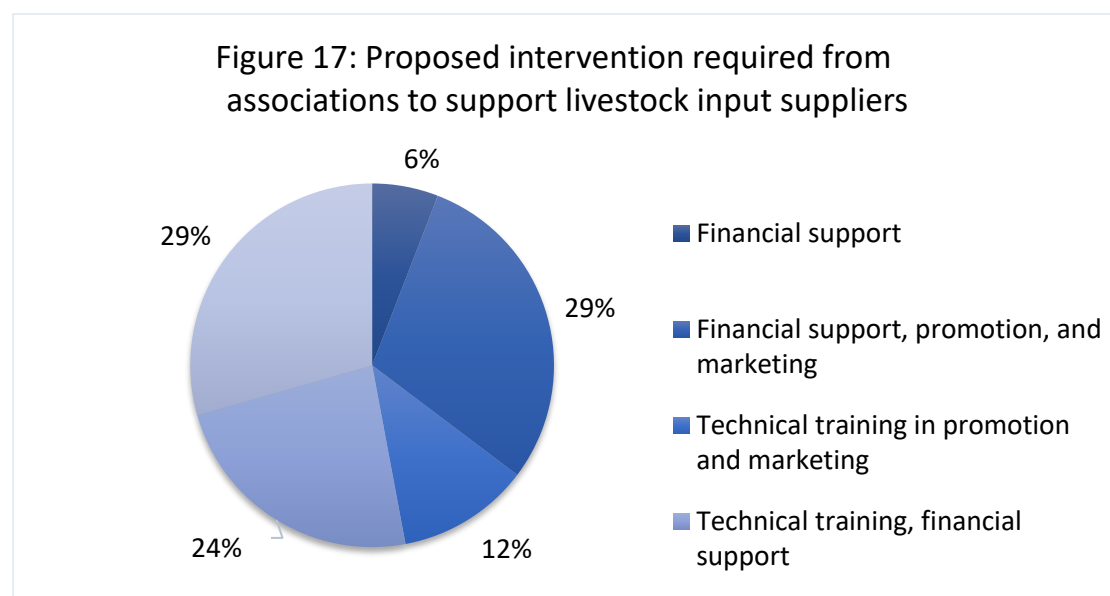


The following Figure 16 shows the trend in sales volume over five years is alarming, with 16 suppliers reporting a decrease and only one reporting stability. None reported

growth, signaling a contracting market likely due to reduced purchasing power, conflict, or shrinking herds, posing a threat to the entire chain's input base.



The Input suppliers identify their own needs for improve their business as showing in Figure 17, the primary of their demand is for financial support (29%), either alone or combined with technical training in marketing. This underscores their liquidity constraints and lack of business development skills.



4.3.2 Cooperatives, Infrastructure, and Policy

The following finding in figure 18 illustrates the distribution of cooperative associations across three specific districts within the governorates of Abyan and Lahj, Zenjibar district holds the highest number of associations, totaling 22.

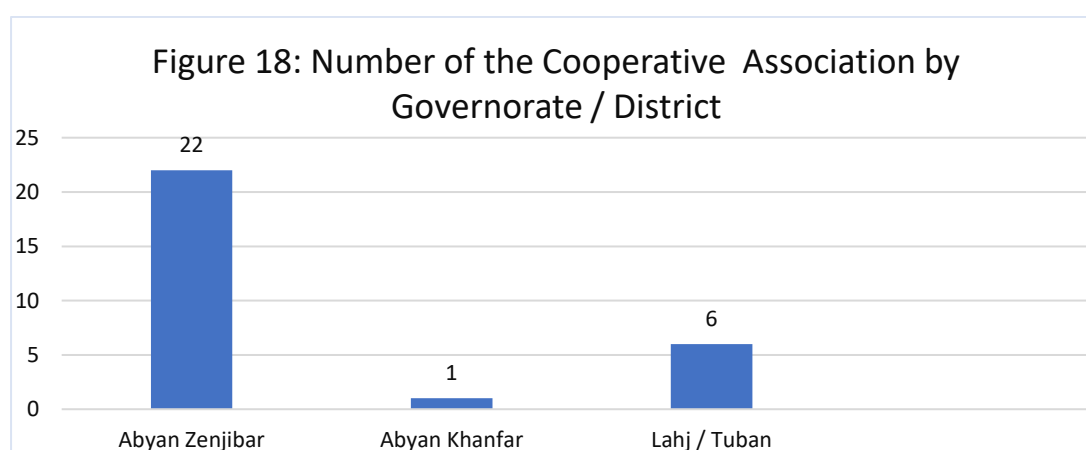
While Tuban district has 6 associations and Khanfar district has the lowest representation, with only 1 association.

The data reveals a sharp disparity in the distribution of cooperative associations between the studied areas:

Zenjibar district in Abyan Governorate represents the primary hub for cooperative activity with 22 associations. This concentration may indicate a more stimulating administrative or agricultural environment, or a higher density of developmental initiatives in this area compared to other. Although Khanfar is also part of the Abyan Governorate, it contains only one association—a vast difference compared to Zenjibar. This could reflect a lack of access to cooperative resources or a gap in community organization within that specific district. The Tuban district in Lahj Governorate shows a modest presence with 6 associations, placing it in second rank but still significantly behind the leader.

It can be concluded from this data that cooperative work suffers from a clear geographical imbalance across the study regions

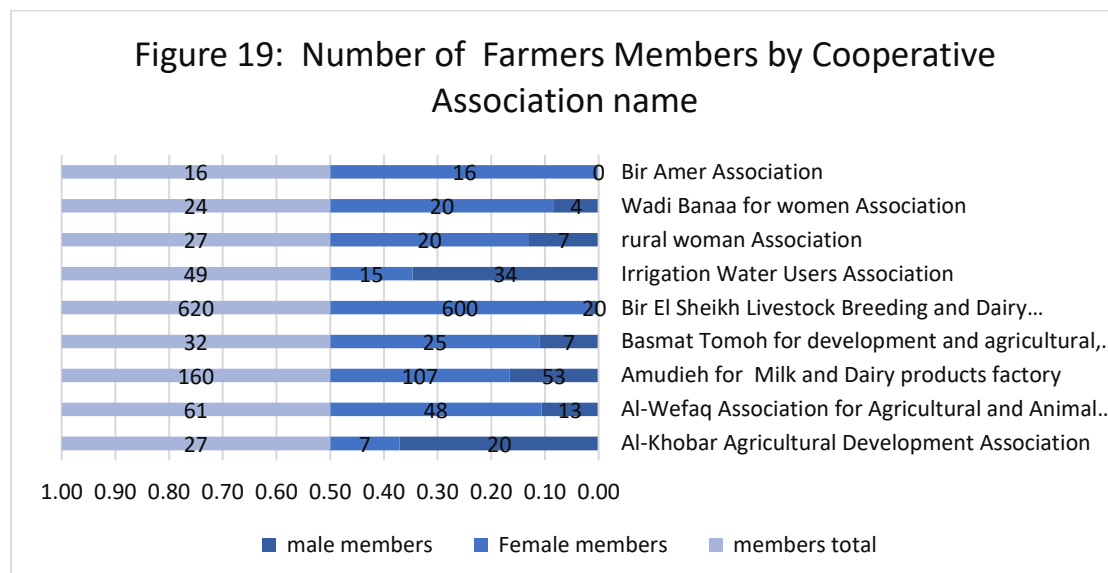
Cooperative strength is almost entirely concentrated in the Zenjibar district, while other vital areas like Khanfar lack this type of organization. This suggests that developmental efforts should be directed toward the districts of "Khanfar" and "Tuban" to encourage the establishment of new associations. This would help unify the efforts of farmers or artisans in those areas and improve income and production levels equitably across all districts.



The results analysis of Figure 19 displays the membership data for nine cooperative associations, segmented by gender and total membership as bellow:

The largest association with 620 members (600 females, 20 males) was Bir El Sheikh Livestock Breeding and Dairy. The Amudieh for Milk and Dairy products factory association was the second largest with 160 members (107 females, 53 males), while Al-Wefaq Association for Agricultural association contains 61 members (48 females,

13 males) and Irrigation Water Users Association notable for having a male majority with 49 members (15 females, 34 males). Also, Basmat Tomoh for development has 32 members (25 females, 7 males), Al-Khobar Agricultural Development Association has 27 members (7 females, 20 males), Rural Woman Association: Has 27 members (20 females, 7 males), Wadi Banaa for women Association: Has 24 members (20 females, 4 males) and Bir Amer Association: The smallest group with 16 members, all of whom are female.



The results reveal significant variations in both the size of the associations and their gender distribution:

Massive Membership Gap: There is a vast disparity in size; Bir El Sheikh Association dominates with 620 members, while others like Bir Amer have only 16. This suggests that livestock and dairy production are the primary drivers of cooperative membership in this region.

Female Dominance: Most associations, particularly the largest ones, are overwhelmingly composed of women. For instance, in the Bir El Sheikh Association, women represent over 96% of the membership.

Gender-Based Specialization: There is a clear trend where men are more active in "Irrigation" and "Agricultural Development" associations, while women are heavily concentrated in "Dairy," "Livestock," and specialized "Women's" associations.

Conclusion

The data concludes that women are the backbone of agricultural cooperative associations in this area, especially within the dairy and livestock sectors.

In summary, While the results show great success in organizing women into productive cooperatives, they also reveal a relative weakness in the size of other types of associations. To ensure a sustainable agricultural cycle, it is essential to support smaller associations and encourage better integration between irrigation-focused groups (mostly male) and production-focused groups (mostly female).

For a deeper understanding of enabling environment that effects on milk value chain in the study area, the data in Table 2 assesses the enabling environment for livestock breeders through five critical dimensions

Modern Technology Adoption: A staggering 100% of respondents lack access to modern dairy production equipment and technologies.

Institutional Awareness and Engagement: Only 8.7% of breeders have knowledge of or hold membership in cooperative associations, while the vast majority (91.3%) remain outside the cooperative framework.

Regulatory Environment: 87% of the surveyed breeders perceive local legislation and regulations as unsupportive of agricultural investment.

Physical Infrastructure: Road infrastructure shows a moderate deficit, with 54.3% reporting inadequate access compared to 45.7% who have functional access.

Table 2: The Livestock Breeder's access to supportive services through infrastructure, associations and regulatory investment Policies.			
Variables	Categories	Frequency	Percent %
Modern dairy production equipment and technologies	No	46	100%
	Yes	0	0%
Availability Knowing of a Cooperative	No	42	91.3
	Yes	4	8.7
Membership in a Cooperative Association	No	42	91.3
	Yes	4	8.7
Local legislation and regulations are supportive of agricultural investment	No	40	87
	Yes	6	13
Road infrastructure	No	25	54.3
	Yes	21	45.7

The empirical data reflects a severe systemic marginalization of the livestock sector in the study area:

The Technological Gap: The total absence (0% adoption) of modern technology indicates that production remains rudimentary and labor-intensive. This technological stagnation hinders productivity, compromises product quality (especially in dairy), and limits the sector's competitive advantage.

Institutional Fragmentation: The minimal participation in cooperatives (less than 9%) suggests a profound disconnect between formal agricultural institutions and small-scale breeders. This deprives the majority of collective bargaining power, shared resources, and technical support.

Policy Barriers: The prevailing perception of a hostile or indifferent regulatory framework (87%) act as a significant deterrent to capital investment and long-term sector growth.

Infrastructure Constraints: While road access is the highest-rated variable, the fact that over half the population lacks reliable roads complicates the logistics of transporting highly perishable dairy products to markets.

These findings lead to the conclusion that the livestock sector is operating under a state of "Structural Neglect".

Current production is sustained solely by traditional practices and individual resilience, with no meaningful support from technological, institutional, or legislative systems.

To revitalize this sector, a multi-dimensional intervention is required, focusing on technology transfer, revitalizing cooperative structures, and reforming investment policies to create a more conducive environment for agricultural development.

Operational Activities of Cooperative Associations, also assessment in this study, results in Table 3 evaluates the functional performance of cooperative associations across several service-oriented variables and we found this key point:

Advocacy and Awareness: This is the most prevalent activity, with 66.7% of associations conducting awareness programs or member meetings.

Logistical Services: Most of the associations (56.7%) are involved in managing milk collection or cooling centers.

Technical and Capacity Building: Exactly 50% of associations provide services such as veterinary care, training, technical advisory, and facilitating access to microloans.

Commercial and Market Integration: Performance drops significantly in commercial areas; only 43.3% facilitate market access, and a mere 26.7% organize the bulk procurement of production inputs (feed, medicine, equipment).

Downstream Marketing: The most critical gap is found in the marketing of members' final products (milk, cheese, meat), which is performed by only 3.3% of associations.

The empirical data reflects a significant imbalance in the cooperative value chain:

Administrative vs. Commercial Focus: While associations excel in organizational roles (awareness and raw product collection), they largely fail as commercial entities. The fact that 96.7% of associations do not market their members' products leaves small-scale farmers vulnerable to intermediaries and market price fluctuations.

Procurement Inefficiency: With 73.3% of associations failing to organize the purchase of production inputs, farmers cannot benefit from "economies of scale," leading to higher operational costs and reduced profit margins.

Stagnant Technical Outreach: The 50% split in technical services (veterinary and training) suggests that half of the cooperative network remains technically inactive, hindering the overall modernization of the sector.

Table 3: The main activities carried out by the cooperative association			
Variables	Categories	Frequency	Percent %
Organizing the purchase of production inputs (feed, medicines, equipment)	No	22	73.3
	Yes	8	26.7
Marketing members' products (milk, cheese, meat, etc.)	No	29	96.7
	Yes	1	3.3
Providing veterinary services to members	No	16	53.3
	Yes	15	50.0

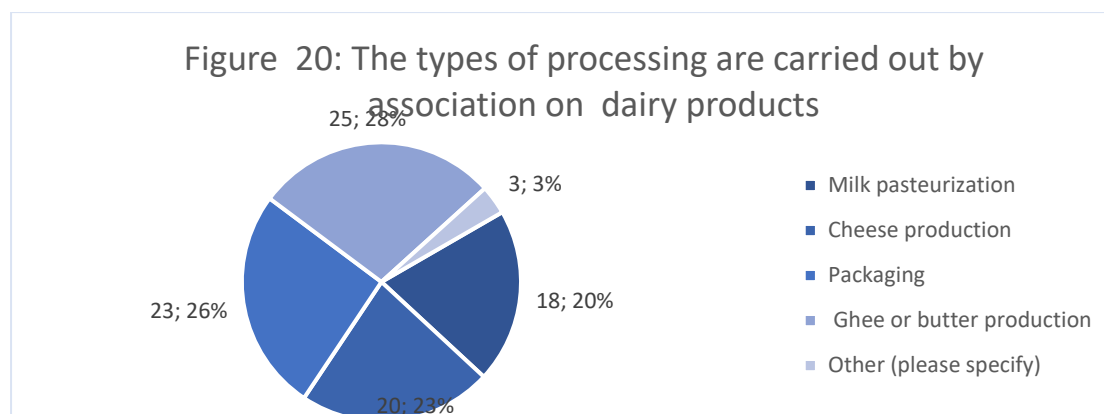
Providing training and capacity-building services to members	No	16	53.3
	Yes	15	50.0
Supporting access to finance or microloans	No	16	53.3
	Yes	15	50.0
Providing technical or advisory consulting services	No	16	53.3
	Yes	15	50.0
Managing a milk collection or cooling center	No	13	43.3
	Yes	17	56.7
Facilitating market access or concluding collective sales agreements	No	17	56.7
	Yes	13	43.3
Conducting awareness activities or meetings for members	No	10	33.3
	Yes	20	66.7
Offer loans or financial support to its members	No	25	83.3
	Yes	8	16.7
Provide facilities for storing and refrigerating dairy products	No	10	33.3
	Yes	20	66.7
Association process milk and dairy products	No	3	10
	Yes	27	90

The findings lead to the conclusion that cooperative associations currently function as "Administrative Facilitators" rather than "Strategic Market Partners" for their members. The cooperative model in the study area is effective in community engagement and basic logistics (milk cooling) but is almost entirely absent from the high-value stages of the supply chain—namely bulk procurement and final product marketing. To improve the economic viability of livestock farming, associations must transition toward an integrated business model. This involves leveraging collective bargaining power to reduce input costs and establishing direct marketing channels to increase the farmers' share of the final consumer price.

The following Figure 20 illustrate the types of Dairy Processing by Associations. Processing activities are largely limited to basic pasteurization, simple packaging, and ghee production, with cheese and diversified products playing a secondary role. This narrow processing scope limits value addition potential.

The data presented in Figure 21 illustrates a diverse yet traditional landscape of value-added dairy processing within the surveyed associations. Ghee and butter production emerges as the primary activity, conducted by 25 associations and accounting for 28% of the total processing share. This is closely supported by packaging services, which represent 26% (23 associations), indicating a growing institutional focus on product standardization and retail readiness. Cheese production remains a significant pillar of the local dairy economy, making up 23% of activities across 20 associations. Interestingly, milk pasteurization—a critical factor for food safety and market

expansion—is currently practiced by only 20% (18 associations), while the remaining 3% of associations engage in other miscellaneous processing types.



The distribution of these results reveals that while associations have successfully diversified into marketable derivatives like ghee and cheese, the sector remains heavily anchored in traditional, low-tech processing. The dominance of ghee and butter production likely reflects its cultural relevance and the practical advantage of a longer shelf-life in environments with limited refrigeration. However, the lower ranking of pasteurization suggests significant barriers to entry, such as high capital costs and energy instability.

In conclusion, the dairy sector in the study area is in a transitional phase. While the focus on packaging shows a professionalizing trend, there is a clear technological gap in safety-critical processes like pasteurization. To move beyond local traditional markets, future strategic interventions should prioritize the provision of modern, energy-efficient pasteurization technology. This would enhance product safety, reduce spoilage, and allow these associations to compete more effectively in high-value urban markets.

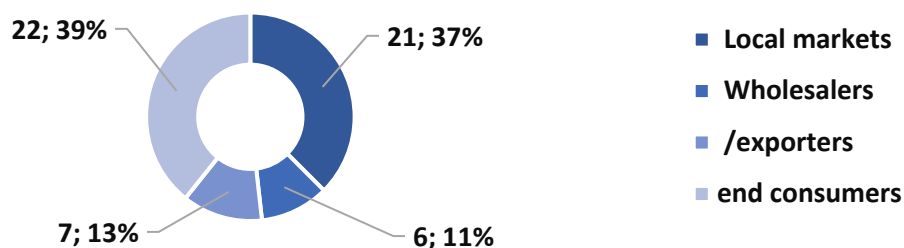
The figure 21 illustrates the primary client base for the cooperative associations, categorized into four main segments. The largest proportion of clients consists of end consumers, accounting for 39% of the total market share with a frequency of 22. This is closely followed by local markets, which represent 37% of the associations' clients (21 in frequency). In contrast, larger-scale distribution channels show significantly lower engagement; exporters comprise only 13% of the client base (7 in frequency), while wholesalers represent the smallest segment at 11% (6 in frequency). The data reflects a marketing strategy heavily reliant on direct and localized sales channels:

Direct-to-Consumer Focus: The combined 76% share held by end consumers and local markets highlights strong community ties and a preference for immediate cash flow over complex distribution networks.

Supply Chain Barriers: Low engagement with wholesalers and exporters suggests significant scaling challenges. This often stems from inconsistent production volumes or failure to meet international quality and standardization requirements.

Profitability vs. Volume: While direct sales offer higher individual margins, the lack of wholesale integration limits the associations' ability to move large inventories rapidly

Figure 21 :The association's main clients



These results indicate that the associations' marketing reach is geographically localized and lacks institutional depth.

Associations excel at local market penetration but struggle to penetrate high-volume supply chains. To increase economic impact, associations must standardize product quality to meet export-grade requirements. Establishing strategic partnerships with regional wholesalers will be essential to mitigate the risks of local market saturation and ensure long-term financial stability.

4.3.3 Access to Training, Supplies, and Credit Sources.

The data presented in Table 4 reveals a critical gap in professional development and formal support systems for livestock breeders. A vast majority of respondents (91.3%) reported having no access to previous formal training. Despite a small percentage receiving training from institutions such as SMPS (10.9%), FAO (6.5%), and Care (4.3%), or from NGOs (19.6%), there remains a universal demand for further education, with 100% of breeders stating they are still in need of training. While 76.1% of participants acknowledge the provision of Microfinance Institution services, actual access to agricultural credit is extremely limited, with 93.5% of respondents unable to secure it. Consequently, breeders rely heavily on informal financial sources, primarily relatives (37%), rather than service cooperatives (4.3%) or microfinance institutions (4.3%). Furthermore, the reach of agricultural extension services is insufficient; 73.9% lack a service provider, and 100% report the total absence of a local agricultural extension service office.

Table 4: The Access to Training, Supplies, and Credit Sources.

Variables	Categories	Frequency	Percent %
Access to Previous formal Training	No	42	91.3
	Yes	6	13.0
Institution Provide training services	SMPES	5	10.9

	FAO	3	6.5
	Care	2	4.3
Still in need of training	No	1	2.2
	Yes	46	100.0
Get a Previous Training by NGOs	No	38	82.6
	Yes	9	19.6
Provision of Microfinance Institutions Services	No	11	23.9
	Yes	35	76.1
Access to Agricultural Credit	No	43	93.5
	Yes	3	6.5
Credit Sources	Relatives	17	37.0
	Service Cooperatives	2	4.3
	Microfinance Institutions	2	4.3
	No	34	73.9
Agricultural extension service providers	Yes	13	28.3
	No	46	100.0
Presence of Agricultural extension service office	Yes	0	0.0
	No	46	100.0

The findings highlight a state of institutional disconnect between available services and the breeders' actual needs:

Educational Deficit: The universal desire for training (100%) indicates that while breeders are eager to modernize, current programs from NGOs and international organizations are either too limited in scope or fail to reach the bulk of the farming population.

Credit Accessibility Paradox: There is a stark contradiction between the recognized existence of microfinance services (76.1%) and the failure to obtain agricultural credit (93.5%). This suggests that the requirements for these loans may be too stringent, or the products offered do not align with the livestock sector's specific risk profile.

Informal Financial Dependency: The heavy reliance on relatives for funding (37%) reflects a lack of trust or access to formal banking systems, which ultimately limits the scale of investment and growth for individual breeders.

Structural Abandonment: The complete absence of local extension offices (100%) means that breeders are operating without scientific guidance or government-backed support, leaving them vulnerable to livestock diseases and inefficient production methods.

The livestock sector in this region is currently operating in a professional and financial vacuum. While there is a strong willingness among breeders to improve their skills and expand their businesses, they are hindered by a systemic lack of formal training, prohibitive credit conditions, and the total absence of government extension infrastructure.

To bridge these gaps, it is essential to establish permanent local agricultural extension offices and simplify the criteria for agricultural credit. Additionally, training programs must be scaled up and decentralized to ensure that technical knowledge reaches the 91.3% who have remained underserved by previous initiatives.

The data presented in the Figure 22 illustrates the specific professional development requirements identified by livestock breeders across various sectors of the industry. The demand for training is relatively evenly distributed across several core areas, with two categories tied for the highest priority: an unspecified area and another key sector, each accounting for 19% of the total training needs. Close behind is the demand for training in Dairy by-product quality, which represents 18% of the identified needs. Technical expertise in Animal Health and Dairy Product Marketing are equally valued by the respondents, each making up 13% of the distribution. The remaining segments of the training spectrum include Dairy Product Manufacturing at 10% and Dairy Production at 8%.

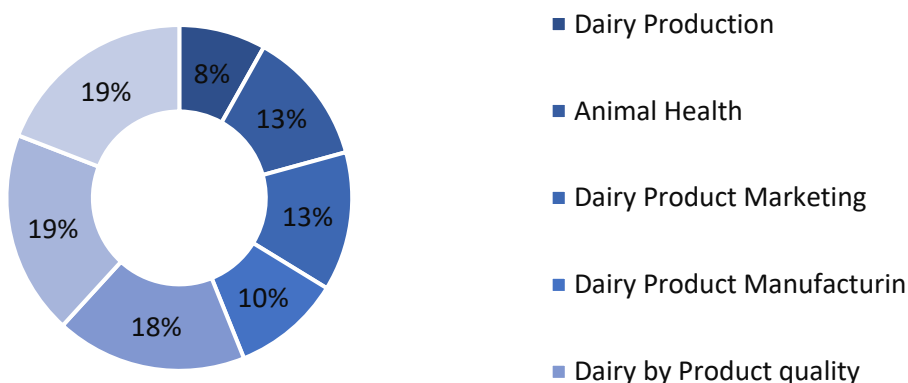
The distribution of training needs highlights a comprehensive desire for modernization across the entire value chain:

Quality Control Priority: The high interest in "Dairy by-product quality" (18%) suggests that breeders are becoming increasingly aware that product safety and standards are essential for market competitiveness.

Holistic Value Chain Awareness: The fact that marketing (13%), manufacturing (10%), and health (13%) all receive significant attention indicates that breeders no longer view their work solely as raw production, but as a multi-stage business.

Balanced Skill Gaps: The relatively narrow range between the highest (19%) and lowest (8%) categories indicates that there is no single "magic bullet" for development; rather, the workforce requires a broad upgrade in technical, medical, and commercial skills simultaneously.

Figure 22: The Training Needs Area

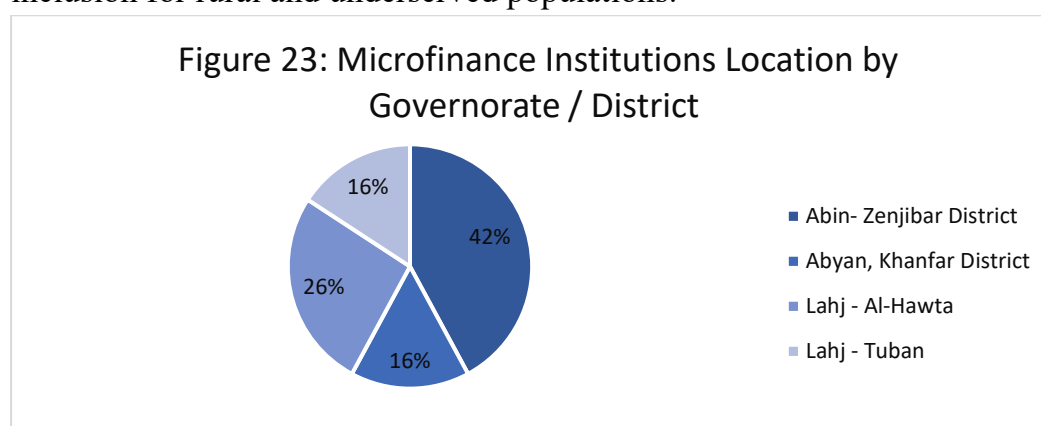


The findings conclude that the workforce is seeking a transition from traditional farming to specialized agrobusiness. The diverse spread of training needs demonstrates that breeders recognize their deficiencies in both technical animal care and downstream commercial activities.

Future capacity-building initiatives should avoid "one-size-fits-all" programs. Instead, they should offer modular training packages that prioritize quality assurance and marketing, as these are the areas breeders identify as most critical for increasing the economic value of their output.

Based on Figure 23, the distribution of microfinance institutions is heavily concentrated in the Abin-Zenjibar District, which dominates the sector with 42% of the total share. Lahj-Al-Hawta follows as the second most active hub at 26%, while Abyan-Khanfar and Lahj-Tuban maintain an equal but smaller presence of 16% each.

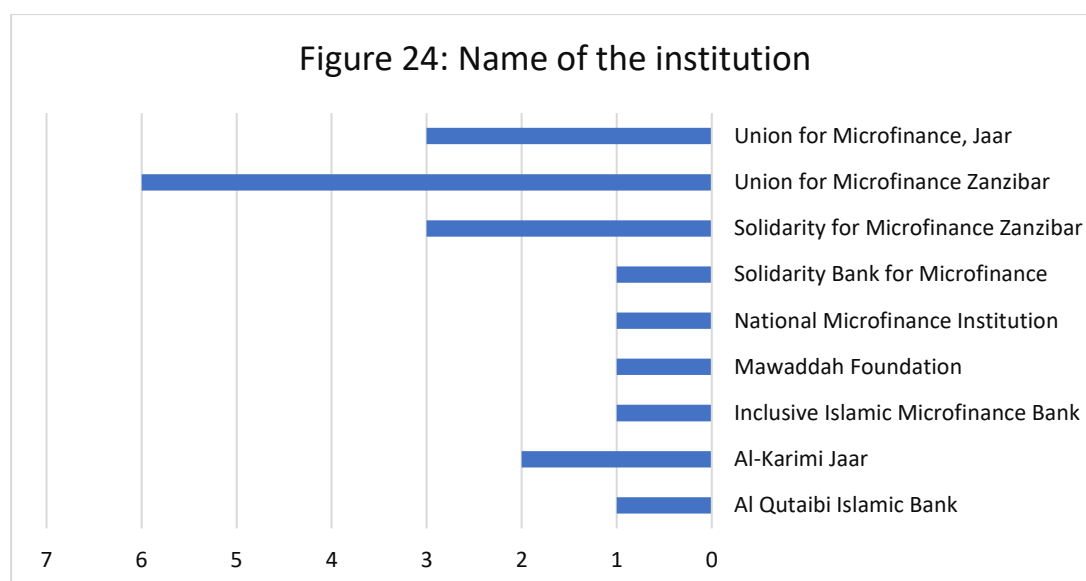
This data indicates a significant centralization of financial services within administrative capitals, particularly Zenjibar. The disparity between the leading district and the others suggests that while urban centers are well-served, there is a clear opportunity for expansion into districts like Khanfar and Tuban to improve financial inclusion for rural and underserved populations.



In conclusion, the microfinance landscape in these governorates is highly centralized, with nearly half of all activity localized in the Zenjibar District. While this concentration benefits urban entrepreneurs, it suggests a need for strategic expansion into districts like Khanfar and Tuban to ensure equitable financial inclusion. To maximize the impact of microfinance on poverty reduction, stakeholders should consider mobile banking or satellite branches to bridge the gap between the administrative hubs and the outlying productive districts.

The bar chart presented in Figure 24 details the landscape of financial institutions available to the community, specifically highlighting those involved in microfinance and banking services. The data indicates that the Union for Microfinance in Zanzibar holds the most significant presence among the listed entities. This is followed by a group of institutions with moderate reach, including the Union for Microfinance in Jaar and Solidarity for Microfinance in Zanzibar. Further down the scale, the Al-Karimi Jaar bank maintains a smaller but notable footprint. Finally, several institutions operate with a minimal presence in the area, such as the Solidarity Bank for Microfinance, National

Microfinance Institution, Mawaddah Foundation, Inclusive Islamic Microfinance Bank, and Al Qutaibi Islamic Bank.



The distribution of financial institutions reflects several key characteristics of the local economic environment:

Regional Concentration: The dominance of institutions labeled with "Zanzibar" and "Jaar" indicates that microfinance activities are highly concentrated in specific geographical hubs. This suggests that while these urban or semi-urban centers are well-served, more remote rural areas may lack direct access to formal financial services.

Sector Diversity: The presence of both "Unions," "Foundations," and "Islamic Banks" suggests a diverse range of financial models. However, the low frequency of the more formal banking institutions compared to microfinance unions indicates that the local economy relies more on small-scale community lending than on traditional corporate banking.

Market Fragmentation: The high number of institutions with minimal presence suggests a fragmented market. Rather than a few powerful institutions providing broad coverage, there are many small players, which may lead to inconsistent service quality and varying interest rates for breeders and small business owners.

The findings conclude that the financial infrastructure is primarily microfinance-driven and geographically centralized. Although multiple institutions exist, the heavy reliance on localized microfinance unions suggests that formal, large-scale banking has yet to fully penetrate the livestock and agricultural sectors. To improve financial inclusion for breeders, there is a need to incentivize the smaller, more formal Islamic banks to expand their reach. Furthermore, establishing "mobile banking" or satellite branches in underserved districts would help bridge the gap between the dominant unions in Zanzibar/Jaar and the breeders in more isolated regions.

The data presented in Table 5 provides a comprehensive inventory of the technological and material requirements identified by livestock breeders to enhance their productivity and profitability. A critical finding is the absolute deficit in modern dairy production equipment and technologies, with 0.0% of respondents currently possessing these tools. Despite this gap, there is a strong demand for specific logistical and operational infrastructure: 54.3% of breeders identified a need for milk cooling tanks, and 37.0% emphasized the necessity of a solar power system to operate equipment. Other significant needs include dairy processing units for products like cheese and yogurt (34.8%), animal feeding equipment (28.3%), and concentrated animal fattening feed (23.9%). Requirements for specialized technical tools such as artificial insemination tools (19.6%), milking machines (15.2%), barn cleaning equipment (10.9%), and milk collection/transport equipment (10.9%) were also noted, albeit with lower frequency.

Table 5: The tools, Materials and equipment needs for improve productivity and profitability			
Variables	Categories	Frequency	Percent %
modern dairy production equipment and technologies	No	47	100.0
	Yes	0	0.0
Milking machine	No	28	60.9
	Yes	7	15.2
Milk cooling tank	No	10	21.7
	Yes	25	54.3
Dairy processing unit (cheese, yogurt, etc.)	No	19	41.3
	s	16	34.8
Animal feeding equipment (mixer/feed dispenser)	No	22	47.8
	Yes	13	28.3
Barn cleaning equipment	No	30	65.2
	Yes	5	10.9
Artificial insemination tools	No	29	63.0
	Yes	9	19.6
Milk collection and transport equipment	No	30	65.2
	Yes	5	10.9
A solar power system to operate equipment	No	18	39.1
	Yes	17	37.0
Concentrated animal fattening feed	No	24	52.2
	Yes	11	23.9
Veterinary instruments or sanitary equipment	No	25	54.3

The results highlight a sector that is eager to modernize but is currently restricted by a total lack of advanced technological infrastructure:

Infrastructure Prioritization: The high demand for milk cooling tanks (54.3%) and solar power (37.0%) reflects the breeders' immediate struggle with perishability and energy instability. Without the ability to preserve milk through cooling, producers are forced into immediate, low-value local sales.

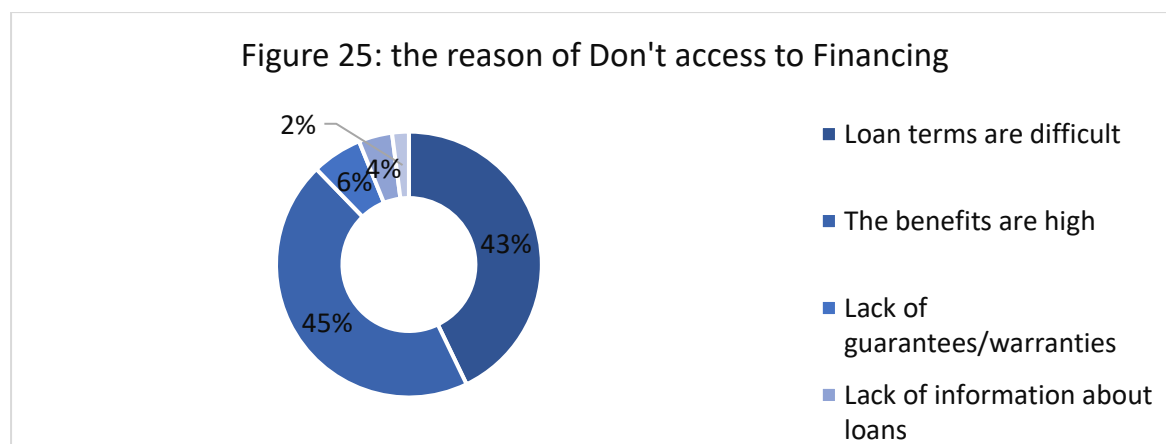
Transition to Value-Added Processing: The interest in dairy processing units (34.8%) suggests a strategic shift among breeders toward producing higher-value derivatives like cheese and yogurt, which offer better profit margins and longer shelf-life than raw milk.

Rudimentary Operational State: The fact that 100% of breeders lack modern technology indicates that the entire sector is operating on traditional, labor-intensive methods. This baseline of zero technology adoption represents a massive opportunity for developmental impact through targeted equipment provision.

The findings conclude that the lack of energy and preservation technology is the primary bottleneck for livestock sector growth.

While breeders are interested in specialized technical tools, their most urgent needs are "foundational technologies"—specifically cooling infrastructure and renewable energy. Intervention programs should prioritize the establishment of community-based, solar-powered cooling and processing hubs. Providing individual milking machines or insemination tools will have limited impact if the resulting raw milk cannot be cooled or processed for wider distribution.

The data illustrated in the Figure chart (Figure 25) identifies the primary obstacles preventing livestock breeders from accessing formal financial support. The most significant barrier is the perception of high benefits (interest rates), cited by 45% of respondents. This is closely followed by the difficulty of loan terms, which affects 43% of the population. Other contributing factors include a lack of guarantees or warranties at 6%, a lack of information about available loans at 4%, and issues related to the institutions themselves at 2%.



The distribution of these results highlights a profound misalignment between financial institutional offerings and the socio-economic reality of the livestock breeders:

The High Cost of Capital: With 45% citing high benefits/interest rates as primary deterrent, current financial products are perceived as a threat to the thin profit margins of small-scale animal production rather than a tool for growth. Institutional Incompatibility: The fact that 43% find loan terms difficult indicates that the administrative and operational requirements of banks—such as repayment schedules or legal documentation—do not match the seasonal and volatile nature of agricultural income. Perceived vs. Structural Barriers: Interestingly, lack of information (4%) and institutional distance (2%) are minor factors. This implies that breeders are aware of the banks and how to find them, but the "product" itself (the loan) is fundamentally unsuited to their needs. The findings conclude that financial exclusion in the study area is driven by "Prohibitive Product Design" rather than a lack of awareness. While banks are physically present, their lending models—characterized by high costs and rigid terms—effectively lock out 88% of the potential breeder client base.

To improve credit penetration, financial institutions should develop sector-specific Sharia-compliant products with lower profit margins and flexible repayment grace periods that align with livestock production cycles. Simplifying guarantee requirements would further enable small-scale owners to transition from informal borrowing (relatives) to formal financial systems.

4.4 Mapping of the Milk Value Chain

This chapter provides a comprehensive analysis of the value chain for livestock breeding and milk production in certain districts of Lahj and Abyan governorates in Yemen. Through detailed mapping of the chain, identification of key actors, and description of the various stages from production to consumption, this analysis aims to understand the current state of the livestock value chain, identify strengths, bottlenecks, and opportunities at each stage, and pave the way for developing effective strategies and interventions to improve chain performance and increase added value.

4.4.1 Milk Value Chain Mapping

Value chain mapping is a crucial analytical tool that helps in understanding the entire path of a product from the farm to the consumer, identifying key actors and the relationships between them.

4.4.1.1 Main Stages of the Value Chain

The value chain for livestock breeding and milk production in certain districts of Lahj and Abyan governorates in Yemen consists of five main stages (Table 6):

1. **Input Stage:** Provision of necessary agricultural inputs for livestock breeding, such as feed, tools, equipment, and veterinary medicines.
2. **Production Stage:** Livestock breeding, including the type of animal, purpose of breeding, breeding methods, and types of animal products (milk and all dairy products, and meat)
3. **Collection and Primary Processing:** Collect milk, store it, and transport it to processing plants. Milk collection, cooling, traditional processing (buttermilk, local yogurt).
4. **Manufacturing (Secondary Processing) Stage:** Processes and treatments applied to the produced milk, including cleaning, packaging, dairy product manufacturing, and storage.
5. **Marketing and Distribution Stage:** Transportation and distribution of milk storage, wholesale and retail sales, and export.
6. **Consumption Stage:** Consumption of milk and dairy products by end-consumers, whether household or institutional consumption through cooperatives or dairy processing factories

4.4.1.2 Analysis of Key Actors

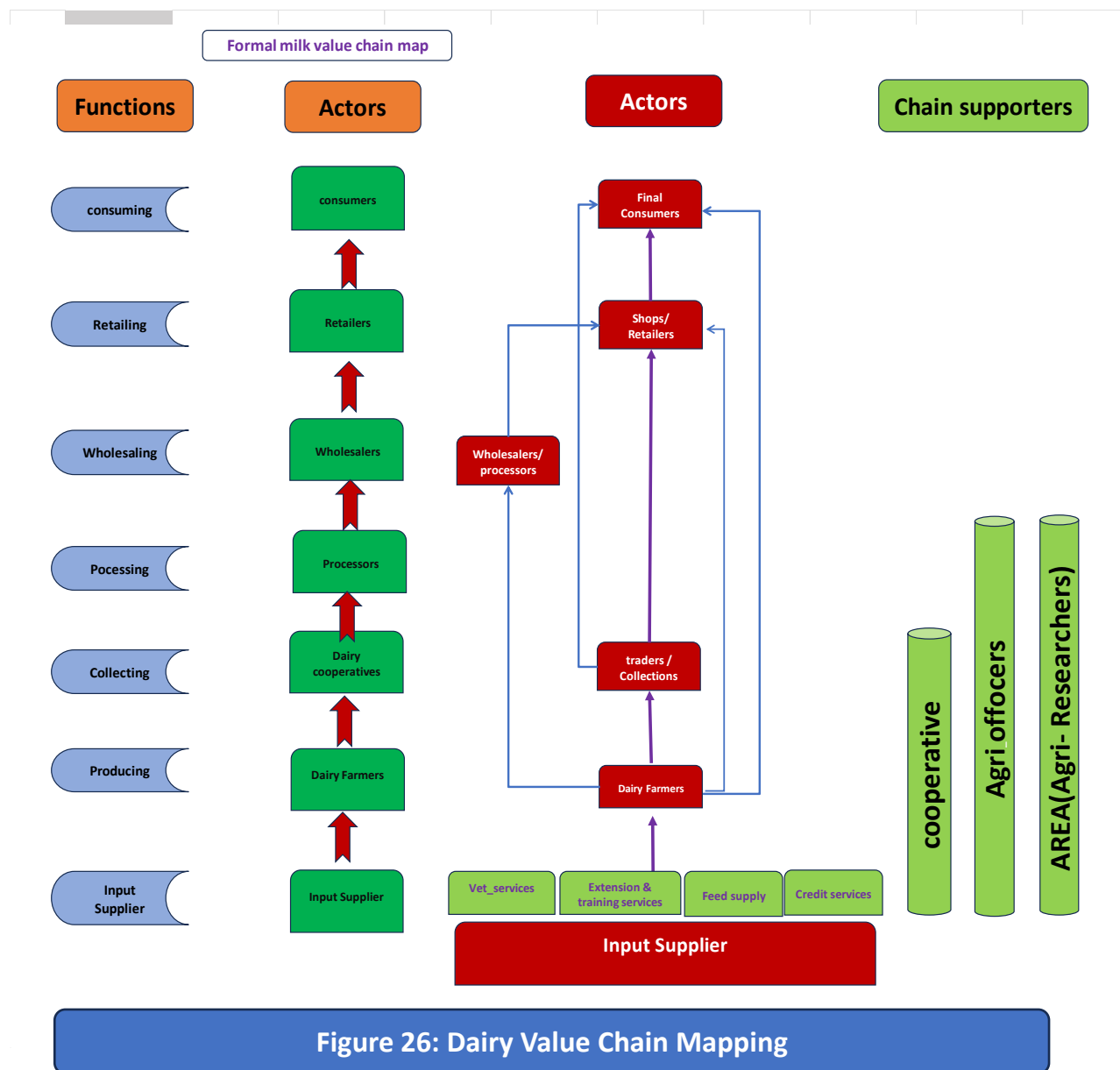
1. **Farmers (Livestock Breeders):** They are responsible for breeding livestock and can be classified into small-scale breeders (33-100 animals), medium-scale breeders (101-250 animals), large-scale breeders (≥ 250 animals), and agricultural companies specializing in livestock breeding.
2. **Collectors, rural processing units, rural women:** Collect milk, store it, and transport it to processing plants. Milk collection, cooling, traditional processing (buttermilk, local yogurt).

3. **Intermediaries and Traders:** They buy milk and dairy products from breeders and sell them to consumers, exporters, or manufacturers, including brokers, wholesalers, and retailers
4. **Processors:** They transform milk into dairy products such as ghee, butter, cheese, and yoghurt.
5. **Exporters:** They export milk and dairy products to foreign markets, especially the Arab Gulf countries.
6. **Consumers:** They are the end-users of the product, whether in the local or foreign market.
7. **Supporting Institutions:** These include institutions that provide support and services to the value chain, such as the Ministry of Agriculture and Irrigation, the Agricultural Research and Extension Authority, agricultural cooperatives, financial institutions and banks, and local community organizations.

Table 6: Key activities, stakeholders, actors and main challenges across dairy value chain.			
Stage	Key Activities	Key Actors	Main Challenges
1. Input Supply	Provide feed, vaccines and veterinary services	Input Suppliers	Delays in delivery, quality of inputs and lack to some skills in financial and management field
2. Production	Raise Cow, sheep and goat, herd Management Practices (feed them, provide veterinary care), and produce milk and some milk by-product	Small farmers, livestock breeders (especially women).	Fluctuating feed prices, epidemic, diseases, difficulty accessing veterinary service and capital, lack to skills
3. Collection and Primary Processing	Collect milk, store it, and transport it to processing plants. Milk collection, cooling, traditional processing (buttermilk, local yogurt).	Collectors, rural processing units, rural women.	Difficulty collecting milk in remote areas, maintaining milk quality, Lack of cooling and storage facilities, poor road infrastructure, poor quality.
4. Manufacturing	Process milk and dairy products, package them (UHT milk, cheese, yogurt, ice cream).	Large companies (e.g., National Dairy and Food Company - NADFOOD), small factories.	Quality standards, contamination, operational costs. Electricity outages, difficulty importing production inputs, competition with import products.
5. Distribution and Marketing	Product transportation, cold storage, wholesale and retail sales.	Distributors, wholesalers and retailers, grocery stores.	Fluctuating demand, transportation and storage issues, High transport and fuel costs and product expiration, competition
6. Consumption	Purchase and consumption of products by households.	End Consumers.	Product quality, prices, product availability, Low purchasing power, some consumers' preference for imported products.

The finding in Table 6 also outlines key constraints include input quality/delays, volatile feed prices and disease at production, a critical lack of cooling and storage during collection, high operational costs and import competition for processors, and expensive logistics for distributors.

Also, Figure 26 provides a visual map, confirming a linear chain from input suppliers to consumers. It crucially highlights the near-total absence of effective chain supporters (credit, extension, research), isolating the core actors in an unsupported environment.



Source: Organized from field study of milk value chain analysis.

4.4.1.3 Relationships Between Actors in the milk Value Chain.

The relationships between actors in the livestock value chain in Lahj and Abyan are characterized by complexity and interdependence, influenced by factors such as trust, bargaining power, and access to information. Some key relationships include:

1. Relationship between livestock breeders and intermediaries: This relationship is often unbalanced, with intermediaries holding greater bargaining power due

to limited marketing options available to breeders, particularly small-scale breeders. Breeders are often forced to sell their products at low prices, especially during peak seasons when supply exceeds demand in local markets.

2. Relationship between intermediaries and exporters: This relationship is marked by cooperation and coordination, with exporters relying on intermediaries to collect large quantities of milk from producers.
3. Relationship between exporters and external markets: This relationship is influenced by competition from other exporters and quality and safety requirements in target markets.
4. Relationship between farmers and manufacturers: This relationship is still limited due to the scarcity of dairy-based processing industries in Yemen, but it represents an important opportunity for developing the livestock value chain.
5. Relationship between supporting institutions and other actors: Supporting institutions provide various services, including agricultural extension, financing, and research. However, the effectiveness of these services varies depending on the region and target group.

4.4.1.4 Key Actors Main Activities and Roles Challenges

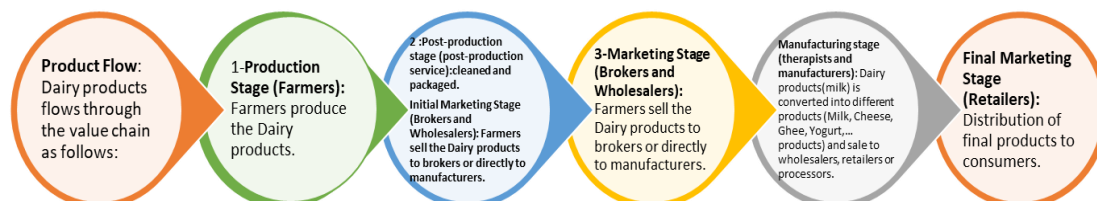
1. Input Suppliers Providing feed, medicines, and tools. High costs and difficulty importing.
2. Livestock Breeders Production, cleaning, and packaging. Low productivity, high production costs.
3. Collectors and Intermediaries Buying and collecting milk and dairy products, temporary storage, sorting, packaging, and transportation. Price fluctuations, poor infrastructure.
4. Traders Buying dairy products from breeders, storing, cleaning, packaging, and selling to processors or consumers. Price fluctuations, poor infrastructure.
5. Processors Cleaning, processing, packaging, and adding value to dairy products. High operating costs, low consumer purchasing power.
6. Dairy Factories Cleaning, testing, processing, adding value, and selling to wholesalers or retailers. High operating costs, raw material shortages.
7. Supporting Institutions Providing technical, financial, and regulatory support. Limited resources, poor coordination, and inadequate infrastructure.
8. End Consumers Buying and consuming final products. High prices, low product quality, and occasional spoilage.

4.4.2 Flows Product, Information, and Money

In this Pat the analysis is tracking the movement of products, money, information and risks like disease across the milk value chain

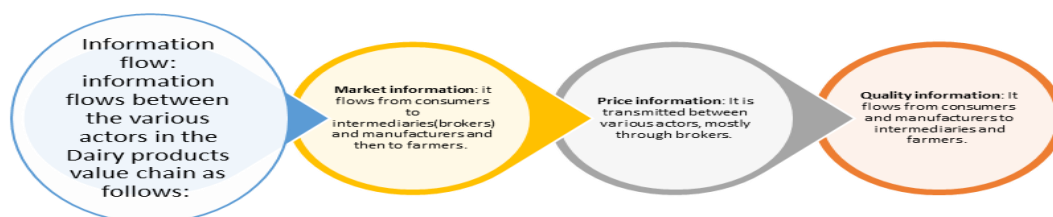
Product Flow:

Starts from livestock breeders to intermediaries, then to wholesalers, retailers, exporters, or manufacturers, and finally to consumers. The flow paths vary depending on the product type, quality, and target market. The chain is linear but leaky, with substantial losses (see Figure 28).



Information Flow:

Includes information about prices, quantities, quality, and required specifications. Often, the information flow is unbalanced, with intermediaries and exporters having more information about markets compared to farmers. Systems are weak and asymmetric. Information trickles down primarily through brokers, leaving small farmers with limited access to market, price, and quality information, reducing their bargaining power



Money Flow :

Moves in the opposite direction of the product flow, from consumers to retailers, wholesalers, exporters, then to intermediaries, and finally to farmers. There is often a time gap between product delivery and payment, especially in export cases. The financial stream is characterized by delayed payments and a heavy reliance on informal, high interest financing due to limited access to formal agricultural credit.

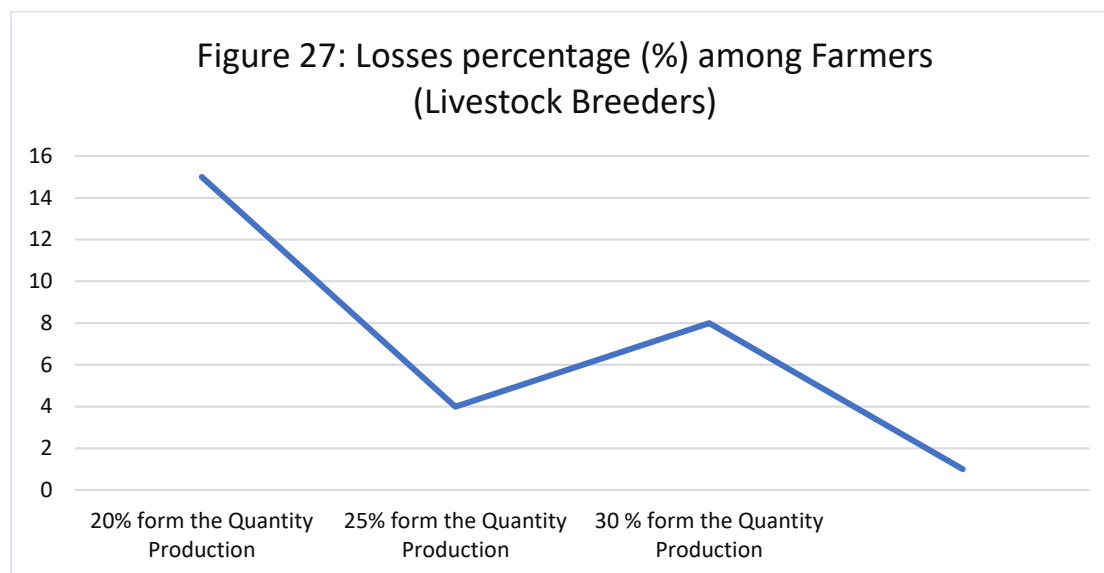


4.4.2 Processing and Value addition Stage

4.4.2.1 Processing, Losses

The data in Figure 27 reveals devastating post-production losses at farm level: 20-30% of total production quantity is lost, primarily due to the lack of basic cooling and

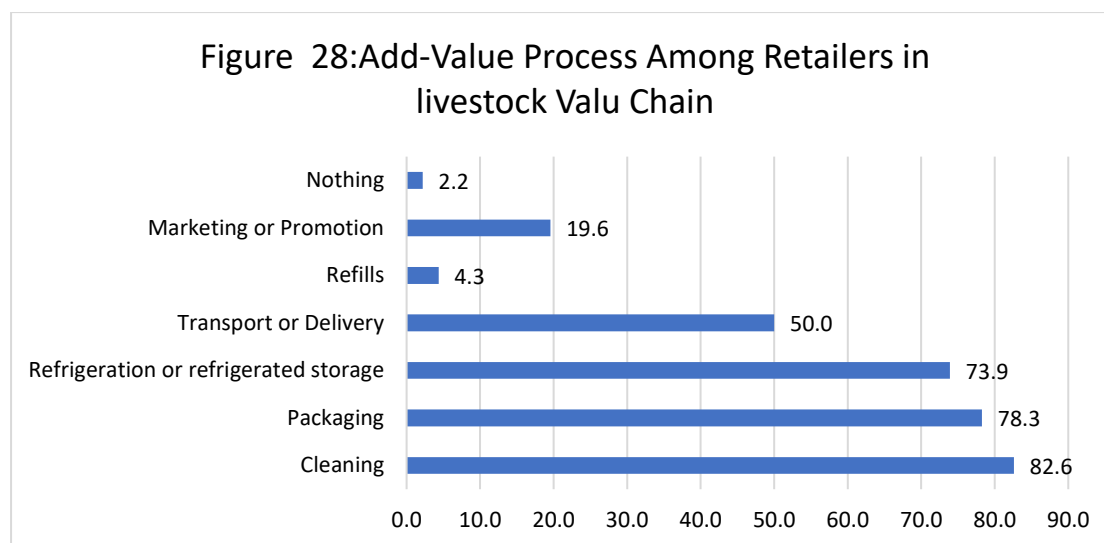
immediate processing infrastructure. Losses of 20–30% of production volume are reported among livestock breeders, indicating significant inefficiencies at the farm and immediate post-harvest stages. These losses are directly linked to inadequate handling, lack of cooling, disease, and weak storage practices, representing a major drain on farmer income.



The chart in Figure 28 illustrates the add-value processes among retailers in the livestock value chain, showing the percentage of retailers engaging in each process, in the livestock retail sector, the most common value-adding activity is cleaning, which is performed by 82.6 % of retailers, indicating that cleaning is a primary way retailers enhance product value. Packaging follows closely with 78.3 % involvement, highlighting its strong role in adding value. Refrigeration or refrigerated storage is used by 73.9 % of retailers, showing the importance of temperature control for livestock products. Half of the retailers (50.0 %) provide transport or delivery services, adding value through logistics. A small segment (4.3 %) offers refills, suggesting limited focus on reusable or replenishment services. Marketing or promotion is practiced by 19.6 % of retailers, indicating moderate investment in promotional activities to increase value. Finally, only 2.2 % of retailers add nothing, meaning nearly all engage in at least one value-adding process.

The data reveal that retailers prioritize physical handling processes—cleaning, packaging, and refrigeration—to enhance livestock product quality and shelf life. These activities are essential for maintaining safety and consumer acceptance. Transport and delivery also play a significant role, reflecting the need for efficient distribution in the value chain. In contrast, marketing and promotional efforts are less prevalent, suggesting retailers focus more on product preservation than on branding or advertising. The minimal involvement in refilling services indicates an opportunity for innovation in sustainable practices. Overall, the livestock retail value chain relies heavily on

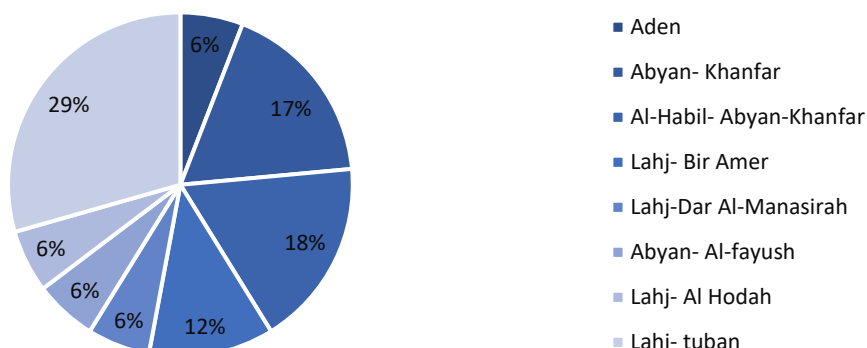
operational processes that ensure product quality and safety, with less emphasis on marketing or value-added services like refills.



4.4.3 Products distribution and marketing

The following pie chart labeled in “Figur 29: Market for Milk and Dairy Product in southern Yemen” shows the distribution of the milk and dairy market across eight regions in southern Yemen. The market shares are as follows: Aden holds 17%, Abyan-Khanfar 18%, Al-Habil-Abyan-Khanfar 12%, Lahj-Bir Amer 6%, Lahj-Dar Al-Manasirah 6%, Abyan-Al-fayush 6%, Lahj-Al Hodah 29%, and Lahj-Tuban 6%. The dairy market in southern Yemen is dominated by the Lahj-Al Hodah region, which commands nearly a third (29%) of the total market, making it the largest single contributor. Abyan-Khanfar follows closely with an 18% share, while Aden accounts for 17%. Al-Habil-Abyan-Khanfar captures 12% of the market. The remaining four regions—Lahj-Bir Amer, Lahj-Dar Al-Manasirah, Abyan-Al-fayush, and Lahj-Tuban—each hold a modest 6% share, indicating a smaller but balanced presence in the market. The data reveal a clear concentration of the dairy market in a few key regions, with Lahj-Al Hodah emerging as the market leader, suggesting strong production or distribution infrastructure there. The combined share of Abyan-Khanfar and Aden (35%) indicates that the central and western parts of southern Yemen are significant dairy hubs. The 6% shares held by four regions imply a fragmented peripheral market that may require targeted development to boost their dairy sectors. Overall, market strategies should focus on strengthening the dominant regions while investing in the smaller ones to achieve a more balanced distribution.

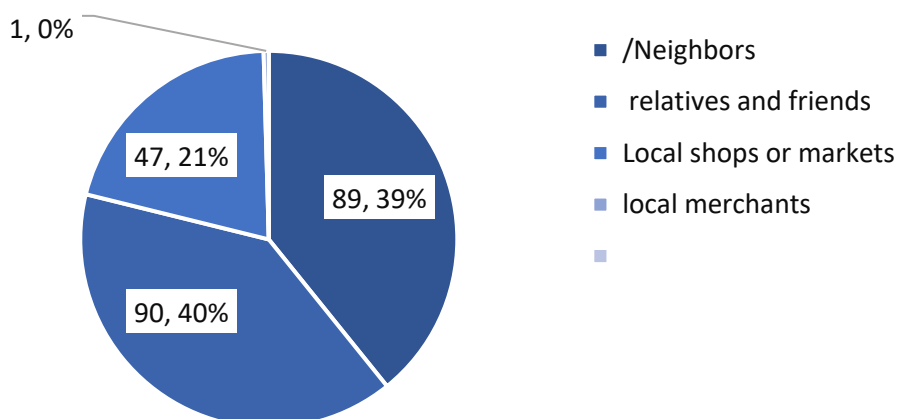
Figure 29: Market for Milk and Dairy Product in southern Yemen.



The data in Figure 30 illustrates the marketing channels used by milk and dairy producers. The results can be summarized as follows:

Milk and dairy producers rely on four main marketing channels. The most widely used channel is relatives and friends, accounting for 40% (90 respondents), indicating that personal networks are the primary outlet for selling dairy products. The second most important channel is neighbors, representing 39% (89 respondents), showing that producers also heavily depend on nearby acquaintances for distribution.

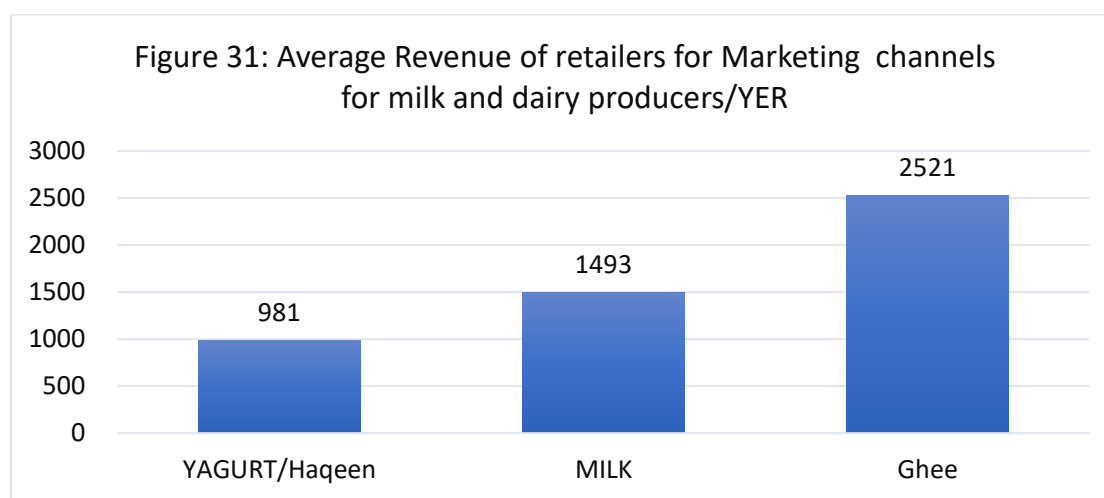
Figure 30: Marketing channels for milk and dairy producers



Local shops or markets make up 21% (47 respondents), meaning a significant portion of sales occur through traditional retail venues. Finally, local merchants are used by only 1 producer (0%), suggesting this channel is negligible in the dairy marketing mix. The data reveal that informal, personal relationships dominate the marketing strategies of milk and dairy producers, with relatives, friends, and neighbors together constituting 79% of the distribution channels. This highlights the importance of community-based

networks in the dairy sector, likely due to trust, convenience, or limited access to formal markets. The reliance on local shops (21%) indicates a secondary role for organized retail, while the absence of local merchants suggests they are not a viable option for these producers. The findings imply that strengthening community ties and improving access to local market infrastructure could further enhance dairy producers' sales opportunities.

The results in Figure 31 show the average revenue of retailers for marketing channels of milk and dairy producers, measured in Yemeni rials (YER). The data cover three product categories: yogurt/haqeen, milk, and ghee.



The average retail revenue from yogurt/haqeen is 981 YER, representing the lowest earnings among the three dairy products. Milk generates a higher revenue of 1,493 YER, indicating a moderate performance in the market. Ghee achieves the highest revenue at 2,521 YER, outperforming both yogurt and milk significantly.

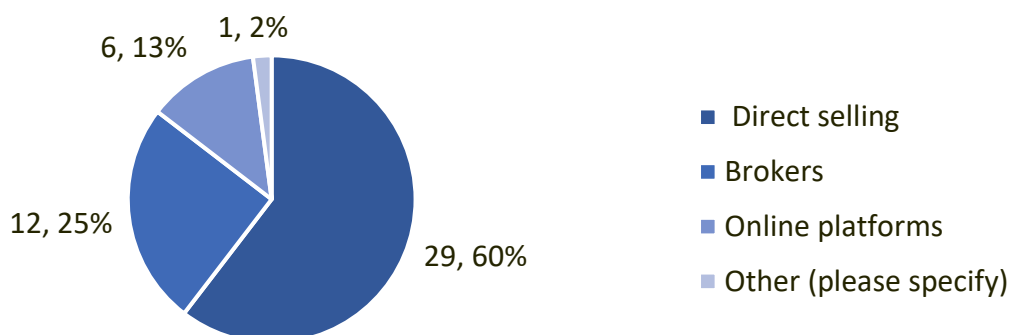
The results suggest that ghee is the most profitable dairy product for retailers in this marketing channel, yielding more than double the revenue of yogurt and about 1.7 times the revenue of milk. Milk occupies a middle position, earning substantially more than yogurt, which brings in the least income. The revenue pattern (ghee > milk > yogurt) implies that retailers should focus promotional efforts and inventory allocation on ghee to maximize returns, while also considering strategies to improve the market performance of yogurt, which lags the other products.

the marketing channels used by cooperatives used by cooperatives of milk and dairy producers were illustrated in Figure 32, the results can be summarized as follows:

The majority of cooperatives, 29 out of 48 (60%), rely on direct selling as their primary marketing channel. This indicates that most producers prefer to sell their dairy products straight to consumers or end-users, likely to maximize profit margins and maintain control over the sales process. The second most utilized channel is brokers, accounting for 12 cooperatives (25%). Brokers act as intermediaries who facilitate transactions between producers and buyers, suggesting a significant reliance on third-party agents for market access. Online platforms are used by 6 cooperatives (13%), showing a modest adoption of digital marketing strategies for dairy products. Finally, a minimal

portion, 1 cooperative (2%), employs other unspecified channels, implying that alternative methods are rare among these producers.

Figure 32: Marketing channels for cooperatives of milk and dairy producers



The data reveals that direct selling is the dominant marketing strategy for milk and dairy cooperatives, highlighting the importance of direct consumer relationships in this sector. The substantial use of brokers suggests that many cooperatives still depend on intermediaries to reach broader markets, possibly due to limited resources for direct outreach. The relatively low percentage of online platforms indicates an opportunity for digital transformation, which could enhance market reach and efficiency. The minimal use of “other” channels implies that existing traditional methods cover most marketing needs. Overall, dairy cooperatives should consider strengthening direct sales capabilities while exploring digital tools to diversify and optimize their marketing mix.

Table 7 presents the business activities among retailers in the livestock value chain, summarizing several variables related to experience, types of business, product sourcing, contracts, and quality perceptions. The results can be narrated as follows:

The retailers’ years of experience are distributed into four categories. Nine retailers (30.0%) have 0–2 years of experience, indicating a sizable portion of new entrants. Twelve retailers (40.0%) have 3–5 years of experience, showing the largest segment of moderately experienced traders. Eight retailers (26.7%) have 6–10 years, reflecting a solid base of experienced participants, while only one retailer (3.3%) has more than 10 years of experience, suggesting limited longevity in the business.

Table7: The Business activities Among Retailers in the Livestock Value Chain.			
Variables	Categories	Frequency	Percentage%
Years experience	From 0–2 years	9	30.0
	From 3–5 years	12	40.0
	From 6 to 10 years old	8	26.7

	More than 10 years	1	3.3
	Milk Trading	35	83.3
	Haqeen Trading	35	83.3
	Yogurt Trading	7	16.7
Dairy Product and By-Product Type	Cheese	32	76.2
	Labneh - Butter	21	50
	Ghee	32	76.2
	Cheese	2	4.8
	Directly from producers	18	42.9
	From wholesalers	1	2.4
Dairy Product and By-Product Purchasing Source	From manufacturers/processor	5	11.9
	From associations/cooperatives	4	9.5
	From the markets	2	4.8
	From street vendors	10	23.8
	No contracts	33	73.3
Purchase Contracts Type	oral contracts	3	6.7
	Formal contracts	8	17.8
Products Quality	Excellent	17	46
	Middle	20	54

Regarding the types of business activities, milk trading and Haqeen trading are the most common, each involving 35 retailers (83.3%). Yogurt trading is less frequent, with only 7 retailers (16.7%). In terms of dairy product and by-product types, cheese and ghee are the most traded items, each handled by 32 retailers (76.2%), followed by Labneh-Butter with 21 retailers (50%), and a minor involvement with cheese as a separate category (4.8%).

For dairy product and by-product purchasing sources, the majority of retailers acquire products directly from producers (18 retailers, 42.9%). Purchases from wholesalers are less common (1 retailer, 2.4%), while 5 retailers (11.9%) source from manufacturers/processors, 4 (9.5%) from associations/cooperatives, 2 (4.8%) from markets, and 10 (23.8%) from street vendors.

Concerning purchase contracts, most retailers operate without contracts (33 retailers, 73.3%). Oral contracts are used by 3 retailers (6.7%), and formal contracts by 8 retailers (17.8%), indicating a preference for informal arrangements.

Regarding product quality, 17 retailers (46%) rate the products as excellent, while 20 retailers (54%) describe them as middle quality, implying that the perceived quality is generally moderate.

The analysis reveals that the retail sector in the livestock value chain is dominated by relatively young businesses with limited experience, focusing heavily on milk and Haqeen trading, as well as cheese and ghee products. The primary sourcing channel is

direct from producers, highlighting a preference for simple supply chains, while reliance on wholesalers or manufacturers is minimal. The prevalent use of no contracts suggests a high level of informality in transactions, which may affect business stability and risk management. Product quality perceptions are mixed, with a slight inclination toward middle quality, indicating potential opportunities for improvement in product standards or retailer training to enhance quality assessments and market competitiveness

The table (Table 8) presents the roles, activities, needs, and challenges of milk and dairy wholesalers. The results can be summarized in as the follows points:

The survey of dairy wholesalers indicates that the most common product handled by wholesalers is milk, reported by 8 respondents (88.9%), followed by laben (66.7%) and yogurt or ghee (55.6% each). Cheese is the least traded product among wholesalers (33.3%). All wholesalers (100%) source their dairy products from local farmers (breeders), while 44.4% also purchase from form retailers, and 22.2% use collection centers or cooling stores. The primary roles of wholesalers involve trading of dairy products (100%) and transporting dairy products (77.8%), with fewer engaged in packing (33.3%) or operating cooling stores (22.2%) .

All wholesalers (100%) report facing key challenges in their business, with the specific challenges being difficulty obtaining business licenses (100%), shortage of cooling stores (77.8%), and transport-related issues such as road and transport problems and product transport costs (55.6% each). Additionally, 44.4% cite low demand as a challenge. To improve operations, all wholesalers identify the need for cold chain transportation and cold storage equipment (100% each).

Table 8: Role, activities, needs and challenge of milk and dairy wholesalers			
Variable	Category	Frequency	Percentage %
Wholesalers Product Type	Milk	8	88.9
	Yogurt	5	55.6
	Laben	6	66.7
	Cheese	3	33.3
	(Butter)Ghee	5	55.6
Purchase Source	Local Farmers (breeders)	9	100.0
	Collection center	2	22.2
	Form retailers	4	44.4
Roles	Cooling store of Dairy Products	2	22.2
	Dairy Products Packing	3	33.3
	Dairy Products Transport	7	77.8
	Trading of Dairy Products	9	100.0
	No	1	11.1

Wholesaler's Key Challenge	YES	9	100.0
Type of Challenge	Road and transport	5	55.6
	Cost of Products transport	5	55.6
	Shortage to Cooling Store	7	77.8
	Low of Demand	4	44.4
	Difficulty obtaining business licenses	9	100.0
Equipment need for improving	Cold chain transportation	9	100.0
	Cold storing equipment	9	100.0
	Packing Machinery	9	100.0
	Quality control instruments	9	100.0

The findings highlight that milk is the dominant product in the wholesale dairy market, and wholesalers rely heavily on local farmers for supply. The primary activities involve trading and transporting dairy products, emphasizing the importance of logistics in this sector. The major challenges are related to regulatory hurdles (business licenses), infrastructure deficiencies (cooling storage and transport), and cost issues, which affect the efficiency of the dairy supply chain. Addressing these challenges requires investment in cold chain infrastructure and simplification of licensing procedures to enhance the wholesalers' performance and market responsiveness.

Table 9 presents the wholesaler's business information for milk and dairy products, summarizing key operational and financial metrics. The data indicate that the wholesaler (No. 9) sources milk from 58 male producers and 51 female producers, totaling 109 producers. Daily sales amount to 23.1 kg of dairy products. The unit purchase price is 1685.7 Yemeni rials (YER) per unit, while the unit selling price is 2107.1 YER, yielding a net profit of 421.4 YER per unit.

The wholesaler operates with a balanced mix of male and female producers, suggesting inclusive sourcing practices. The daily sales volume of 23.1 kg indicates a modest market size for the wholesaler's dairy products. The purchase price of 1685.7 YER and selling price of 2107.1 YER generate a profit margin of 421.4 YER per unit, reflecting a markup of about 25 % $[(2107.1 - 1685.7) / 1685.7]$. This margin suggests the business is profitable, but further analysis of operational costs and market demand would be needed to assess overall sustainability and potential for expansion.

Table 9: Wholesaler's business information for milk and dairy products		
Variable	Measurement Unit	value
Wholesaler No.	No.	9

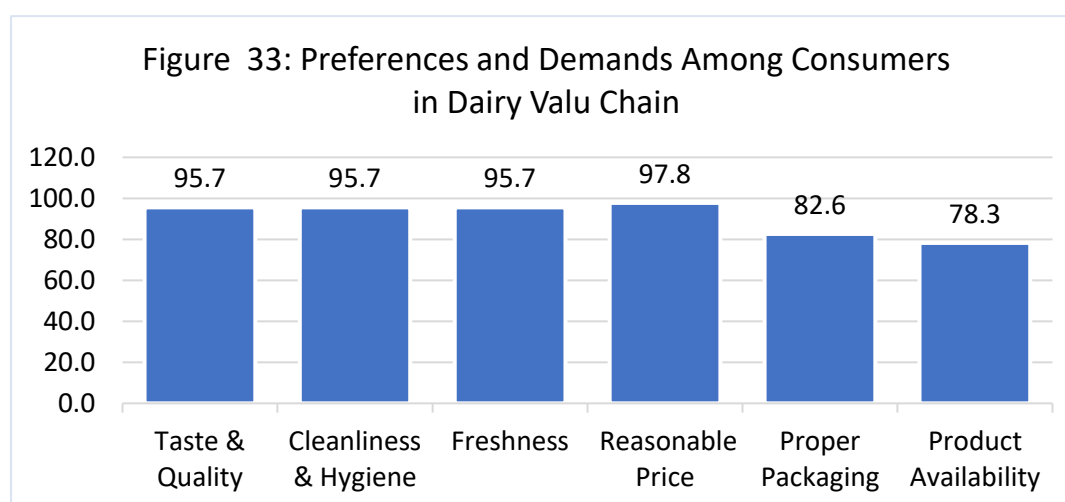
Number of Producers / men	No.	58
Number of Producers / Women	No.	51
Daily Sales/KG	KG	23.1
Unit Purchase Price/ YER	YER	1685.7
Unit Salling Price/ YER	YER	2107.1
Net Profit	YER	421.4

4.4.4 Consumption Stage

In this section, we attempt to understand the end consumers of milk and dairy production, the finding in Figure 33 illustrates the preferences and demands among consumers in the dairy value chain, showing the percentage of consumers who prioritize six attributes: Taste & Quality, Cleanliness & Hygiene, Freshness, Reasonable Price, Proper Packaging, and Product Availability.

The results can be presented as follows:

Consumers in the dairy value chain place the highest importance on Reasonable Price, with 97.8% of respondents rating it as a key factor, indicating that affordability is the most influential driver in their purchasing decisions. Taste & Quality, Cleanliness & Hygiene, and Freshness follow closely, each scoring 95.7%, which shows that sensory attributes and safety concerns are almost equally significant to consumers. Proper Packaging is considered by 82.6% of consumers, suggesting that packaging plays a notable but less critical role compared with intrinsic product qualities. The least emphasized factor is Product Availability, cited by 78.3% of respondents, implying that while accessibility matters, it is the weakest of the measured preferences.



The data reveal that consumers prioritize price sensitivity and intrinsic product attributes such as taste, hygiene, and freshness when choosing dairy products. This suggests that businesses in the dairy sector should focus on maintaining high quality and ensuring competitive pricing to satisfy market demands. Improving packaging and ensuring product availability are secondary strategies, yet they remain important for enhancing overall consumer satisfaction and market competitiveness. The findings imply that a balanced approach addressing both product quality and economic accessibility will strengthen the dairy value chain and better meet consumer expectations.

Table 10 presents the consumer-driven proposals for dairy market development, showing the percentage of respondents who Agree, Strongly Agree, Disagree, or are Neutral about each variable.

The results can be summarized as follows:

A total of 107 % of consumers support combating fraud, with 49 % agreeing and 58 % strongly agreeing, while only 2 % disagree and none are neutral. For providing store facilities, 50 % agree and 56 % strongly agree, again with 2 % disagreeing and no neutral responses. Regarding price control, 23 % agree and 54 % strongly agree, but 4 % disagree and a notable 28 % remain neutral. Improving packing receives 33 % agreement and 52 % strong agreement, with 4 % disagreeing and 17 % neutral. Enhancing market access gathers 40 % agreement and 51 % strong agreement, 4 % disagree, and 14 % are neutral. The provision of refrigerated transport and distribution equipment gets 40 % agreement and 54 % strong agreement, 4 % disagree, and 11 % are neutral. Finally, activating consumer services attracts 50 % agreement and 54 % strong agreement, 2 % disagree, and 3 % are neutral.

Table 10: Proposed for Dairy Market Development by consumer				
Variable	Agree %	Strongly Agree %	Disagree %	Neutral %
Combating fraud	49	58	2	0
Providing store facilities	50	56	2	0
Price control	23	54	4	28
Improve Packing	33	52	4	17
Enhancing market access	40	51	4	14
Providing refrigerated transport and distribution equipment	40	54	4	11
Activating consumer services	50	54	2	3

The data indicate strong consumer endorsement for most development proposals, especially combating fraud, providing store facilities, and activating consumer services, all of which achieve combined agreement (Agree + Strongly Agree) above 100 %. Price control shows the highest neutral rate (28 %), suggesting uncertainty or mixed feelings about its effectiveness. Improving packing and enhancing market access also receive substantial support, highlighting the importance of logistics and packaging in dairy market growth. The low disagreement percentages (2–4 %) across all variables signal broad acceptance of the proposed measures. Prioritizing investments in fraud prevention, facility provision, and consumer services would likely yield the greatest consumer satisfaction and market development in the dairy sector.

The table (Table 11) presents “Factors affected on purchase consumer decision according to Importance Degree important” presents the distribution of consumer responses regarding four variables: Quality of Dairy Products, Price of Dairy Products, Type of Dairy Products, and Reputation and trust in the seller. Respondents rated each variable on a scale from 1 to 5, indicating the importance degree, and the scores are summarized in the rightmost column.

The variables examined are Quality of Dairy Products, Price of Dairy Products, Type of Dairy Products, and Reputation and trust in the seller. Respondents rated each variable on a scale from 1 to 5, where 1 is the highest importance and 5 is the lowest. The results show that the Quality of Dairy Products receives the highest score of importance, with 95 respondents assigning it the top rank (1), indicating that consumers prioritize product quality most strongly when making purchasing decisions. Only a few respondents placed quality in lower importance categories (2, 3, 4, or 5), reflecting its dominant role in decision-making.

The Price of Dairy Products is the second most influential factor, with 134 respondents rating it as importance level 2. However, 9 respondents gave it the highest importance (1), while 52 assigned it a middle rank (4) and none placed it in the lowest category (5). This suggests that price significantly affects choices but is secondary to quality.

The Type of Dairy Products has a notable concentration of responses in the middle to high importance levels (3 and 4), with 180 respondents rating it 3 and 160 rating it 4. Only 2 respondents gave it the highest importance, indicating that the specific type of product is less critical than quality or price but still relevant.

Reputation and trust in the seller show a mixed distribution, with the highest frequency at importance level 4 (164 responses) and a significant score of 100 at level 5. Only 2 respondents ranked it as the most important (1). This implies that trust in the seller has a moderate influence, less decisive than quality or price

Table 11: Factors affected on purchase consumer decision according on Importance Degree important					
Variable	1	2	3	4	5 score
Quality of Dairy Products	95	16	9	8	5
Price of Dairy Products	9	134	60	52	0
Type of Dairy Products	2	10	180	160	5
Reputation and trust in the seller	2	52	60	164	100

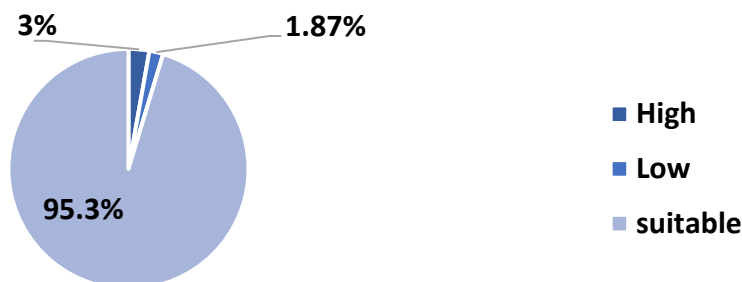
The analysis reveals that quality is the primary driver of consumer purchasing decisions for dairy products, emphasizing the need for producers to focus on maintaining high product standards. Price follows as a significant but secondary factor, suggesting that competitive pricing strategies can influence buyers, especially after ensuring quality. The type of dairy product has a moderate effect, indicating that product diversification should be balanced with quality assurance. Reputation and trust have the least direct impact, yet they still matter in building long-term customer relationships.

In conclusion, dairy businesses should prioritize quality improvement and competitive pricing while also considering product variety and seller reputation to enhance consumer satisfaction and loyalty.

The pie chart labeled “Figure 34: consumer's Assessment of the Current dairy product prices” shows the distribution of consumers’ perceptions of dairy product prices.

The survey results indicate that most consumers, 95.3 %, consider the current dairy product prices to be suitable. A small segment, 3 %, perceive the prices as high, while an even smaller proportion, 1.87 %, view the prices as low.

Figure 34: consumer's Assessment of the Current dairy product prices

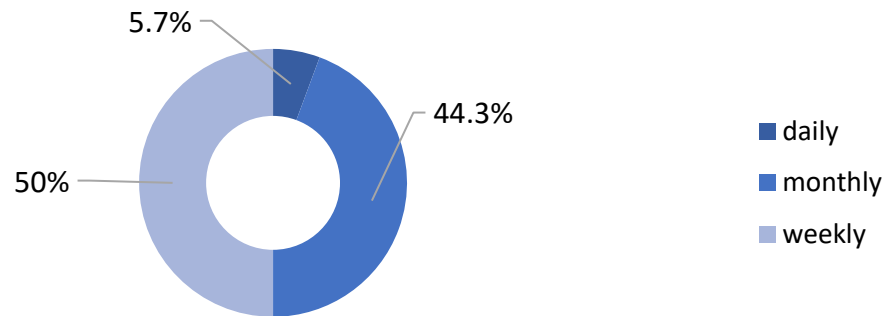


The data reveal a strong consumer acceptance of dairy price levels, with the overwhelming majority finding the prices appropriate. The tiny percentages for “high” and “low” suggest that only a marginal group feels the prices are unfavorable or unusually cheap. This implies that the market pricing strategy for dairy products is generally aligned with consumer expectations, and there is little pressure to adjust prices from the consumer perspective. However, the small “high” segment (3 %) could represent a niche market that might be sensitive to price increases or could be targeted with value-added products to justify the cost. Overall, the assessment signals market stability in dairy pricing.

The results “Figure 35: Frequency of dairy product Purchase by consumer (daily/weekly/monthly)” shows the distribution of consumer purchase frequency for dairy products.

The survey reveals that half of the consumers (50%) buy dairy products on a daily basis, indicating a strong habitual consumption pattern for this group. A significant portion, 44.3%, purchase dairy products monthly, suggesting that a large segment of consumers prefer to stock up less frequently, possibly for budgeting or storage reasons. The remaining 5.7% of consumers buy dairy products weekly, representing a smaller niche that shops with intermediate frequency between daily and monthly habits.

Figure 35: Frequency of dairy product Purchase by consumer
 (daily/weekly/monthly)



The data highlight that dairy products are essential items for a majority of consumers, with half of the market engaging in daily purchases, which implies a need for regular supply chains and freshness assurance. The large monthly purchase segment indicates an opportunity for bulk marketing or subscription services targeting consumers who plan their purchases and likely prioritize cost savings or convenience. The small weekly segment suggests a niche that may value freshness over bulk buying or have specific consumption patterns that require more frequent restocking than monthly but less than daily. Overall, businesses should focus on maintaining daily availability and consider flexible purchasing options (bulk or subscription) to capture both the high-frequency and less-frequent buyer groups.

4.5 Cost-benefit analysis across value chain

The milk value chain is a vital economic sector that provides employment opportunities and generates income for numerous individuals and businesses across various stages of production and distribution. This section aims to analyze the economic aspects of the milk value chain, including cost analysis, revenue, profitability, and resource utilization efficiency. The focus will be on examining value addition at different stages of the value chain, from raw milk production to the distribution of final products such as fresh milk, yogurt, laban, cheese, and ghee. The study will also investigate the distribution of value added among various actors in the chain, including farmers, processors, wholesalers, and retailers. Through this analysis, the most profitable stages in the value chain will be identified, and opportunities for improving efficiency and increasing profitability will be determined. The findings will inform recommendations to enhance the performance of the value chain and contribute to the local economy.

This introduction sets the stage for a comprehensive examination of the economic dynamics within the milk value chain, highlighting its significance and potential areas for improvement.

4.5.1 Value addition across active actors

The analysis of value addition across the milk value chain for fresh milk (per liter) in the study area during 2025 reveals the distribution of value added among different stages of the value chain. The producer sells fresh milk at a price of 1000 YR, adding a value of 1000 YR, which represents 77% of the total value added in the chain, generating the highest gross income among all stages. The collector purchases milk at 1000 YR and sells it at 1160 YR, adding 160 YR of value (12% of the total value added), with a gross income of 160 YR, accounting for 16% of the total gross income. The wholesaler buys at 1160 YR and sells at 1200 YR, adding 40 YR of value (3% of the total value added), with a gross income of 40 YR, representing 3% of the total gross income. The retailer purchases at 1200 YR and sells at 1300 YR, adding 100 YR of value (8% of the total value added), with a gross income of 100 YR, making up 8% of the total gross income (Table 12).

Table 12. Value addition across the milk value chain for fresh milk / (per liter) in the study area during 2025.						
Value Chain Stage	Purchase Price	Selling Price	Value Added (YR)	% share add value	gross income	%Gross income
Producer	—	1000	1000	77%	-	-
Collector	1000	1160	160	12%	160	16%
Wholesaler	1160	1200	40	3%	40	3%
Retailer	1200	1300	100	8%	100	8%

For the yogurt value chain (per kg/pack), the processor purchases inputs at 400 YR and sells yogurt at 650 YR, adding 250 YR of value (54% of the total value added), with a

gross income of 250 YR, representing 63% of the total gross income. The wholesaler buys at 650 YR and sells at 730 YR, adding 80 YR of value (17% of the total value added), with a gross income of 80 YR, accounting for 12% of the total gross income. The retailer purchases at 730 YR and sells at 860 YR, adding 130 YR of value (28% of the total value added), with a gross income of 130 YR, making up 18% of the total gross income. The results indicate that in the fresh milk value chain, the producer captures the largest share of the value added (77%), highlighting the significance of production in the overall value chain. The collector also plays a notable role with 12% of the value added. In contrast, the wholesaler adds the least value (3%). For yogurt, the processor adds the majority of the value (54%), followed by the retailer (28%), indicating the importance of processing in increasing value in the yogurt chain (Table 13).

Table 13. Value addition across the milk value chain for Yogurt (per kg / pack) in the study area during 2025.						
Value Chain Stage	Purchase Price	Selling Price	Value Added (YR)	% share add value	gross income	%Gross income
Processor	400	650	250	54%	250	63%
Wholesaler	650	730	80	17%	80	12%
Retailer	730	860	130	28%	130	18%

The analysis shows that value addition varies significantly across different stages of the dairy value chain and between products (fresh milk and yogurt). Producers in the fresh milk chain and processors in the yogurt chain are the key value contributors. Enhancing the efficiency of these stages or supporting other stages like retailing in yogurt production could optimize value distribution and improve overall profitability in the dairy sector.

The results in (Table 14 and Table 15) present the value addition across the milk value chain for Laban/Labneh and Fresh Cheese in the study area during 2025.

Table 14 shows that for Laban/Labneh, the processor purchases milk at 600 YR per kg and sells the processed product at 1050 YR, adding 450 YR of value (53% of the total value added), which represents 75% of the gross income in this stage. The wholesaler buys at 1050 YR and sells at 1200 YR, adding 150 YR (18% of value added), contributing 14% of the gross income. The retailer purchases at 1200 YR and sells at 1450 YR, adding 250 YR (29% of value added), accounting for 21% of the gross income. The processor captures the largest share of value addition and gross income, indicating that processing is the most profitable stage in the Laban/Labneh chain.

Table 14. Value addition across the milk value chain for Laban / Labneh (per kg) in the study area during 2025.						
Value Chain Stage	Purchase Price	Selling Price	Value Added (YR)	% share add value	gross income	%Gross income
Processor	600	1050	450	53%	450	75%
Wholesaler	1050	1200	150	18%	150	14%
Retailer	1200	1450	250	29%	250	21%

Table 15 presents the value addition for Fresh Cheese. The processor buys milk at 1200 YR and sells cheese at 1900 YR, adding 700 YR of value (54% of the total value added), which constitutes 58% of the gross income. The wholesaler buys at 1900 YR and sells at 2150 YR, adding 250 YR (19% of value added), representing 13% of gross income. The retailer buys at 2150 YR and sells at 2500 YR, adding 350 YR (27% of value added), making up 16% of gross income. Again, the processor dominates the value addition and income share, showing that processing is the key profit generator in the Fresh Cheese chain as well.

Table 15. Value addition across the milk value chain for Fresh Cheese (per kg) in the study area during 2025.						
Value Chain Stage	Purchase Price	Selling Price	Value Added (YR)	% share add value	gross income	%Gross income
Processor	1200	1900	700	54%	700	58%
Wholesaler	1900	2150	250	19%	250	13%
Retailer	2150	2500	350	27%	350	16%

The analysis reveals that in both dairy product chains (Laban/Labneh and Fresh Cheese), the processing stage contributes the highest percentage of value added and captures the largest portion of gross income compared to wholesaling and retailing. This suggests that investing in processing capabilities or improving processing efficiency could maximize profitability in the milk value chain. The retailer adds a substantial portion of value (29% for Laban/Labneh and 27% for Fresh Cheese),

indicating that marketing and distribution also play significant roles in capturing profit. The wholesaler has the smallest share of value addition and income, implying that reducing intermediary costs or integrating wholesale functions into processing or retail could optimize the value chain.

The data in (Table 16 and Table 17) that analyze the value addition in the milk value chain for local ghee and other dairy products in the study area during 2025.

Table 16 shows the value addition across the milk value chain for local ghee (per kg). The chain includes three stages: processor, wholesaler, and retailer. The processor buys ghee at 2000 YR/kg and sells it for 3200 YR/kg, adding a value of 1200 YR/kg, which represents 50% of the total value added and contributes 60% of the gross income. The wholesaler purchases at 3200 YR/kg and sells at 3700 YR/kg, adding 500 YR/kg (21% of value added), generating 16% of gross income. The retailer buys at 3700 YR/kg and sells at 4400 YR/kg, adding 700 YR/kg (29% of value added), contributing 19% of gross income. The total value added along the chain for ghee is 2400 YR/kg.

Table 16. Value addition across the milk value chain for Local Ghee (per kg) in the study area during 2025.						
Value Chain Stage	Purchase Price	Selling Price	Value Added (YR)	% share add value	gross income	%Gross income
Processor	2000	3200	1200	50%	1200	60%
Wholesaler	3200	3700	500	21%	500	16%
Retailer	3700	4400	700	29%	700	19%

Table 17 compares the economic value added by actors for different dairy products. Fresh milk and fresh cheese/butter generate the highest total value added (1300 YR each), while yogurt adds 460 YR and laban/labneh adds 850 YR. Local ghee has the largest total value added of 2400 YR. Producers capture high value for fresh milk and ghee. Processors create very high value for cheese, labneh, and yogurt. Wholesalers have a moderate share, while retailers have a low-moderate share of value added.

Table 17: Comparative the economic value added created by actors and Dairy Products Across the milk value chain.			
Product	Total Value Added Along Chain (YR)	Stage	Share of Value Added
Fresh milk	1300	Producers	High (fresh milk, ghee)
Yogurt	460	Processors	Very high (cheese, labneh, yogurt)
Laban / Labneh	850	Wholesalers	Moderate
Fresh cheese/butter	1300	Retailers	Low–Moderate
Local ghee	2400		

The analysis indicates that the ghee value chain generates the highest cumulative value addition (2400 YR/kg), with the processing stage contributing the largest share (50% of added value and 60% of gross income). This suggests that processing is the most profitable stage in the ghee chain. Fresh milk and cheese/butter also exhibit strong value creation, primarily at the production and processing stages. The distribution of value-added shows that producers and processors capture the majority of economic benefits, while wholesalers and retailers receive smaller shares. Enhancing processing efficiency or expanding product diversification (e.g., cheese, labneh) could further increase overall chain profitability. Policymakers should focus on supporting processors to maximize value addition and income distribution in the dairy sector.

5. Challenges, constraints, Solution and Opportunities.

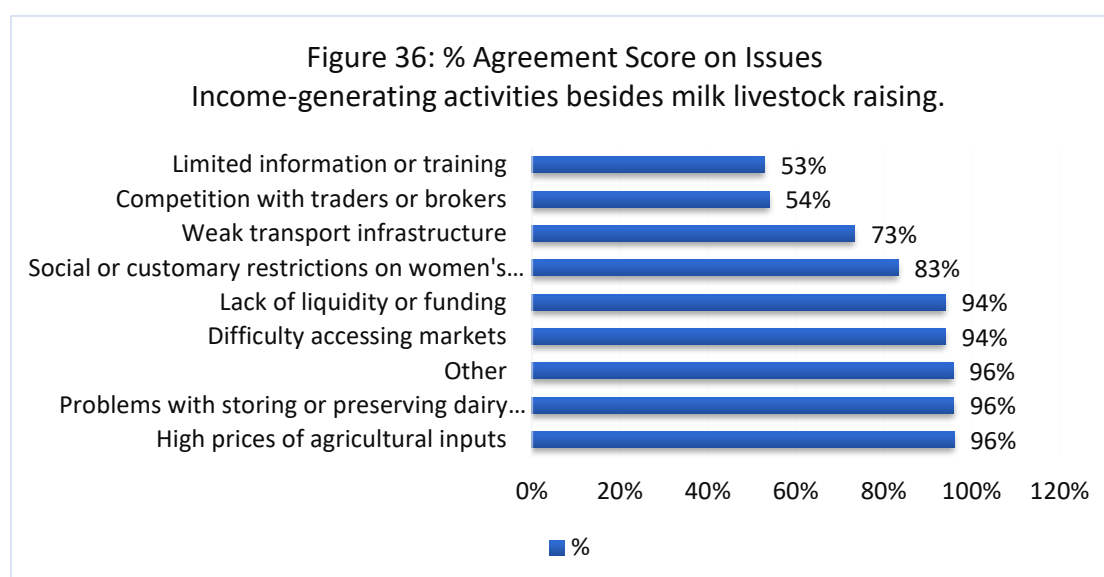
The dairy industry is at a critical juncture, facing multifaceted challenges that impact its sustainability and efficiency. From production to distribution, various obstacles hinder the sector's growth and profitability. However, alongside these challenges lie significant opportunities for innovation, improvement, and growth. This section explores the key challenges confronting dairy producers, potential opportunities to enhance input supply and production processes, and proposed solutions to address these issues, based on the findings presented in section.

5.1 Challenges, Issues and constraints

The main issues facing livestock keeping' activities are multifaceted, as illustrated in Figure 38, which highlights the key obstacles and their relative impact.

Figure 36 presents the percentage agreement scores on issues related to income-generating activities besides milk production and raising goats and sheep/other livestock. The chart shows the following results in descending order of agreement:

The survey reveals that the most pressing issues for income-generating activities beyond milk production and raising goats/sheep are “high prices of agricultural inputs,” “problems with storing or preserving dairy products,” and “other” factors, each scoring 96 % agreement among respondents. These are followed closely by “difficulty accessing markets” and “lack of liquidity or funding,” both at 94 %. “Social or customary restrictions on women’s participation” receive an 83 % agreement score, indicating a significant but relatively lower gender-related barrier. “Weak transport infrastructure” is cited by 73 % of respondents, while “competition with traders or brokers” and “limited information or training” are the least agreed-upon issues, at 54 % and 53 % respectively.



The data highlight that financial and logistical constraints—especially high input costs, market access, and liquidity—are the dominant obstacles limiting non-milk income activities in livestock production. Storage and preservation problems also rank extremely high, suggesting that improving post-production handling could greatly enhance profitability. Gender-related social restrictions are notable but less universal than economic factors, implying that interventions should address both financial infrastructure and cultural empowerment. The relatively low scores for information/training and competition indicate that these are secondary concerns compared with systemic issues like funding and market linkage. Overall, policy or project interventions should prioritize financial support, market facilitation, and infrastructure improvements to alleviate the primary bottlenecks identified in the survey.

Also, there are another challenges facing livestock keeping' activities are multifaceted, as illustrated in Figure 37, which highlights the key obstacles and their relative impact. The presented figure is a pie chart (Figure 39) that illustrates “The challenges facing societies’ activities” based on an average agreement score out of 5. The chart divides the total impact into five categorical variables (challenges), each represented by a percentage share of the overall problem, the pie chart (Figure 39) allocates the relative importance of five challenges as follows:

Lack of funding accounts for 21% of the total agreement score, sharing the highest proportion with “Lack of equipment”. Lack of equipment also represents 21%, indicating that financial and material resource shortages are equally critical obstacles. Animal diseases occupy 20% of the score, making it the third most significant challenge. Weak infrastructure and Competition from imported products each comprise 19% of the agreement score, marking them as relatively less emphasized issues compared with resource-related problems. The distribution shows a balanced perception of challenges, with resource deficiencies (funding and equipment) being the most prominent concerns, followed closely by biological and structural issues.

Figure 37: The challenges facing the farmers Activities According the average agreement Score (out of 5)



The prominence of “Lack of funding” and “Lack of equipment” suggests that societies perceive financial and material resources as primary constraints affecting their activities. This may reflect external economic pressures or internal budgetary limitations that hinder operational capacity. The equal weighting of “Lack of equipment” implies that even when funding exists, the availability or accessibility of necessary tools is a distinct barrier.

“Animal diseases” receiving 20% indicates health-related risks are a notable impediment, possibly linked to agricultural or livestock-dependent societies. The slightly lower percentages for “Weak infrastructure” and “Competition from imported products” suggest these are perceived as less immediate concerns, though they still contribute significantly to operational difficulties, likely influenced by market dynamics and development levels.

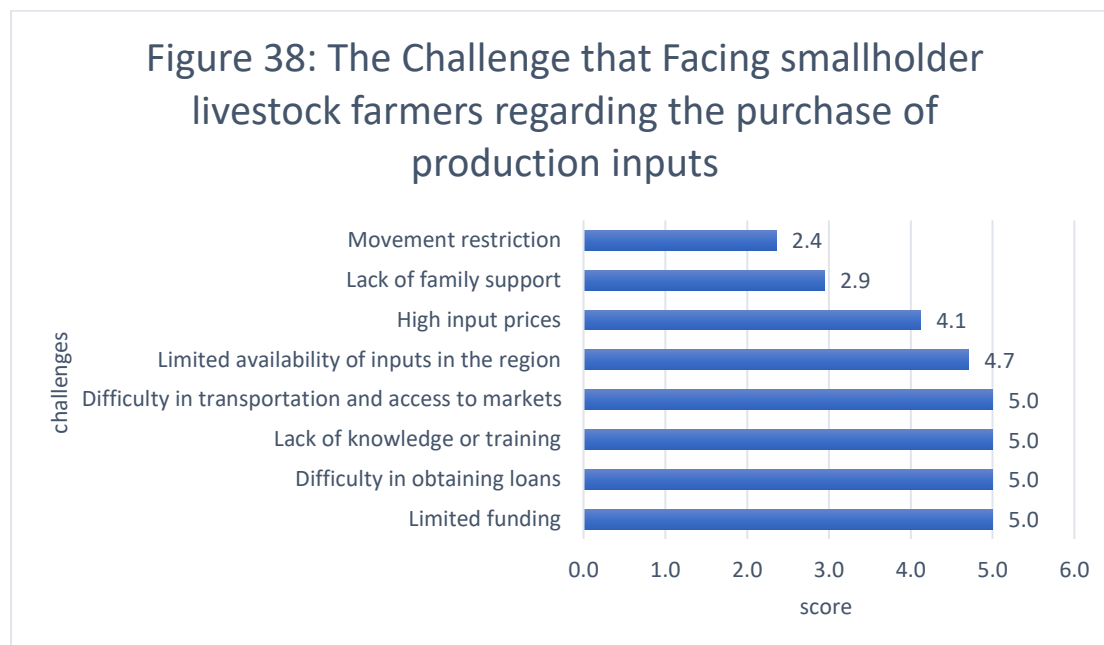
The analysis reveals that resource scarcity (financial and equipment) is the dominant challenge facing societal activities, followed by biological threats and infrastructural weaknesses. The relatively uniform distribution of percentages indicates a multifaceted problem requiring comprehensive strategies.

Prioritizing funding mechanisms and equipment procurement programs to alleviate resource gaps, strengthening veterinary services and disease control measures to mitigate animal health issues, investing in infrastructure improvements to enhance operational efficiency and developing policies to address competitive pressures from imported products, such as supporting local production or quality enhancements.

While the data in Figure 38 presents the challenges facing smallholder livestock farmers regarding the purchase of production inputs, ranked by their average score (0–6). The results can be narrated as follows:

Smallholder livestock farmers experience the most severe obstacles in four areas that all receive the maximum score of 5.0: limited funding, difficulty in obtaining loans, lack of knowledge or training, and difficulty in transportation and access to inputs. These issues indicate that financial constraints and access to resources are the primary barriers for these farmers. The next challenge is the limited availability of inputs in the region, which scores 4.7, showing that even when funds or loans are secured, the necessary materials are often not accessible locally. High input prices are also

significant, with a score of 4.1, implying that cost inflation further hampers procurement. Less impactful but still notable are the lack of family support (score 2.9) and movement restrictions (score 2.4), which affect farmers to a moderate extent compared with the financial and logistical hurdles.



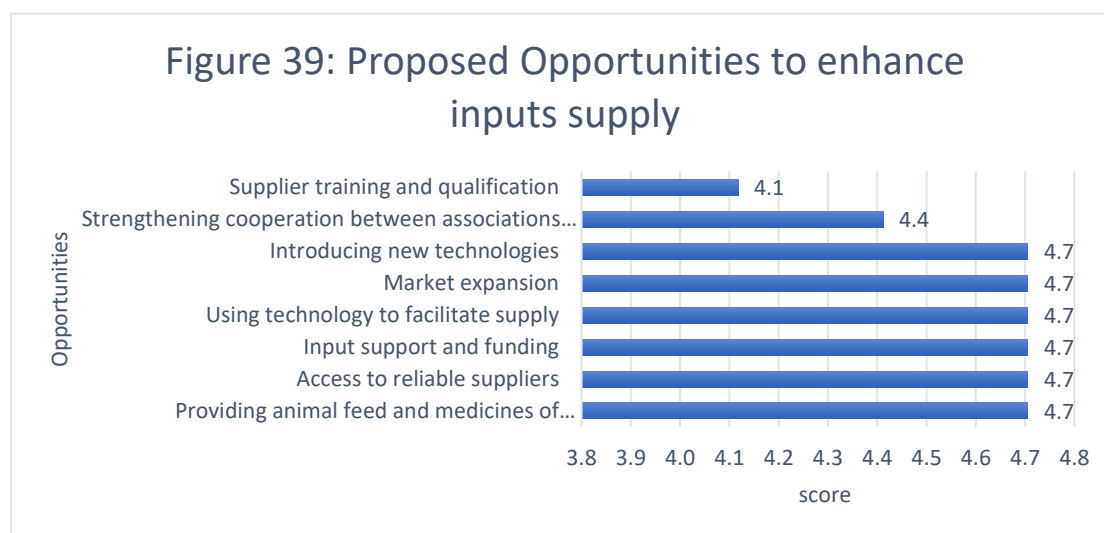
The analysis reveals that smallholder livestock farmers are predominantly constrained by economic and infrastructural factors. The four equally high-scoring challenges suggest an intertwined problem of financial liquidity and knowledge gaps, compounded by poor transportation and market access. Addressing these issues would require multifaceted interventions such as providing micro-finance or grants (to alleviate funding and loan difficulties), establishing local input distribution centers (to improve availability and transport), offering extension services and training programs (to bridge knowledge gaps), and implementing price regulation or subsidies (to mitigate high input costs). The relatively lower scores for family support and movement restrictions indicate that social or regulatory barriers are secondary to economic and logistical ones in this context.

5.2 solution and opportunities.

The purchase of production inputs poses significant challenges for smallholder livestock farmers, as depicted in Figure 39, which outlines the major hurdles they face, To enhance input supply and support dairy production, several opportunities have been proposed, as shown in Figure 44, which ranks the potential impact of these strategies. The opportunities are listed in descending order of their impact scores:

The analysis shows seven strategic opportunities to improve input supply. Supplier training and qualification receives a score of 4.1, indicating it is considered a foundational step to build competent suppliers. Strengthening cooperation between... (likely between stakeholders or sectors) scores 4.4, highlighting the importance of

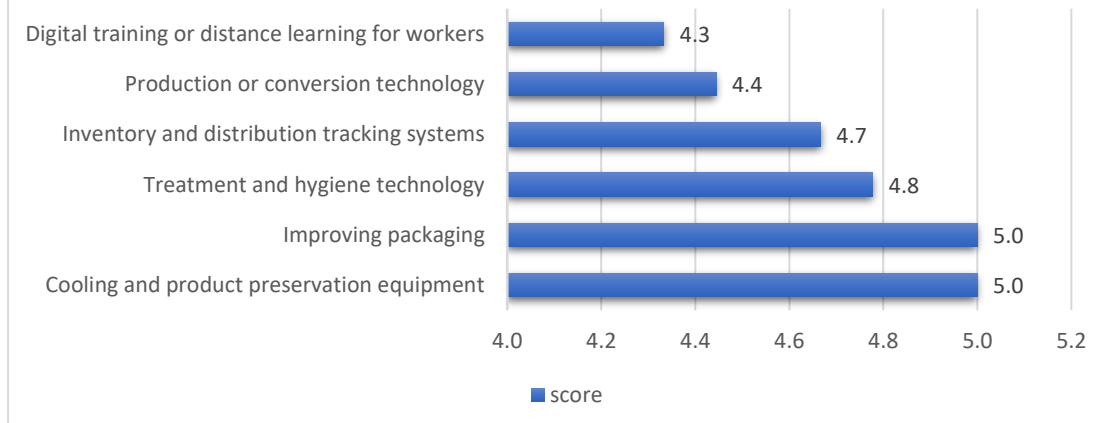
collaboration in enhancing supply chains. The next five opportunities—Introducing new technologies, Market expansion, using technology to facilitate supply, Input support and funding, and Access to reliable suppliers—all achieve the highest score of 4.7, suggesting they are perceived as the most influential actions for boosting input supply. Additionally, providing animal feed and medicines of... also scores 4.7, emphasizing the critical role of essential inputs in the production process.



The results indicate that technological adoption and market-focused strategies are prioritized as the strongest levers for improving input supply, sharing the top score of 4.7 with supply-chain reliability and funding support. This implies that investments in innovation and technology, combined with financial and logistical facilitation, are seen as the most effective ways to enhance the input supply system. Meanwhile, supplier training, though important, is viewed as a baseline improvement with the lowest score among the listed options, suggesting that qualification programs should be complemented with advanced technological and collaborative measures for maximum effect.

The adoption of appropriate techniques and technologies is crucial for improving dairy production, with Figure 40 highlighting the most promising approaches based on expert agreement. The techniques are ranked as follows: “Improving packaging” and “Cooling and product preservation equipment” both received the highest score of 5.0, indicating strong agreement that these are the most effective methods for enhancing dairy production. “Treatment and hygiene technology” scored 4.8, showing a very high level of agreement on its importance. “Inventory and distribution tracking systems” earned a score of 4.7, highlighting its significant impact on dairy management. “Production or conversion technology” received 4.4, suggesting moderate to high relevance. Lastly, “Digital training or distance learning for workers” scored 4.3, marking it as the least prioritized among the listed techniques, yet still positively regarded.

Figure 40:score Agreement of Proposed
 Appropriate techniques/technologies for
 improving dairy production



The results reveal that dairy producers prioritize technologies that directly affect product quality and shelf life, namely packaging and preservation equipment, which received the maximum score of 5.0. This emphasis suggests that maintaining product integrity and extending freshness are critical concerns in the dairy industry. Treatment and hygiene technology also ranks very highly (4.8), underscoring the importance of safety and processing standards. Inventory and distribution systems are valued for optimizing supply chain efficiency, while production/conversion technologies are seen as moderately influential. Digital training for workers, though useful, is perceived as less critical compared with physical and operational improvements, implying that investments should first target equipment and process enhancements to achieve the greatest impact on dairy production.

The appropriateness of various techniques and technologies for improving dairy products is evaluated in Table 18, which presents the results of a survey on the perceived effectiveness of these methods. The results can be summarized narratively as follows: The survey evaluated six variables related to dairy product improvement. Cooling and product preservation equipment received the highest score of 5.0, with 16 respondents strongly agreeing and 29 agreeing that this technology is appropriate, indicating unanimous support with no neutral or disagreeing opinions. Improving packaging also scored 5.0, with 6 strongly agreeing and 39 agreeing, showing full consensus on its importance. Treatment and hygiene technology achieved a score of 4.8; 4 strongly agreed, 39 agreed, and 2 were neutral, reflecting strong overall approval. Inventory and distribution tracking systems scored 4.7, with 1 strongly agreeing, 41 agreeing, and 3 neutral, suggesting widespread acceptance. Production or conversion technology obtained a score of 4.4, with 9 strongly agreeing, 31 agreeing, and 5 neutral, indicating moderate support. Digital training or distance learning for workers received the lowest score of 4.3; no one strongly agreed, 39 agreed, and 6 were neutral, showing the least enthusiasm among the listed techniques.

Table 18: Appropriate techniques/technologies for improving dairy products						
Variables	Strongly agree	Agreed	neutral	Strongly Disagree	Disagree	Score
Cooling and product preservation equipment	16	29	0	0	0	5.0
Improving packaging	6	39	0	0	0	5.0
Treatment and hygiene technology	4	39	2	0	0	4.8
Inventory and distribution tracking systems	1	41	3	0	0	4.7
Production or conversion technology	9	31	5	0	0	4.4
Digital training or distance learning for workers	0	39	6	0	0	4.3

The analysis reveals that physical infrastructure improvements such as cooling equipment and packaging are considered the most critical technologies for enhancing dairy products, achieving perfect scores and unanimous agreement. Treatment and hygiene technology also ranks highly, emphasizing the industry's focus on safety and quality processes. Inventory and distribution systems are viewed positively, highlighting the importance of logistics in dairy management. Production or conversion technology and digital training receive relatively lower scores, suggesting they are seen as less immediately essential or more supplementary compared to direct product-handling technologies. Overall, the dairy sector prioritizes equipment and hygiene measures over training or production upgrades when seeking product improvement

6. Overall Conclusions and Recommendations

According of the results of this assessment, the main finding can be concluded as the following key point:

6.1 Key Conclusions

1. Socio-Economic Importance of Livestock and Milk Production

- Livestock rearing and milk production constitute a critical source of income and food security for rural households in Lahj and Abyan.
- The sector functions primarily as a supplementary livelihood activity rather than a main economic enterprise, limiting investment and expansion.
- The absence of institutional support has resulted in a system sustained by household resilience rather than by an integrated production framework.

2. Demographic and Socio-Economic Characteristics of Livestock Keepers

- Women own a significant proportion of livestock assets and play a central operational role in milk production.
- Low educational levels among livestock keepers constrain the adoption of improved technologies and practices.

- Youth participation across the value chain remains limited, posing a risk to long-term sector sustainability.

3. Herd Structure and Milk Production Systems

- Traditional production systems dominate, resulting in low milk productivity.
- Milk production relies almost entirely on inherited knowledge, with minimal access to formal technical training.
- Limited breed diversity and weak feed and animal health management practices negatively affect productivity

4. Enabling Environment (Inputs, Infrastructure, and Policies)

- Modern production technologies and cold-chain systems are virtually absent.
- Poor infrastructure, including roads, energy supply, and storage facilities, constrains value chain performance.
- The regulatory and policy environment does not adequately encourage private investment in the dairy sector.

5. Role and Performance of Cooperatives

- Cooperative membership among livestock keepers remains low.
- Existing cooperatives largely lack commercial and marketing functions.
- Weak linkages exist between cooperatives, markets, and financial service providers.

6. Skills Gaps and Capacity Development Needs

The analysis reveals critical skills gaps across the dairy value chain, particularly in improved herd management, feeding practices, animal health, hygienic milk handling, and post-harvest loss reduction. These gaps stem from the absence of effective extension services and heavy reliance on traditional knowledge. Cooperatives also lack essential business and marketing capacities, including financial management, collective marketing, quality control, and basic processing skills.

6. Marketing, Distribution, and Value Addition

- Marketing systems are dominated by intermediaries and traders.
- Local dairy processing remains limited, and quality standards are largely absent.
- Producers capture a low share of the total value added within the chain.

7. Access to Finance and Business Support Services

- Access to formal financial services for dairy producers is extremely limited.
- Informal financing mechanisms are widely used.
- Available financial products are poorly aligned with the milk production cycle.

6.2 Key Recommendations

This section outlines recommendations derived from the key finding presented in the study report, which can be categorized into the following areas:

1. Integrate the dairy sector into sustainable livelihood programs as a core economic activity rather than a secondary one.

2. Link livestock and dairy support to social protection and economic recovery interventions.
3. Design phased interventions aimed at sustainably increasing the contribution of milk production to household income.
4. Develop women-focused economic empowerment programs that extend beyond production to include processing and marketing.
5. Apply practical, hands-on training approaches tailored to low-literacy contexts.
6. Integrate youth into value-added activities such as cooling, transport, processing, and digital marketing services.
7. Introduce low-cost productivity enhancement packages, including improved feeding practices, gradual upgrading of local breeds, and basic animal health interventions.
8. Implement regular training programs on herd management and milk production.
9. Strengthen community-based veterinary services and link them operationally to cooperatives.
10. Invest in small-scale milk collection and cooling centers powered by solar energy.
11. Improve access to production inputs through collective procurement mechanisms facilitated by cooperatives.
12. Engage local authorities to simplify procedures and promote small- and medium-scale investment in dairy activities.
13. Restructure cooperatives to function as commercial and market-oriented entities.
14. Build the managerial, financial, and marketing capacities of cooperative leadership.
15. Support the establishment of new cooperatives in underserved districts.
16. Promote direct and cooperative-based marketing models to reduce dependence on intermediaries.
17. Support the development of locally processed, value-added dairy products.
18. Improve packaging, labeling, and quality standards to enhance market competitiveness.
19. Design flexible, dairy-specific financial products tailored to production and cash-flow cycles.
20. Link access to finance with technical training and advisory support.
21. Utilize cooperatives as collective guarantors to improve producers' access to credit.

22. The study underscores the need for practical, market-oriented training programmes, tailored to low-literacy contexts, with a strong focus on women and youth to enhance productivity, value addition, and long-term sustainability.

7. Documentation



During Data Collection using survey with HH of livestock breeders in Tuban /Lahj



Focus Group Discussions (FGDs) with women groups held in Tuban/Lahj



During Data Collection using survey with Wolesallers



During Data Collection using survey with Retailers



During Data Collection Using Survey with Cooperative Associations



During Data Collection Using Survey With Consumers



During Data Collection Using Survey with with Microfinance_Institutions



During Data Using Survey with with Primary Processing

8. Annexes

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