

## Review on Existing Dairy Value Chains and it's Strands to Construct Viable Strategies for Upgrading in Ethiopia

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### Abstract

Ethiopia holds substantial potential in dairy development mainly due to its large livestock population coupled with the relatively suitable environment for livestock production. The aim of this review is to review existing dairy value chains and its strands to construct viable strategies for upgrading in Ethiopia. Based on climate, land holding and integration with crop production, dairy production systems are classified as small-scale rural, peri-urban and urban. While based on market orientation, the scale of operation and production intensity, dairy production systems can be categorized as traditional smallholders, privatized state farms and urban and peri-urban systems. Ethiopia has complex dairy value chain, with both formal and informal channels. Only 5 % of the milk produced in Ethiopia is sold in commercial markets. A dairy sector has significant contribution in supporting household income and job creation. The value chain approach starts from an understanding of the consumer demand and works its way back through distribution channels to the different stages of production, processing, and marketing. A value chain map also allows one to depict all activities, actors, and relationships among segments of the chain, and the interactions between producers and intermediaries. The Ethiopian dairy sector is developing but not to the level of its potential due to various challenges. Moreover, despite of the importances from dairy sector, there are no scholars conducted on the existing dairy value chains and its strands to construct viable strategies for the upgrading of smallholders farmers. For this reason, it has been difficult to formulate and implement the appropriate intervention in relation to dairy value chain development actions. Therefore, it is imperative to conduct comprehensive studies that can cover to construct viable strategies for the upgrading of smallholder dairy farmers by examine the existing dairy value chains system.

**Keywords:** Dairy; Value chain; Strands; Upgrading; Strategies

### Introduction

Ethiopia holds substantial potential dairy development mainly due to its large livestock population coupled with the relatively suitable environment for livestock production<sup>[1]</sup>. Ethiopia is a home for an estimated 57.83 million cattle. Out of this total cattle population, the female cattle constitute about 55.38% of the national herd. Out of this total female cattle population, dairy cows are estimated to be around 20% and milking cows are about 12% million heads during the reference period<sup>[2]</sup>.

The national average daily milk yield, lactation length and lactation yield of cows are 1.35 liter, 6 months and 242.8 liters, respectively. Livestock plays an important role in the national economy. It contributes 10% of all formal export earnings accounting about 150 million USD per year and 300 million USD per year from the informal market sources. Moreover, livestock accounts for 15 to 17% of the total GDP and 35 to 49% of the agriculture GDP. At the household level, it contributes to the livelihoods of approximately about 70% of Ethiopia<sup>[3]</sup>. However, the development of livestock sector is challenged by a number of constraints such as unimproved (traditional technologies), limited supply of inputs (feed, breed, stock, and water), poor extension service, high diseases prevalence, poor marketing infrastructure, lack of marketing support service, lack

**Received date:** December 26, 2018

**Accepted Date:** April 22, 2019

**Published Date:** April 25, 2019

**Citation:** Gebremariam, B., et al. Review on Existing Dairy Value Chains and it's Strands to Construct Viable Strategies for Upgrading in Ethiopia. (2019) Int J Food Nutr Sci 6(1): 13-20.

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of market information and limited credit services<sup>[4]</sup>.

Dairying is one of the investment areas where farmers can undertake to improve their standard of living<sup>[5]</sup>. It is a developmental tool as it expands and sustains three major mechanisms out of poverty; securing the assets, improving smallholders and pastoral productivity and increasing market participation by poor<sup>[6]</sup>. Dairying production is practiced in the pastoralist, agro-pastoralist, and crop-livestock mixed farming, urban and peri-urban ranges from small scale, medium scale, and large-scale practices. Based on climate, land holding and integration with crop production, dairy production systems are classified as small-scale rural, peri-urban and urban<sup>[7]</sup>. While based on market orientation, the scale of operation and production intensity dairy production systems can be categorized as traditional smallholders, privatized state farms and urban and peri-urban systems<sup>[8]</sup>. The traditional smallholder dairy production system is not market-oriented and most of the milk produced is retained for home consumption. Milk production in this system is characterized by low yield and seasonal variability<sup>[9]</sup>. In the case of privatized state dairy production system producers raise animals primarily to produce milk with intensive feeding and management practices to generate profits. They regard their milk production as an important business, rather than as a sideline activity<sup>[10]</sup>. Whereas urban and peri-urban dairy production sector accounts most of the country's improved dairy stock and serves as the major milk suppliers to the urban market<sup>[4]</sup>. The major sources of milk in Ethiopia are dairy cows that account 83 % of total milk production, while goats and camels also account 17 % of milk production in pastoralist areas<sup>[11]</sup>.

In Ethiopia, dairy value chain accounts about 500,000 smallholder rural farmers who produce about 1,130 million liters of milk, of which 370 million liters of raw milk, 280 million liters of butter and cheese and 165 million liters that are consumed by the calves<sup>[12]</sup>. The remaining 315 million liters are marketed through both informal and formal retailers through cooperatives and farmers' organizations. Currently, the demand for dairy products in the country exceeds supply, which is expected to encourage rapid growth in the dairy sector<sup>[13]</sup>. Factors contributing to this include rapid population growth<sup>[14]</sup>, increased urbanization and expected growth in incomes<sup>[1]</sup>.

Value chain analysis is essential to an understanding of markets, their relationships, the participation of different actors and the critical constraints that limit the growth of livestock production and consequently the competitiveness of smallholder farmers<sup>[15]</sup>. Value-chain analysis can play a key role in identifying the distribution of benefits of actors in the chain. That is, through the analysis of margins and profits within the chain, one can determine who benefits from participation in the chain and which actors could benefit from increased support or organization. This is particularly important in the context of developing countries (and agriculture in particular), given concerns that the poor in particular are vulnerable to the process of globalization<sup>[16]</sup>. Ethiopia has complex dairy value chain, with both formal and informal channels. Only 5 % of the milk produced in Ethiopia is sold in commercial markets<sup>[17]</sup>. Therefore, this review review existing dairy value chains and its strands to construct viable strategies for upgrading in Ethiopia

## **Analysis of Existing Dairy Value Chains and its Strands to Construct Viable Strategies for Upgrading in Ethiopia**

### **Concepts and definitions**

**Dairy value chain analysis:** Refers to the various stage through which milk and milk products pass from farm to the final consumers<sup>[18]</sup>. The value chain approach starts from an understanding of the consumer demand and works its way back through distribution channels to the different stages of production, processing, and marketing<sup>[19]</sup>.

**Value chain:** The value chain is the full range of activities that are required to create and add value to a finished product or service. This refers to the different phases of production from raw material, processing, distribution, and marketing until the product or service reaches the consumer and is disposed of after use<sup>[16]</sup>.

**Supply chain:** Supply chain is defined as the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce values in the form of products and services in the hands of the ultimate customer or consumer<sup>[20]</sup>. Likewise, another author stated that supply chain is concerned with the coordinated flow of materials and services from origins through suppliers into and through the organization and on to the ultimate consumer in such a way as to maximize value added and minimize cost<sup>[21]</sup>. Milk Supply chain takes the similar orientation as meanings given by the above authors.

**Value chain actors:** Chain actors are defined as those involved in supplying inputs, producing, processing, marketing and consuming a particular agricultural product. The actors include directly involved in the value chain (rural and urban farmers, traders, retailers, cafes, and consumers or indirect actors who provide financial or non-financial support services such as credit agencies business services and government, researchers and extension agents<sup>[22]</sup>.

**Value chain influencers:** It influences the operation of the chain by providing the regulatory, framework, policies, infrastructures and administrative conditions that have to be meeting all players within the value chain. The value chain concept entails the addition of value chain as the product progress from input suppliers to producers and consumers. A value chain, therefore, incorporates productive transformation and value chain addition at each stage of the value chain. Value addition results from diverse activities including bulking, cleaning, grading, and packing, transporting, storing and processing<sup>[4]</sup>.

**Value chain mapping:** A value chain map allows one to depict all activities, actors, and relationships among segments of the chain and the interactions between producers and intermediaries. Information from a market analysis is used in conjunction with detailed firm data to understand the sourcing, production, and delivery segments of an industry at micro levels<sup>[23]</sup>.

**Value chain analysis:** It examines the full range of activities required to bring a product or service from its conception to its

end use, actors that perform those activities in a vertical chain and final consumers for the product or service<sup>[24]</sup>. Value chain analysis involves collecting information about firms and market connections to identify strengths or weaknesses in the coordination of these activities and to examine the power and position of firms in relationship to other actors in the chain<sup>[25]</sup>.

**Service providers:** Service providers are individuals or firms providing a service without taking ownership of the product are considered as service providers. Support service providers are essential for value chain development and include sector specific input and equipment providers, financial service, business management service, and market information access and dissemination, technology suppliers, advisory service, and others important services for smallholders<sup>[16]</sup>.

**Value chain governances:** It refers to the structure of relationships and coordination mechanism that exist between actors in the value chain<sup>[26]</sup>. The value chain can be classified in two based on the governance structure: buyer-driven value chain and producer-driven value chain<sup>[16]</sup>. Buyer-driven chains are usually labor industries and more important international development and agriculture.

**Value chain upgrading:** Upgrading refers to the acquisition of technological capabilities and market linkages that enable firms to improve their competitiveness and move into higher-value activities. Upgrading in firms can take place in the form of process upgrading, product upgrading, functional upgrading and chain upgrading<sup>[16]</sup>. Likewise<sup>[27]</sup>, upgrading refers to the innovation that increases firm and / or value chain competitiveness.

**Dairy production systems in Ethiopia:** Dairy production is an important part of the livestock production systems in Ethiopia. Cattle, camel, and goats are the major sources of milk and milk products in Ethiopia<sup>[28]</sup>. According to the same source, cattle produce 83 % of the total milk and 97 % of cow milk comes from indigenous breeds. Dairy production is practiced almost all over Ethiopia (pastoralists, agro-pastoralistscrop-livestock mixed farming, urban and peri-urban farming systems) involving a vast number of small scale, medium scale, and large scale operation farms. In Ethiopia, a different type of milk production system can be identified based on various criteria. According to<sup>[29]</sup>, dairy production systems could be identified; urban system, peri-urban system, and rural systems. Each of these systems is defined by its location, agro-ecology, their main production objective, resources and resource use, the scale of production and management, market orientation, and access to inputs and services. Likewise<sup>[7]</sup>, based on climate, landholdings, and integration with crop production, dairy production systems are classified as small-scale rural; peri-urban and urban.

**Urban dairy systems:** It is located in cities and/or towns and focuses on production and sale of fluid milk, with little or no land resources, using the available human and capital resources mostly for specialized dairy production under stall feeding conditions. As compared to other systems they have relatively better access to inputs (e.g. feeds) and services (e.g. artificial insemination) provided by the public and private sectors and use

intensive management<sup>[9]</sup>.

**Peri-urban dairy production system:** It is mainly operational in areas where the population density is high agricultural land is shrinking due to expanding urbanization or non-existence and labor cost is on the increase. Such producers are mainly found around big cities like Addis Ababa and smaller towns. They may or may not have access to cultivable or pastureland and some of them are usually seen grazing the few animals they have by the roadside. In genotype, the animals they keep range from 50% crosses to high-grade black-and-white Friesian. Their main source of animal feed is home-produced hay for some and purchased hay for others with or without an additional supplemental feed<sup>[9]</sup>.

**Rural dairy production system:** Part of the subsistence farming system and includes pastoralists, agro-pastoralist, and mixed crop-livestock producers mainly in the highland areas. The system is not market-oriented and most of the milk produced is retained for home consumption. As reported by<sup>[30]</sup>, of the total annual milk production in rural areas, 85% is used for household consumption 7% is sold. The same source reported, this sector is largely dependent on the indigenous zebu breeds of low productivity, which produce about 400–680 kg of milk / cow per lactation period. The level of milk surplus is determined by the demand for milk by the household and its neighbors, the potential to produce milk in terms of the herd size and production season, and access to a nearby market. The surplus is mainly processed using traditional technologies and the processed milk products such as butter, ghee, ayib and sour milk are usually marketed through the informal channels after the households satisfy their needs<sup>[31]</sup>. Dairy farmers in the peri-urban and urban areas are specifically targeting consumer in the nearby town and city. Producers would have a better understanding of dairy management. Producers will sell to processors or direct to consumers. These producers have better genetics with greater dependence on artificial insemination services. The preferred cross-bred cows have 50–62.5% improved genetics. Because of the scarcity of land, cattle are maintained under confined systems where the feed is provided directly to cattle<sup>[32]</sup>.

**Dairy product marketing system in Ethiopia:** Dairy products in Ethiopia are channeled to consumers through both formal and informal dairy marketing systems<sup>[1]</sup>. Until 1991, the formal market of the cold chain, pasteurized milk was exclusively dominated by the DDE (Dairy Development Enterprises) which supplied 12% of the total fresh milk in the Addis Ababa area<sup>[33]</sup>. Recently, private businesses have begun collecting, processing, packing and distributing milk and other dairy products. However, the proportion of total production being marketed through the formal markets remains small<sup>[34]</sup>. Formal milk markets are particularly limited to peri-urban areas and to Addis Ababa. Over 85% of the milk produced by rural households is consumed within the producer households with the proportion marketed being less than 7%<sup>[35]</sup>.

**Informal milk trade:** According to<sup>[36]</sup> revealed that the milk marketing system in Ethiopia is not well developed giving the large majority of smallholder milk producers, limited access

to the market. The informal market involves direct delivery of fresh milk by producers to consumers in the immediate neighborhood and sale to itinerant traders or individuals in nearby towns<sup>[37]</sup>. The term 'informal' is often used to describe marketing systems in which governments do not intervene substantially in marketing. Producers sell the surplus milk produced to their neighbors and/or in the local markets, either as liquid milk or in the form of butter and /or Ayib<sup>[38]</sup>. This system is characterized by no license to operate, low cost of operation, high producer prices as compared with the formal market and no regulation of operation<sup>[39]</sup>. The hygienic condition of milk and milk products channeled through this system is also poor. This is mainly due to the prevailing situation where producers have limited knowledge of dairy product handling coupled with the inadequacy of dairy infrastructure such as cooling facilities and unavailability of clean water in the production areas<sup>[31]</sup>.

**Formal milk trade:** In the formal system, milk is collected at the cooperative or private milk collection centers and transported to processing plants. In this system, milk quality tests are performed on delivery, thereby assuring the quality of milk. This has encouraged the producers to improve the hygiene conditions, storage, and transportation of the milk in order to avoid rejection of the product on delivery to the collection center. The formal milk market appears to be expanding during the last decade with the private sector leading the dairy processing industry in Addis Ababa and other major regional towns. However, the share of milk sold in the formal market in Ethiopia (2%) is much less than that sold in neighboring countries: 15% in Kenya and 5% in Uganda<sup>[34]</sup>. In fact, the vast majority of milk produced outside urban centers in Ethiopia is processed into products by the farm household and sold to traders or other households in local markets<sup>[37]</sup>. Although the price of the different inputs into the dairy production varies and is constantly increasing, milk producers continue to get very low amounts for their products as compared to the cost of production. Most farmers live in remote areas not easily accessible by road to facilitate transportation of agricultural products including milk and milk products to places with storage facilities and selling points.

**Dairy product processing:** Dairy product processing is generally based on ergo (fermented milk), without any defined starter culture or with a natural starter. Milk is either kept at warm temperature or in a warm place to ferment prior to processing<sup>[40]</sup>. Milk processing is basically limited to dairy farmer level and hygienic qualities of products are generally poor<sup>[41]</sup>. Dairy products require processing to meet consumers' needs and tastes and it can prolong the shelf life of a product, especially for perishable products. For example, processing fluid milk into milk products such as butter, cheese, and other products enables the producer to store the product longer<sup>[26]</sup>. The dominant milk processing method across rural dairy production system is traditional home processing method and it involves processing of fluid milk into fermented or sour milk, butter and local cheese (ayib). For example, in the rural highland system, milk is fermented for 3 to 5 days before it is processed into butter and other milk products<sup>[42]</sup>. About 0.6 kg of butter is produced from 10 liters of milk (approximately 16.5 liters of milk is required to produce 1 kg of butter) through the traditional milk processing methods<sup>[29]</sup>.

For processing, the milk should be fermented either in a plastic container or other local materials made from clay. Butter is the major value added product produced at the units it is used for cash generation, cooking Ethiopian dishes, and medicinal and cosmetic purposes (e.g. application to the braided hair of women). In almost all societies of Ethiopia, women are responsible for butter<sup>[43]</sup>.

## **Constraints and opportunities of dairy production and marketing in Ethiopia**

### **Constraints of dairy production and marketing**

The Ethiopian dairy sector is developing but not to the level of its potential mainly due to various challenges. Some of these are presented in each of stage value chain.

**Input supply:** In this stage the primary constraints to increase the dairy production under all production system are: inadequate animal feed resources and expensiveness price, limited access and high cost of dairy heifers/cows, limited availability of credit to the dairy farmer and inadequate veterinary and artificial inseminations service provision<sup>[32]</sup>. Feed is the key input for animal productivity and its cost represents more than 60 % of operating costs in a commercial dairy business<sup>[44]</sup>. The dairy sector is constrained by an insufficient quantity of forage produced on the farm, insufficient inputs for commercial feeds and lack of quality feed formulation. Seasonal fluctuation in the availability and quality of feed has been a common phenomenon, inflecting serious changed in livestock production. The feed shortage mostly happens in the dry season of the year<sup>[45]</sup>. The improved crossbreed, grade, and pure exotic dairy cattle are usually in short supply and when available, the high cost is a major problem. Prices of crossbreed cows and heifers are now unaffordable by the poor and the average smallholder farmers that would have liked to engage in the dairy business<sup>[17]</sup>.

Diseases and parasites are the major constraints to improved dairy production in Ethiopia, which caused poor performance across the production system<sup>[45]</sup>. The prevalence of various animal diseases, tick-borne diseases, internal parasites, and infectious diseases affect dairy development programs in varying scales, depending on ecological zones and management levels. The animal health services provided are inadequate; the cost of drugs and acaroids is very high, while the diagnostic services are not readily available to the dairy farmer<sup>[36]</sup>. Financial support or credit facilities to smallholder farmers who intend to enter into commercial dairy farming are very much limited. The importance of establishing credit facilities is a crucial step to the country's dairy sector as indicated in the livestock development master plan<sup>[36]</sup>.

**Production stage:** The main problem of milk production in the country is that of the poor genetic potential of the indigenous cattle, which gives rise to low milk output. Milk production is as low as 0.5 to 2 liter per day over a lactation period of 160 to 200 days<sup>[46]</sup>. Low health care is also they cause directly to production through diminished reproductive performance<sup>[47]</sup>. In general Poor husbandry practices, the in dairy sectors is the main challenged in the production and productivities animals.

**Marketing:** Access to the local market is the most important economic determinant to adopt technologies<sup>[48]</sup>, and choice of production enterprises. Marketing constraints include fluctuation in demand and supply of dairy products (as a result of feed shortage and different socio-cultural reasons), poor infrastructure (Lack of cooling facilities, simple processing equipment and quality testing skills and equipment) and the long time fasting of the members of the Ethiopian Orthodox church<sup>[49]</sup>. Many people of Ethiopia are Orthodox religion believers and they have a great role in milk marketing during the long fasting period<sup>[50]</sup> indicate that the calendar of Orthodox Christian church involves three prolong fasting period per year (before Easter, in August, in December) and two fasting periods every two weeks (Wednesday and Friday ) for a total of more than 200 days per year. During the fasting period, most of Orthodox Christian abstains from consuming products of animal origin then it is a big challenge in demand marketing of milk and milk product. Distance to markets, shortage of milk and seasonal fluctuation in milk supply, lack of training in milk handling and marketing lack of access to market, cultural taboo to sell milk spoilage of milk, and high transport cost have been also the major reasons for weak market access in Ethiopia<sup>[29]</sup>.

**Processing:** Shortage of raw milk supply and milk quality problems coupled with a shortage of technical skills to process value-added products such as cheese and butter, low level of market linkage among the value chain actors, low marketing skills that lead to poor labeling, distribution and the high cost of packaging. Local small-scale processors complained about poor demand for their processed products<sup>[51]</sup>. Most of the dairy cooperatives are inefficient and ineffective, have limited knowledge and skill in dairy husbandry practices and dairy business, lack transparency and accountability. Unlike cooperatives, the involvement of private sector in the collection, processing, and marketing of dairy products is very weak<sup>[29]</sup>.

**Opportunities of dairy production and marketing:** Ethiopia is endowed with large and diverse dairy animal genetic resources, which are widely distributed across the various agro-ecologies and climatic conditions prevalent in the country. With continued urbanization, growing population size, demand for and consumption of milk, income generation and employment opportunity. There are indications that dairy production will be a major player in the agricultural development and has further potential to contribute extensively towards increased income generation, food security, and the creation of job opportunities<sup>[29]</sup>. The ultimate goal of the intervention in the dairy production in general and dairy Value chain, in particular, is to increase the urban and peri-urban incomes by increasing and the number of urban and peri-urban dairy producers deriving the livelihood and upgrading from dairy industry through high productivities enterprises while delivering affordable dairy products to the markets.

**Empirical review in dairy value chain analysis:** There are a number of studies that have employed in dairy value chain analysis. According to<sup>[52]</sup>, Business Promotion and Consultancy Service conducted a study to analyze the milk and milk products value chain in Borana pastoral community, primarily undertaking an in-depth assessment of the milk and milk products

marketing through identifying actors' factors and relationships. This study identified that, there are opportunities which the competitiveness of milk subsector can be built upon, there was untapped high milk production potential, small portion of the total marketable milk reaches the terminal market, addressing the constraints needs a value chain approach, there were organizational and business management and development gaps among the small-scale milk processing units, any interventions in the milk and milk value chain should address the poor pastoralists.

Fluid milk value chains assessed at two peri-urban sites in western Oromia, Ethiopia<sup>[53]</sup>. The identified key value chain stages were: input supply, production, marketing (distribution), processing and consumption. No formal milk marketing and processing system prevailed in both areas; the milk produced is generally channeled through informal routes. Inadequate supply and the high price of, dairy feeds, inefficient breeding and veterinary service and a shortage of land was observed to be critical constraints. The subsector was also observed to face various technical, institutional and policy-related constraints that are institutional and policy-related constraints that are responsible for the inefficiency embedding in the value chains. Strategic directions to alleviate these constraints and make dairy development venture more attractive are also pinpointed for further development interventions.

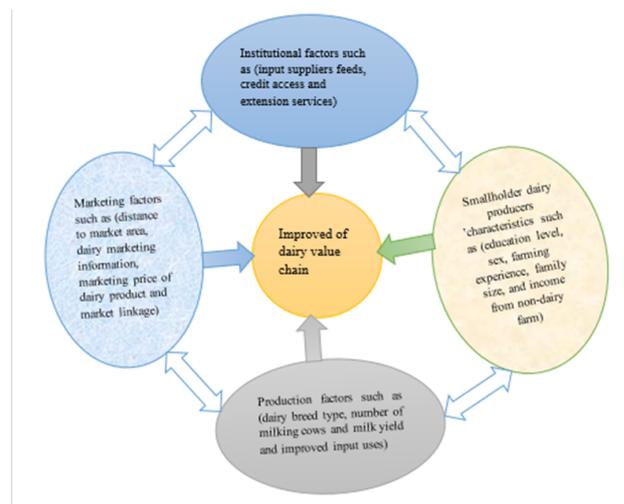
Major constraints and opportunities in the dairy value chain could be used as points of entry for research, policy and development interventions to revitalize the dairy sector<sup>[54]</sup>. The data was uses of both qualitative and quantitative data collected from primary and secondary sources and analysis by descriptive statistics. The authors explained that dairy value chain in the study areas involves six distinct value-adding activities from the inception of the milk production through reaching to the final consumer. These activities include input supply, production, gathering (bulking), processing, transportation and retail trading. Most farmers do not have access to training on ration formulation and improved feeding techniques. They feed their animals based on their own experience and by copying what other farmers in the area are doing. In the study the major prioritized challenges that hampers the development of the dairy value chain of the study area based on their order of importance include feed shortage and undeveloped forage seed production, low quality and poor timeliness of Artificial Insemination and animal health service provision, lack of awareness and knowledge regarding improved feed formulation, information gap on credit services and weak coordination between union, primary cooperatives and farmers. In the study areas major interventions such as: Introduce improved forage seeds, Improve the effectiveness and efficiency of artificial insemination service and training of farmers on improved feed formulation techniques and scale up/out good practices are suggested to overcome the priority constraints of the dairy value chain actors and make use of the available opportunities in order to improve the dairy value chain in the study area.

A study conducted on liquid milk and feed value chain analysis in Wolmera District<sup>[51]</sup>. He reported that access to market-related to distances from market points for producers is a major factor affecting marketing. Establishing cooperative collection centers and strengthening the capacities of existing ones may help producers in the distant areas to access inputs and ser-

VICES and fair prices for their saleable products. Currently, the growing population and improving living standards are increasing the demand not only for quantity but also for quality and diversity of milk products. Ever increasing the cost of inputs, especially the cost of feed, is one of the factors affecting milk production and marketing. In this regard, proper interventions should be considered to safeguard smallholder producers and consumers

A study conducted on analysis of the dairy value in Dire Dawa<sup>[55]</sup>. They found that the dairy value chain in Dire Dawa is not well organized. The roles and functions of all actors in the value chain are not clear and there is a weak linkage between milk producers, traders and all stakeholders of the dairy industry in the area. In order to develop the dairy sector in Dire Dawa, there is a need to consider the constraints of the dairy sector identified in the study. Besides, based on the constraints identified, possible intervention strategies should be designed and applied along the entire value chain in order to bring about positive change in the dairy industry in the area. The above-mentioned studies provide useful information on the organization and functioning of dairy production and marketing systems. However, the previous studies did not give a complete picture, because of their limited studies coverage.

**Conceptual framework of dairy value chain:** This framework is a dairy value chain of smallholder which provided a visual view of interactions among smallholder dairy producers' internal and external environmental factor within dairy product marketing chain actors. At this conceptual framework, smallholder dairy producers characteristics (such as education level of the individual dairy producers, sex of household milk producers, the farming experience of producers, family size, and income from the non-dairy farm) and institutional factors (such as input suppliers like credit access and extension service). Production factors (such as dairy breed type, the number of milking cows and milk yield and improved input uses). Marketing factors (such as distance to the market area, dairy marketing information, marketing price of the dairy product and market linkage) are influences the level of dairy production and marketing (Figure 1). Positive interaction among smallholder dairy producer characteristics, institutional factors, production factors, and marketing factor, leads to improve dairy production and supply in dairy product marketing in the study areas. However, production constraints (for example dairy breed type, the number of milking cows, milk and butter yield, feed, disease and other husbandry practices) have direct influence in the amount of dairy product produced and this has an influence on dairy product marketing volume of supply and sales. This is because when the production is more constrained, the dairy product marketing system tends to inefficient and lacking.



**Figure 1:** Conceptual framework of dairy value chain  
**Source:** Own computation from survey result, 2016

## Conclusions and Recommendations

The main dairy value chain segments identified were: input supply, production, marketing, processing, and consumption. Key inputs / services used in the dairy production system activities are improved feed, artificial insemination and veterinary services, extension services and labor. There are also public and private supportive services that support dairy value chain directly or indirectly. From different dairy value chain analysis, the predominant problem is market access which hampers profitability of smallholder dairy producers from the sector. Therefore, institutional interventions (establishment of dairy producers-led-cooperatives, processors, easy access to dairy market information) are the best alternative to save the producers from losses of dairy products due to lack of market. Government and other stockholders should work here as the main actor to provide dairy market information and to mobilize and establish dairy producer-led-cooperatives. Most of the smallholder dairy producers in Ethiopia are using traditional dairy production technique that results in low milk production. Creating awareness and other capacity building intervention of smallholder dairy producer for quality and quantity milk production are one of the ways to assist dairy producers in building on their resources to create more income by managing their dairy farm skillfully and get a good price in the market. Hence, all concerned organizations (chain enablers) should focus on the provision of appropriate training for both dairy producer farmers and extension agents on how to manage dairy cattle and incorporate new technologies profitably into farm level production strategies.

**Acknowledgements:** I am grateful to Raya University for providing internet access. I am also indebted to all my colleagues who devoted their time, energy and their resources for sharing vital comments and suggestions.

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