MOVING DAIRY FARMERS FROM INFORMAL TO FORMAL MILK SUPPLY CHAIN: A CASE OF TANGA DAIRY COOPERATIVE UNION, IN TANGA DISTRICT, TANZANIA.

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Management – specialization in Livestock Production Chains.

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Acknowledgements

Dedication

I dedicate this work to my lovely wife, Grace Peter Muro for her tireless encouragement, endless prayers, everlasting love and most of all for being an inspiration and being with me every step of the way. I cant thank you enough mother, may this be for you.

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List of Abbreviations

ADF	Ammy Dairy Farm
BEP	Break Even Point
FC	Fixed Cost
DADPs	District Agricultural Development Plans
FGD	Focus Group Discussion
FMD	Food and Mouth Disease
GDP	Gross Domestic Product
MCC	Milk Collection Centre
MFEA	Ministry of Finance and Economic Affairs
MLDF	Ministry of Livestock Development and Fisheries
SWOT	Strength, Weakness, Opportunities and Threat
TAMPA	Tanzania Milk Processing Association
TALIRI	Tanzania Livestock Research Institute
TBS	Tanzania Bureau of Standard
TC	Total Cost
TR	Total Revenue
TFDA	Tanzania Food and Drugs Authority
TFL	Tanga Fresh Limited
UHT	Ultra High Temperature
URT	United Republic of Tanzania
VC	Variable cost
IC	Indirect cost

Abstract

The theme of the research is "Moving dairy farmers from informal to formal milk supply chain" *A case study of Tanga Dairy Cooperative Union in Tanga district, Tanzania".* The study was carried out in two wards of Tanga district namely Pingon and Pongwe, between the end of June and the fist half of August 2018, Tanzania. The objective of the study was to give the recommendations to the TDCU on the strategies which can be followed to improve milk supply of sufficient level throughout the year.

The research surveyed the status of the TDCU and the contributions toward improving milk supply from its members. Simple random and purposive sampling was carried out to select forty smallholder dairy farmers (twenty farmers per ward), two chain supporters, TDCU, three retailers, one competitor, and two milk retailers. Then interviews were conducted through semi structured questionnaires to gather the relevant information from smallholder dairy farmers according to the research objective and sub questions. Focus Group Discussion was used to collect required information from chain supporters, TDCU and one TDCU competitor in order to get an accurate result from the above listed stakeholders. Data collected by semi-structured questionnaire survey was coded, entered, cleaned and analysed by using SPSS statistical software of 19 versions and Excel spread sheet. Value chain mapping was used to show both qualitative and quantitative data collected.

The Tanga Dairy Cooperative Union (TDCU) is the umbrella organization for seventeen primary co-operative societies, which are located in Tanga region with a total membership over 5000 smallholder dairy farmers. It was registered in 1993, with the roles of bulk collection, bulk processing and marketing of processed dairy products. The plant has the capacity of processing 80,000 litres of milk per day. Current milk volumes delivered by its numbers is around 35,000 litres per day, as a result the processing plant operates under its capacity (43.8% less than its installation capacity). Most of the TDCU members market their milk to the informal market through milk hawkers in their neighbourhood, who collect milk from smallholder dairy producers and sell it to hotels/restaurants and vendors.

The field study results revealed that there are different factors that cause low volume of milk supply to TDCU. Among these factors are side selling of milk by its members to Ammy Dairy Farm who compete with TDCU in milk collection and processing, the high cost of milk production, poor dairy breeds, lack of transparency between the TDCU and its members are some of the major factors leading to a low volume of milk supply.

Out of the total interviewed dairy farmers, 60% ranked the high cost of input supply (i.e. animal feeds, unreliable AI services); 15% mentioned insufficient extension services and 25% mentioned poor dairy cow breeds as the main problems causing low milk production in the study area. Additionally, 72.5% of the members of the TDCU sell their milk directly to local consumers and side sell to ADF. Only 15% of the respondents frequently deliver their milk directly and only to the TDCU and the rest (12.5%) of the interviewed dairy farmers sell their milk both to TDCU and to local consumers.

It is recommended that, in order to build trust and to improve their relationship with its members, TDCU should provide strong economic benefit for its members through sharing information and available resources. The TDCU should provide incentives for members including credit with low interest in order to expand their dairy business, and incentivize the members deliver high volumes of good quality milk through out the year.

Key words: Market channel, Milk Collection Center, Milk production, Dairy farmers, TDCU.

CHAPTER ONE: INTRODUCTION

1.1 Overview of the Dairy sector in Tanzania

Tanzania is one of the developing countries in East Africa bordering the Indian Ocean, between Kenya and Mozambique, with a total area of about 945,097 square kilometres of which approximately 5, 5048 square kilometres is land water. The population of Tanzania is round 42.87 million people (Economic Survey, 2010).

According to the Economic survey, (2008) the livestock industry is presently contributing 5.9 percent to the National Gross Domestic Product (GDP) of which 31% comes from dairy products. Besides its share to the GDP, the dairy industry plays an import substitution role for most of its products consumed in the country and acts as a source of animal protein and 20% employed by the livestock sector to the rural population.

Tanzania has opportunities to develop the dairy industry, in 2008 it was estimated to have 18.8 million heads of cattle, the third largest in Africa after Ethiopia and Sudan Njombe, (2008). Though the performance of the sector has been dismal in an absolute context, the output of milk per cow is low with the country only producing 1.667 billion litres of milk in 2008 (MLDF, 2016).

Its was reported that in Tanzania, the average milk processed in the country was 88,440 litre per day or 32.28 million litres per annum. Thus the installed capacity can absorb 7.75% of domestically produced milk. In 2008 most of the dairy plants operated at about 25% of their capacity, this accounts only for 1.94% of the total milk produced in Tanzania (World bank, 2008).

The promotion of dairy products marketing through cooperatives as a means of linking smallholder dairy farmers to markets is a key pillar of Tanzania rural development polices. Cooperatives can help dairy farmers to increase market information and so help them to increase their wealth. As individual smallholder farmers, it is difficult to access timely and relevant market information, they have less bargaining power, insufficient information to market and their linkage to markets are weak (Kawa, 2007).

Moreover, Penrose-Buckley (2007) endorsed that farmer cooperative are easy to form, flexible and can be used to address many issues that are facing many farmers. Through cooperatives, the members can create ideas, share concerns, offer support to each other, share the existing skills as well as learn new ones and empower themselves. By sharing their production efforts through their cooperatives, followers can access better prices, and improve the quality of their produce.

Tanga region has a large population of cattle (322,351 cattle) and produces approximately 20, 315, 219 litres of milk per year (MLDF, 2016). The idea of starting the Dairy Cooperative Union became more feasible in the Tanga region. The aim of the TDCU to its members is to reduce transaction costs, increase market access by providing the smallholders dairy farmers with better extension services at affordable prices and other services that facilitate higher dairy productivity (TDCU, 2013).

1.1.1 Tanga Dairy Cooperative Union (TDCU)

The Tanga Dairy Cooperative Union (TDCU) is the umbrella organization for seventeen Primary Co-operative Societies, which are located throughout the eight districts in Tanga region, with a total membership over 5000 smallholder dairy farmers. It is privately owned by smallholder dairy farmers in the Tanga region. The plant has the capacity of processing 80,000 litres of milk per day. It was registered in 1993 and the majority of the milk producers are smallholder dairy farmers, mainly located in rural areas with only a few members in urban areas.

The seventeen primary cooperative societies are generally operating as milk collection centres with varying membership and their own leadership. Despite that TDCU plays a great role in the bulk collection, processing and marketing of processed dairy products, the milk supply is insufficient to meet the processing capacity of the processing plant. This is similar for most of the Dairy Cooperatives in Developing Countries (Van der Valk and Tessema, 2010).

Currently, the average milk supply to TDCU from its members has declined as a result of the TDCU processing plant under capacity and is therefore inefficient. This has an effect on the cooperatives profitability of dairy products marketing. Due to this situation, TDCU does not benefit well from the principle of economies of scale.

1.2 The principle of economies of Scale

The concept of "economies of scale" of a dairy processing plant, it involves the cost advantage that occurs when a processing plant increases the scale of production per unit of product output. The idea is based on the inverse relationship between the quantity produced and per unit fixed costs. Therefore, the greater the quantity produced, the lower the fixed costs of the processed products, as these costs are shared over a larger number of products. At the same time, many variable costs can be reduced due to operational efficiencies and synergies.
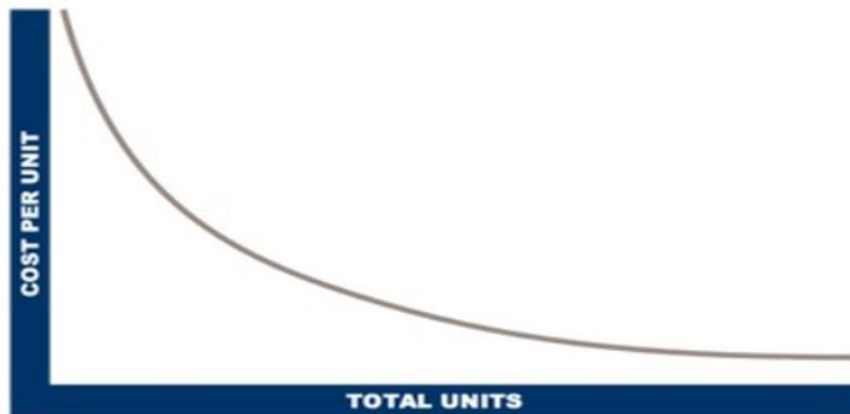
Figure 1: Cost and output relationship

For instance, dairy processing plant processes products with a fixed cost of USD10,000 for production of 100 units. Thus, the cost of production is USD100 per unit. However, if the factory increases its production to 1000 units from the same factory; the fixed cost is the same i.e. USD10,000. Thus, when production increases to 1000 units, the unit fixed cost is just USD10. Thus, because of the increase in manufacturing capacity or total units produced, economies of scale sets in and the cost of the product goes down. Additionally, economies of scale from a different perspective. One of them consists in the two types of economies of scale, either internal, when it is arising from within the company or external, when it is arising from external factors such as industrial size operation (Landsburg, 2012).

Low milk supply to TDCU has an effect on the profitability of its dairy products marketing. This is because the processing plant is operating below the breakeven point. Hence the identification of the key factors that cause low milk supply to TDCU is very important in order to strength the position of TDCU in the milk value chain in the study area.

1.3 Problem statement

Tanga Dairy Cooperative union is playing a great role in the bulk collection, processing and marketing of processed dairy products, current the average of milk collect to TDCU is 35,000 litres per day which still low instead of reaching full capacity of 80,000 litres per day (TDCU,2016).

As a result of the low volume of milk collected, the TDCU could not get enough amounts of milk and the processing plant work under its efficiency of 43.8% of the installation capacity. This reduction in the volume of milk supply to the dairy cooperative has an effect on the profitability of the dairy cooperative, what they can get from dairy products marketing to improve the income of its members.

Due to this continues the reduction in the volume of milk supply to TDCU the current levels of cooperative milk collecting, processing and marketing activities are not large enough to have an important impact on the income of its members because of the quantity of milk collected is low as compared to what the TDCU collected in the previous time.

Given this background, the study aim is to find out why smallholder dairy farmers do not deliver their milk to the TDCU and prefer to sell through the informal marketing channel which will be the basis for recommendations to the TDCU, what should be done to improve milk supply so as to ensure sufficient supply of good quality milk for the effectiveness and strengthening the position of TDCU in the value chain in the study area.

1.4 Problem justification

The Government of Tanzanian through the District Agricultural Development Plans (DADPs) has organized smallholder dairy farmers, has facilitated the formation of the Dairy Cooperative Union and has helped them to jointly market their produce. This has resulted in increased bargaining power for smallholder dairy farmers. This enables them to have easy access to extension services, market information, agricultural inputs and finance/credit (MLDF, 2016).

Due to the low volume of milk supply to TDCU, processing and marketing are not sufficient to have a significant positive impact on the income of smallholder dairy farmers. Hence there is a need for research to identify the major causes of low milk supply to TDCU and to develop recommendations, and policies/ strategies to be followed by TDCU in order to improve milk supply of the sufficient level through out the year.

1.5 Research objective

The objective of this study is to determine the factors causing low milk supply to TDCU and to give the recommendations on the strategies which can be implemented in order to improve milk supply of sufficient level throughout the year.

1.6 Research questions

Two main questions were formulated in line with the objective of the study. For each of the main questions, sub-questions were generated.

Main research question 1

What are the main factors that contribute to low milk supply to Tanga Dairy Cooperative Union in the study area?

1. What is the current potential of milk production in the study area?

2. What are the roles of the Tanga Dairy Cooperative Union in milk value chain in the study area?

3. What are the different factors that cause dairy farmers to choose between formal and informal milk marketing channels in the study area?

Main research question 2

What are the strategies that TDCU should be implemented to improving the milk supply of sufficient level through out per year?

1. What is the value share of different the actor gets from informal and formal milk value chain in the study area?

2. What are the challenges of milk collection and processing?

3. What can be done to improve milk deliveries to the Tanga Dairy Cooperative Union?

1.7 Conceptual framework

 To conduct this research work the following conceptual frame work was used to generate the required information related to milk value chain analysis with particular emphasis on the basic concept of the value chain, the definition of terms, Dairy Cooperative Union and other associated issue related to milk production potential, milk marketing channels, value share of different stakeholders participate in the formal and informal marketing chain and consumption were assessed from different sources.
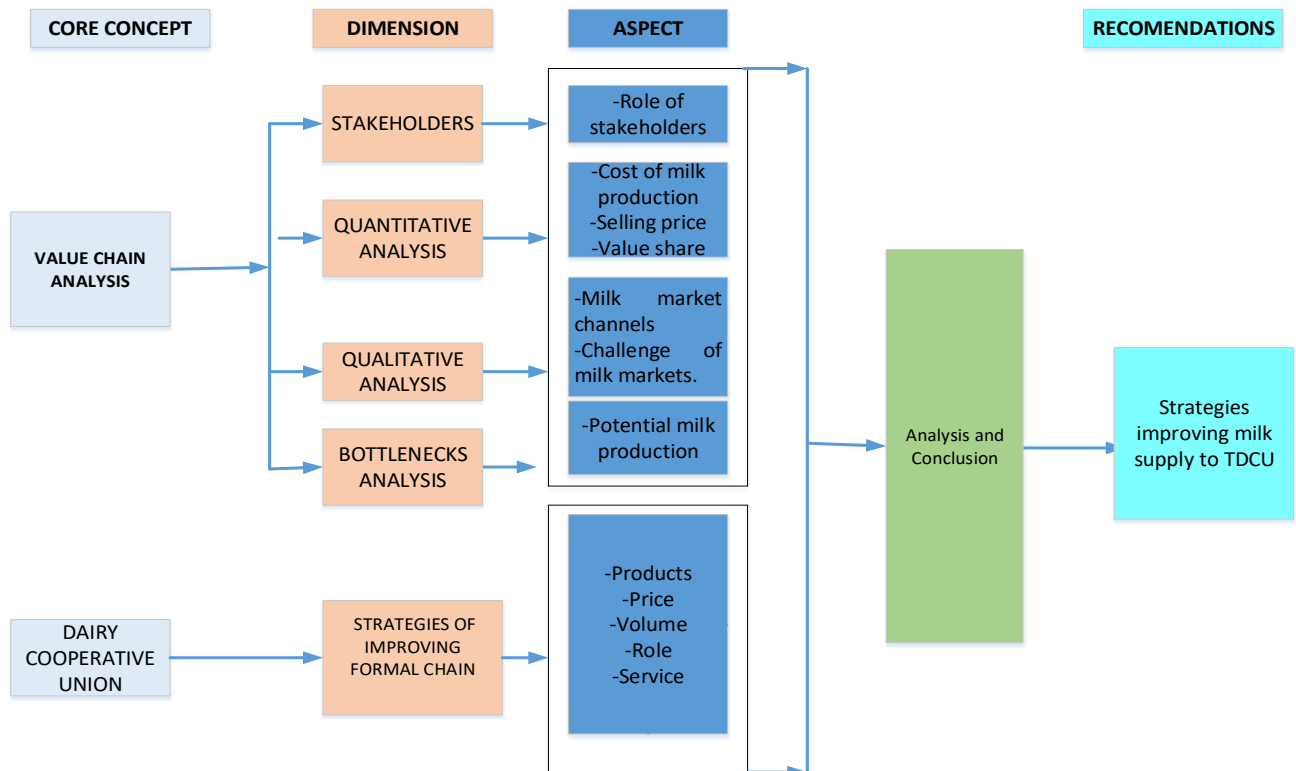
Figure 2: Conceptual frame work: Source: Author, 2018

1.8 Definition of concepts

Bargaining power is the ability to influence the price or terms of a business transaction and can enable producers to negotiate for better prices, such as a long-term supply agreement or access to business services.

Chain actors: These are the chain players who directly deal with the products through either production, processing, trading or consuming (Roduner, 2007).

Chain supporters: are the service providers by actors who never directly deal with the product but whose service add value to the product for instance like banks, microfinance institutions, insurance companies, transporters, brokers; and other supporters including NGOs, government agencies, and research centres (KIT and IIRR 2010).

Dairy Cooperative-A co-operative is a group of people who work together willingly to meet their common economic, social, and cultural needs through a jointly owned and democratically controlled enterprise. Co-operative members believe in honesty, openness, social responsibility and caring for others.

Formal chain: Supply chain where actors support each other so that they can increase their efficiency and completeness (Land O'Lakes, 2010).

Informal chain: Set of linkage between actors in a chain who do not seek to support each other and have no binding relationships either formal or informal apart from when transacting agreements involving the exchange of products and money.

Primary society- Primary Societies are generally agriculture based and include all the producers of a given product in a given village.

Profitability: It is the return to investment given by profit divided by cost price expressed as a percentage.

Smallholder dairy goat farmer- Is a farmer rearing 2-5 dairy cattle's in zero grazing or semi intensive system for income generation.

Stakeholders- people who are directly involved in the dairy value chain. These include actors, chain supporters and chain Influencers.

Value addition is simply the act of adding value (s) to a product to create a form, whether you have grown the initial product or not. It involves taking any product from one level to the next (Kahan, 2004).

Value chain development- Value chain development is understood to be strategies used to improve small-scale dairy farmers' participation in chain activities and their involvement in the management of the chain (Kahan, 2004).

Value chain mapping: a value chain analysis systematically maps the actors involved in the production, collection, processing, wholesaling, retailing and consumption of a particular product/ products. This mapping assesses the characteristics of actors profit and costs structure and flow of goods, money and information through the chain (Roduner, 2007).

CHAPTER TWO: LITERATURE REVIEW

This chapter presents out the review from the previous study which was related to my research study, in order to find out the information which can support my findings. Under this heading different issues related to milk value chain with particularly emphasis on the basic concept of the value chain, dairy cooperative and other associated issue related to milk production, milk marketing channels and consumption will be assessed from different published and documents sources.

2.1 Value chain concept

The value chain is a prearranged and operational model by which businesses receive raw materials, add value to the raw materials through various processes to create a finished product, and then sell that end product to consumers (Roduner, 2009).

The value chain perspective offers an important means to understand the business-business relationships between the different actors which are involved in order to increase efficiency and ways to enable a business to increase productivity and add value. Many agricultural food chains in Africa, such as in Tanzania are very short because of the rampant informal market which limits value addition in the chain (Richter, 2008).

2.1.1 Dairy stakeholders

Stakeholders in the Dairy value chain map include the value chain actors, value chain supporters and chain influencers. Value chain actors are stakeholders who are directly involved with products as it passes from production to the consumer. These include input suppliers and service providers of feeds, veterinary drugs and farm equipments. Findings are highlighted by Anteneh(2008) asserting that Governmental Organizations and the private sector play a vital role in the provision of different inputs services and products such as animal feeds, AI service, pasture and forages establishments.

Milk producers who are involved in milk production. Modderman(2010) who argues that low production and performance by most of the dairy farmers in Tanzania is linked to many attributes which lower milk production. Some of them include poor market linked, land size, quality of pasture and forage, milk quality, insufficient capital to invest in the dairy business and inadequate dairy training. Including their organisations, Similar findings from UNIDO (2009) reported that due to severe shortages of animal feed supplies and poor dairy breeds, the cost of running a dairy farm is becoming more expensive and this affect dairy farmers welfare.

Dairy processors including both small and large scale milk processors and those who add value to the raw milk in other forms, including formal and informal traders, retailer and consumers of milk and dairy products including consumers organisations. Chain supporters these are stakeholders who are not directly dealing with the product but provide services that add value to the product. These include extensionist, donor agencies, local government authorities, transporters. Chain influencers include the regulatory framework, policies, infrastructure at the local, national and international level (Roduner, 2009).
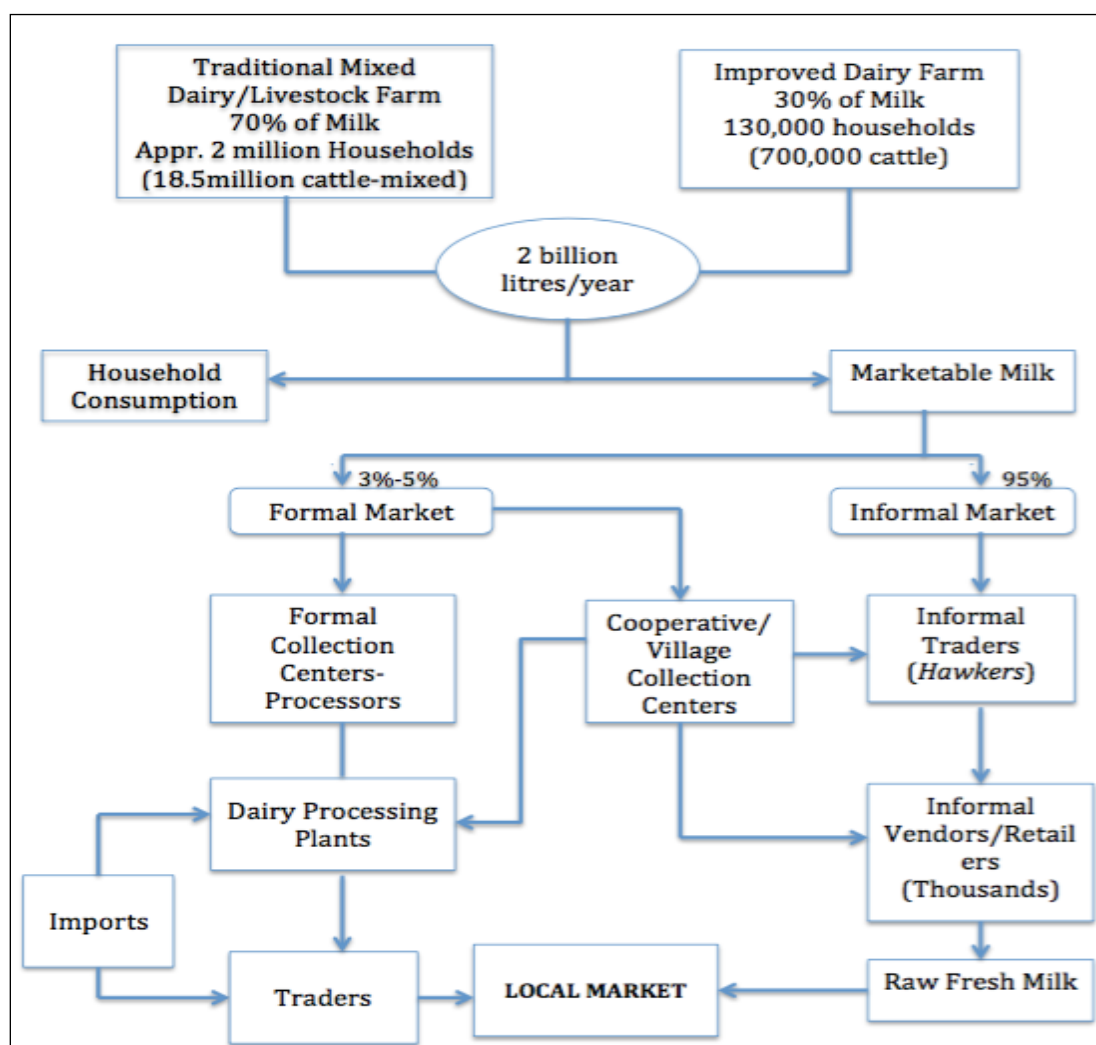
Figure 3: Tanzania cow milk value chain. Source: Modified word Bank, 2012.

In the dairy value chain in Tanzania, 10% of raw milk produced reaches both formal and informal markets, of this only 2% are formally traded. Kurwijila, (2010) reported that, in the commercial dairy sector 30% of milk is produced, the milk market share is apportioned as: neighbours (86.1%), local market (5.3%), traders at the farm (4.6%) and processing factories (1.4%).

2.1.2 Information and cash flow

Information and money flows are very important when handling perishable products such as milk and milk products, especially referring to sustainability aspects. It is therefore important to familiar key information system issues to chain management for an efficient flow of physical products, information and money flows since they are vital to creating a transparent and successive value chain (Vorst, 2000). The material flow is from input suppliers to the consumer while money flows are from consumers to input suppliers and it is vice versa. Nevertheless, information flows in both directions with actors proactively sharing relevant information. Furthermore, communication and information sharing accelerates improvements in the chain coordination and efficiency through reduction of transaction costs and fast relaying of necessary information leading to achieving greater operational efficiencies (Kotabe et al.,2003). To access markets has been one of the factors swaying the performance of smallholder producers in developing countries (World Bank, 2007).

2.2.3 Value shares

Generally in the dairy value chain, value share means the cost and risks an actor has put in a chain. If the actor added more value into the product the value share should be high. According to the (KIT and IIRR, 2008), this is the percentage of the final retail price that the actor earns. It is calculated as follows:

$$Value\ share = \frac{Added\ value}{Final\ retail\ price} \ x\ 100\%$$

2.2 Milk production potential of Tanzania

Tanzania milk production mainly comprises of smallholder dairy producers. The enormous majority of whom keeps "Zebu" traditional cattle (98% of the total available cattle). Precisely, "70% of the total national milk production originates from smallholder dairy farmers (Quaedackers, 2010).

Milk production in Tanzania has been increasing over time, however, it should be noted that the increase is due to the augmented number of dairy cattle and not the production per herd. Still this increase of milk production does not go in streak with the human population growth. FAOSTAT data reveal that yields (litres/Animal) have gradually been increasing but still remain very low underneath half a litre per animal (Randolph *et al.* 2008).

Modderman, (2010) who reported that the low dairy production performance of the smallholder dairy farmers is associated with many attributes. Some include low market price, small land size for pasture and forage establishment, insufficient capital and inadequate dairy training. KIT et al (2006) reported that in order for the dairy farmers to improve their profit from their milk produced, dairy farmers should add value to their product through vertical integration to earn more profit.

A large part of the milk produced is consumed on the farm, while the rest is mainly marketed through informal channels by milk hawkers and delivered door to door to the consumers. Round 3% of milk produced by the dairy famers were marketed through milk collection centers and processed to dairy products and sold by formal retailers to the consumers (MLDF,2016).

In Tanzania, the dairy industry donates one-third of the total livestock's contribution to GDP. According to the National Economic Survey report (2014), It has been reported that total milk production in Tanzania is estimated to be 2.1 billion litres per year. Out of the total annual milk production 70% of the milk produced by the local dairy breeds and 30% from the improved cattle mainly kept by smallholder dairy producers.
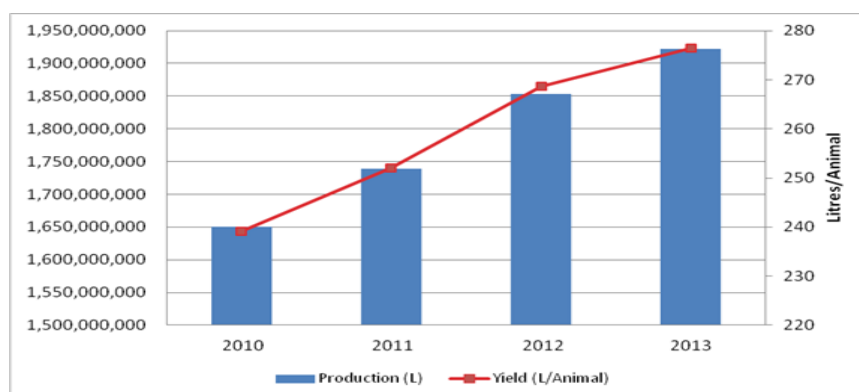
Figure 4: Tanzania milk production and yield trend of the year 2010/2013.

Source: FAOSTAT,2016.

Further more the study conducted by the Anteneh, (2008) reported that an average milk yield per cross breeds dairy cow and the local breeds dairy cow was 9.63 and 2.10 litres per day respectively. This variation in the average milk yield per cow has been attributed to the difference in dairy breeding potential for milk production and herd management practices.

However, the Economic Survey (2015) reported that, the increase in the level of dairy productivity in the country largely depends on the proper development in infrastructure, which comprise roads, cooling and storage facilities in MCC as well as crossbreeding of indigenous cattle.
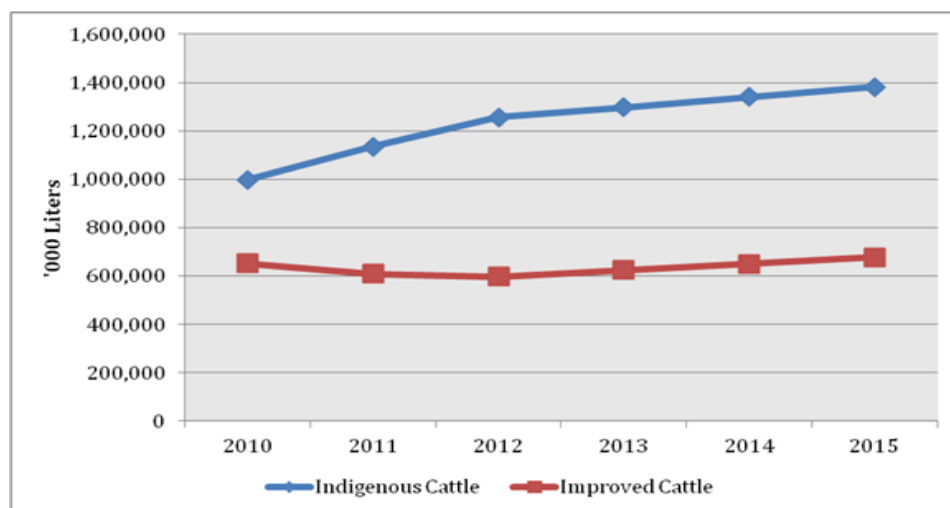
Figure 5: Annual Contribution of Produced Milk by type of Cattle (%), 2010-2015

Source: Economic survey, 2015.

2.3 Tanzania Milk Collection Centers

Generally, Tanzania collection of milk is carried out at the Milk Collection Centers where most of the smallholder dairy farmers are deliver their milk to the nearby Milk Collection Centers. Most of the milk collection centres are concentrated in an area with high milk production is takes place. Most of the Milk Collection Centers is owned by a Dairy Cooperative Union together with milk processing company to collect the milk and processing it into different dairy products (Land O'Lakes, 2010).

2.4 Tanzania Milk processing plant

Tanzania is stated to have a total of 72 milk plants processing. The total milk processing plant in Tanzania varies in the processing efficiency, but an average domestic milk processing varying potential and accounting for actual processing capacity of 121,620 litres out of 501,500 litres per day of installed capacity. According to statistics from Tanzania Milk Processors' Association (TAMPA), there are five main processing plants account for 57per cent of the total amount of milk processed per day with the foremost plant processing capturing more than 25 per cent. Most of the processing capacities of all the processing plants are still preform under efficiency, with an average of 30% of the total installed capacity (TAMPA, 2016). It is reported that 41 million litres of milk are processed annually were processed into pasteurized milk, cultured milk, ghee, UHT, butter, cheese and cream and sold in the domestic market (MLFD, 2016).

According to Match Maker Associates Ltd (MMA, 2008), reported that dairy industries did not get enough guard and support from the Government especially in improving dairy policies regulation in order to favour dairy industries development.
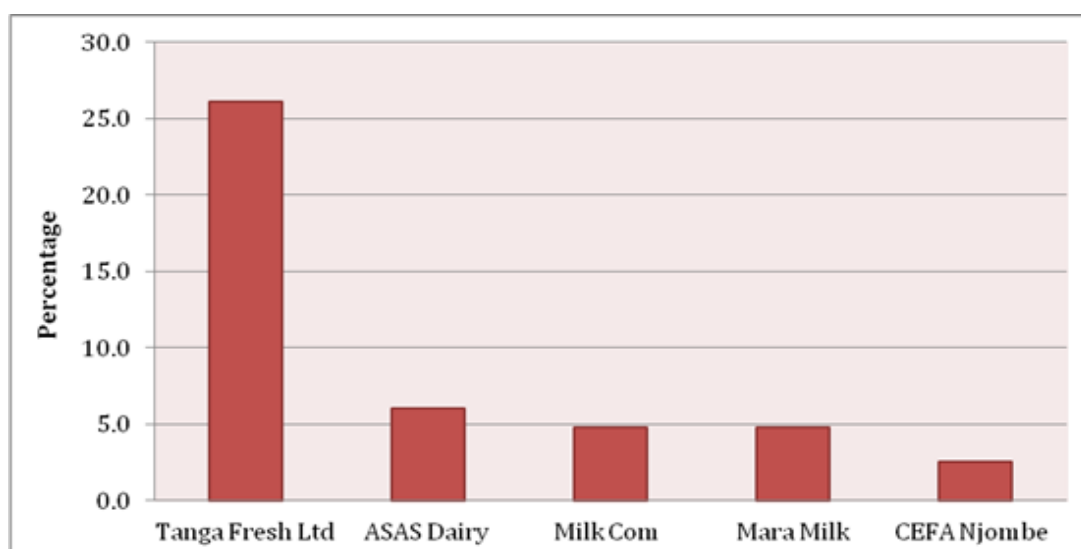
Figure 6: Major Processing Companies in Tanzania, 2014-2015

Source: MLDF, 2015

2.5 Milk marketing channels

According to GTZ, (2007) defined the market as " the interaction of buyer and sellers of a particular type of goods and services. The exchange rules differ depending on the character of the goods traded (perishable products or services).

2.5.1 Informal milk channels

The major milk marketing channel being the informal market. According to Tessema (2010), reported that 98% of milk produced by smallholder farmers was sold through the informal chain (direct sales local consumers and milk hawkers). In the informal milk marketing is mainly practiced by milk hawkers who collect milk direct from the smallholder dairy farmers and sales directly to the to retailers (kiosks, restaurants) consumers whereas only 2% of the milk produced is channelled through the formal chain.

The positive advantage of the informal market is that it provides employment opportunities to the milk hawkers who are making their living by sales approximately 80 to 100 litres of raw milk per day to the final consumers which include local consumers, kiosks and hotels. Most of the milk hawkers in Tanzania use motorcycle and bicycles as means of milk transportation to their consumers (MLDF,2016). Addition, Rajendran *et al,* (2004) reported that 80% of the milk is marketed through the informal channels that are highly disjointed and includes milk vendors, wholesalers, retailers and producer themselves.

However, there are health risks when the milk is not checked for quality and even the cows may have diseases. This is due to ignorance on the side of the vendors on such risks (MLDF,2016). Figure 7 showed formal and informal channels in Tanzania.
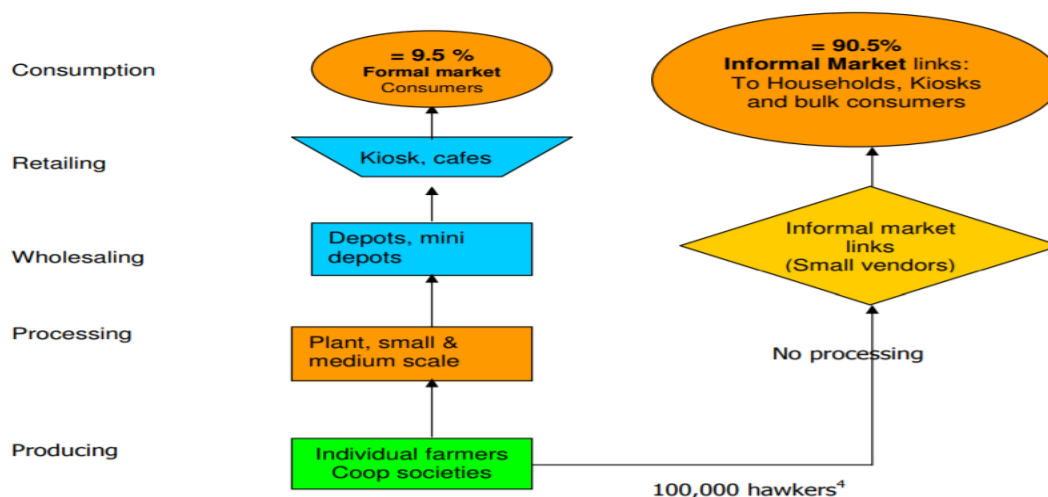
Figure 7: Formal and informal milk marketing, source; Njombe,2011.

2.5.2 Benefit of formal and informal milk marketing chain

Van der Valk and Tessema (2010) point out that, there are many benefits that dairy farmers obtain whe sale their milk to formal and informal milk marketing channels. Formal milk marketing channel includes the way through which dairy farmers deliver their milk directly to a Milk Collection Center who buy milk from farmers and then sell to the dairy processing plant. The advantage of this informal milk marketing channel is high farm gate price for dairy farmer, simple decision making by farmers (farmer have no any contract agreement with processing plant so that if they do not agree with their customer they easily decided to stop delivering of milk to milk buyers), low investment costs and high consumers demand because of low price. However, the dis advantage of this channel of milk marketing way is no quality control and traceability of product, high risks and loss of milk during less demand for milk.

2.5.3 Formal milk channel

Formal milk channel refers to a channel that actor value added to the raw milk and move the processed milk products to final consumers. In Tanzania, the formal market channel represents 3% of the marketed quantity. These formal channels are well organized in such a way that milk passes from producer to processors and then to the final consumer. In this channel, the processors determine the quality of milk to be produced. Most of the producers do not prefer the formal channel because payments take several weeks and low milk price per litre (MLDF,2016). According to Elepu (2006), formal marketing channels have a lot of advantages which include production and marketing of good and acceptable quality raw milk and milk products, improved the shelf life of milk and milk products, enormous amounts of milk and easily controlled and managed quality standards. According to Kurwijila (2006), there are seven milk-marketing channels found in Tanzania as shown in Table 1.

Table 1: Milk marketing channels in Tanzania

Milk marketing channels	Numbers of intermediaries
Producer - consumer	0
Producer – Milk vendors - consumer	1
Producer – Middle men - Consumer	1
Producer – Processor – retailer - consumer	2
Producer – Milk trader – processor – retailer - consumers	3
Producer – Dairy cooperative – Processor – retailer – consumer	3
Producer – Middle men – milk traders – retailer – consumer	4

Source: Swai, (2013).

2.6 Factor affecting milk production and marketing

The research carried out by FAO (2010) reported that the constrains faced most the dairy farmers which lead to the low milk production are poor dairy genetic potential for milk production(92%), Low milk supply (88%) and high input supply cost include animal feed (83%). The highly fluctuating demand for milk because of seasonal in the supply of quality milk and fragmented market at supply side affects milk production. Nevertheless to this negative consumers perception of milk product quality and milk hygiene of the milk products, the absence of a minimum standard set by dairy industry are the major constraints for low milk production and marketing of the most developing country. .

2.7 Demand for milk and milk product in Tanzania

In Tanzania the rate of milk consumption level per capital per year is relatively low compared to ingesting levels in East Africa countries like Kenya (84 litres) and Uganda (40 litres). However, in both situations, the milk consumption in Tanzania is below the average world consumption rate, which is above 50kg/capita/year, as well as the World Health Organization recommended a rate of 200*l/capita/year* (MLDF, 2016).

Mwijarubi (2007) findings out that, most people in Tanzania consume milk only once or twice per week. The low milk consumption of milk and milk products is credited by high prices of milk in which the average price per litre of processed milk was around Tsh.1000 to 2000 per litre. While for unprocessed milk the price was Tsh.1000 per litre. This is also nearby to the average income per day of most people living in developing countries counting Tanzania.

2.8 Role of Dairy Cooperatives

Dairy Cooperatives, as a form of business organisation, play a meaningful role in inspiring the socio-economic conditions of its members and their local communities. Dairy co-operatives play a positive role in milk collection, milk production, processing and marketing activities on behave of smallholder dairy farmers. Provide dairy support to their members with cretits with low interest to its members in order to expand their dairy busnesses. Co-operative members produce and sale high volume of good quantities milk to the cooperative. Co-operatives also provide farmers with a reliable market of milk produced, adequate access to market information through frequent visits of extension officers and regular dairy training (Asfaw,2010). Cooperative can brand decision to alteration of the marketing system of the produce different products and the nature of product from one to another form in order to maintain the highest return to their members and end users (Shields, 2009).

2.8.1 Potential challenges facing Dairy cooperatives

There are many challenges facing dairy cooperatives as pointed out by Penrose –Buckley, (2007), which include poor governance, lack of transparency among the members and leaders, poor financial services, ability of reducing internal transaction costs, risk of losing business to traders who may offer better prices to members than them, limited capacity building in leadership and entrepreneurial skills, Lack of member commitment, Inadequate business planning, Lack of competent management, Inadequate communication and absence of clear policies and guidelines.

2.9 Break even point analysis of Dairy processing plant

According to the principle of economic of scale point of view, the fixed cost relates to the full maximum capacity of the factory. For instance, when the factory operates 50% of its installation capacity, means only 50% of the products can contribute to cover the cost of production. Hence, when processing plant uses it is maximum capacity, its obtain more benefit from the higher scale of production, due to the lower fixed cost per unit of output produced.

The Break-even point occurs when Total Costs equals Revenue (Sales Income) = Total Costs Break-Even Analysis At this point the business is not making a Profit nor incurring a Loss – it is merely covering its Total Costs. Break-even analysis is the examination of the relationship between costs, volume and profits. In addition to determining the break-even sales level for a firm. According to the economic of scale, the factory starts to make a profit when its operate above the break even point

Determine the level of sales necessary to break-even is a very important exercise so that management can determine how the company is doing in this regard. Sustained operation at less than the break-even level must be accompanied by a reduction in fixed costs in order to avoid losing money. If this trend is caught soon enough, losses can either be avoided or minimized. The fact is that in most cases it is possible to avoid ever losing money. Losses are simply a result of a failure to cut fixed costs when necessary.
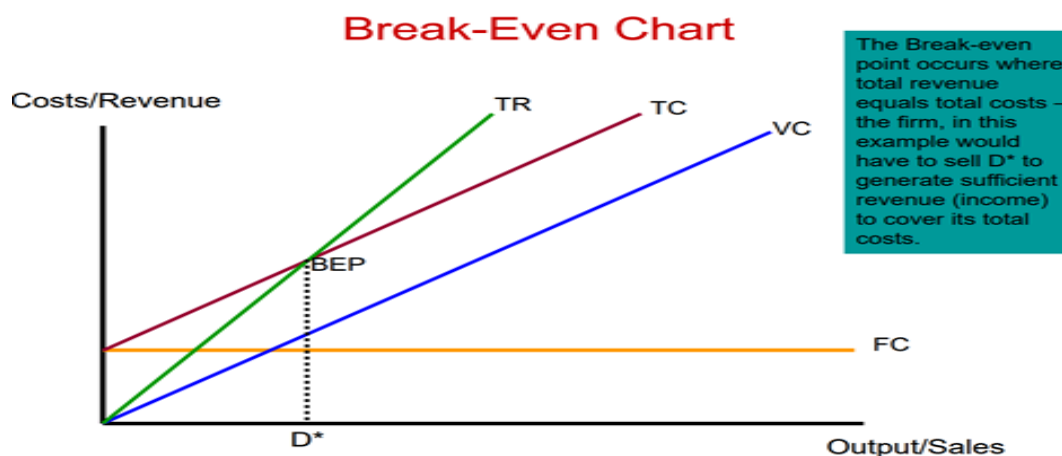
Figure 8: Break even point analysis of dairy processing plant

Source: Landsburg, 2012.Economics and principle of economies. New York.

Break-even point analysis is a dimension system that calculates the margin of safety by comparing the number of revenues or units that must be sold to cover fixed and variable costs associated with making the sales of dairy products. Not all revenues result in profits for the company. Many products cost more to make than the revenues they generate. Since the expenses are greater than the revenues, these products great a loss—not a profit.
 The purpose of the break-even analysis is to calculate the number of sales that equates revenues to expenses and the number of excess revenues, also known as profits, after the fixed and variable costs are met.
The break-even point formula is calculated by dividing the total fixed costs of production by the price per unit less the variable costs to produce the product.

Source: Landsburg, 2012

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CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

The research methodology covers a study area, a research framework, a method of data collection and the way the gathered data was analysed and interpreted. This research was contained both quantitative and qualitative approaches based on primary data collected from the survey, a case study and secondary data obtained from the study of literature related to study theme, documents and from internet sites.

3.1 Study area

The study was carried out in the Tanga district located at the extreme north-east corner of Tanzania between 40 and 60 degrees below the Equator and 370-390 10'degrees east of the Greenwich meridian. Tanga District is one of the eight districts in the Tanga region. The district covers a total area of 1,497.96 square kilometres, with a population of 204,461. The district has a population of nearly 322,351 cattle's and more than one third (107,450) of the cattle are crossbreds of indigenous Tanganyika short-horn Zebu with Friesian, Jersey, Ayshire and Boran.

Dairy activities and crops productions are the main economic activities that support the livelihood of more than one million smallholder dairy farmers. The area, which is suitable for food crops production is 80,001 ha and 50, 46,607ha for cash crops.
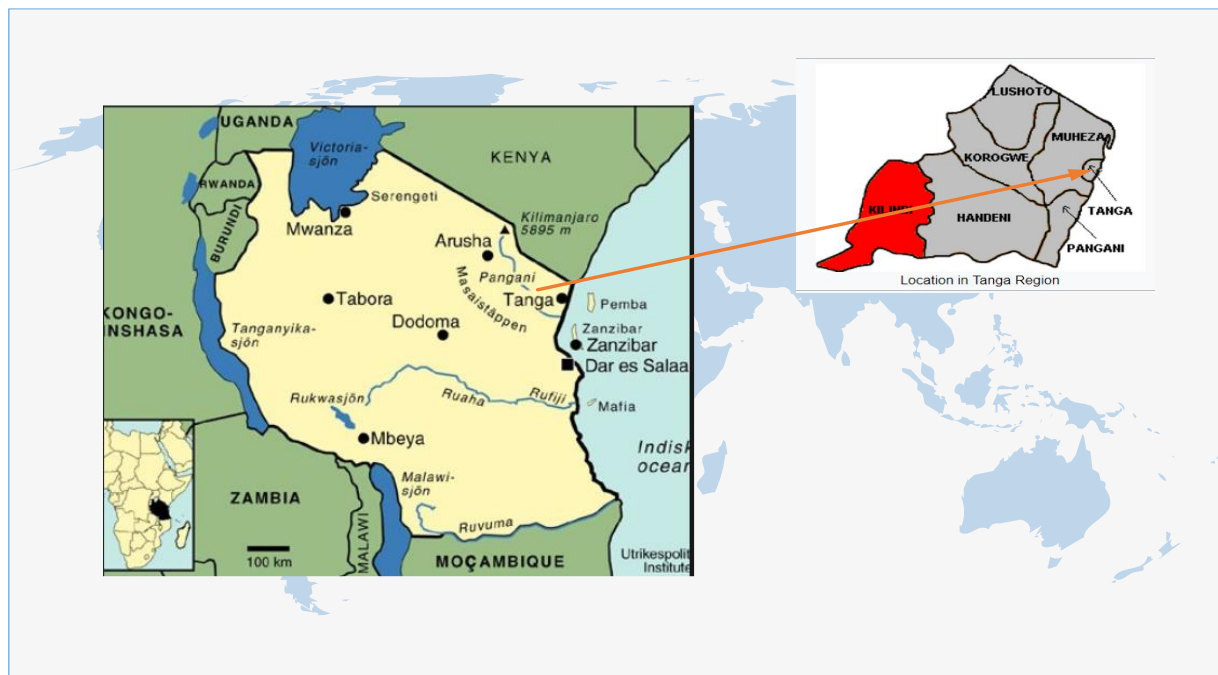
Figure 9: The Geographical position of Tanzania showing the study area. Source, GIS, Tanga.

3.2 Research strategy

The research has a qualitative and quantitative approach based on field survey, case study, professional literature and documents from the District Livestock Department Office. Based on the research objective and research questions, this research framework below was used as guidance throughout this research topic.
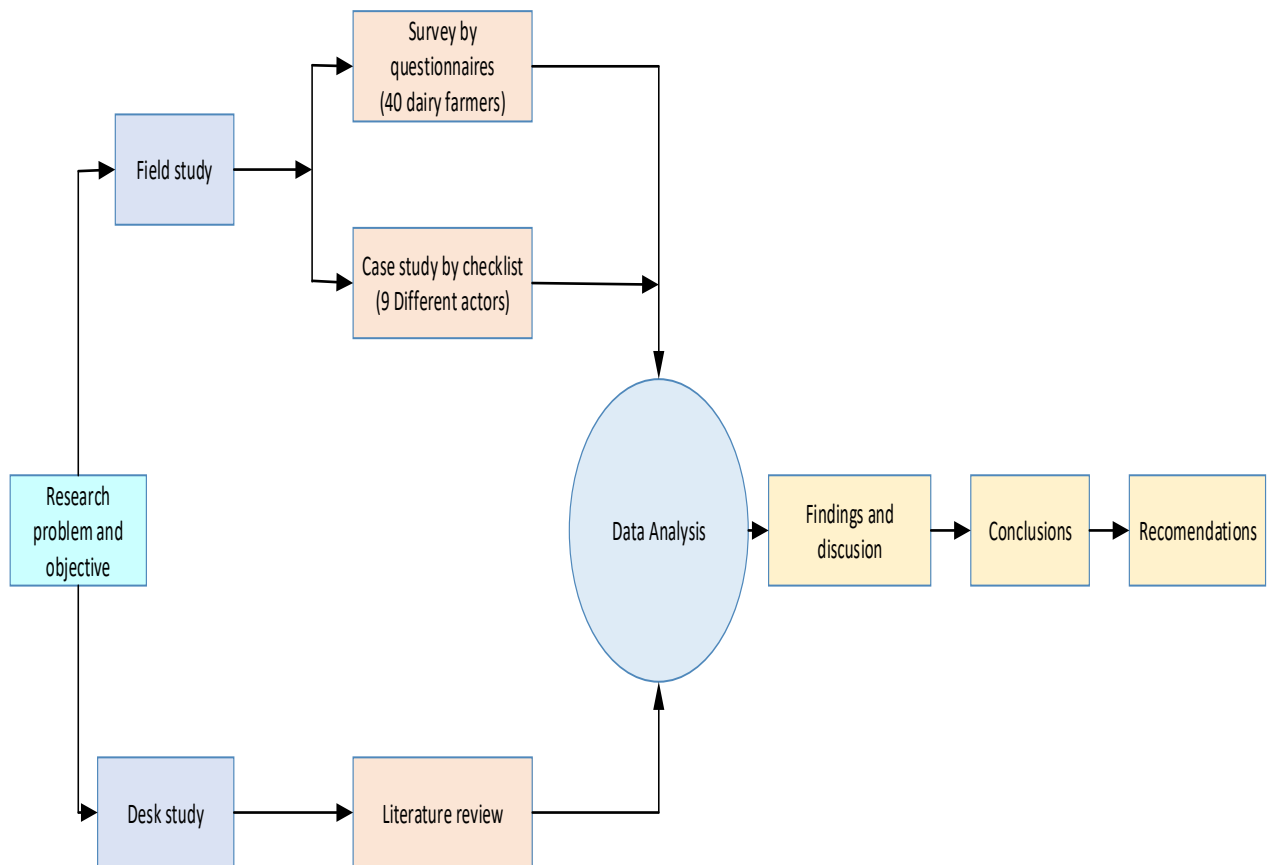
Figure 10: Research Framework

Source: Author, 2018

3.3 Data Collection

The data of the study was collected through surveys and case study. To implement the current field study in the study area the following procedures of data collection was implemented. Pretesting of the semi-structured questionnaire survey was carried out by interviewing of four smallholder dairy farmers before actual implementation of the fieldwork. Based on the responses of the interviewed smallholder dairy farmers, the prepared semi-structure questionnaire survey was modified.

3.3.1 Desk study

This method was used to generate information from existing literature essential to lay down the foundation information related to the research topic. This research work before setting for field study. For this desk study information was extracted from different sources like the internet source, text books, scientific journals, MSc thesis and different reports.

3.3.2 Survey

The survey was carried out in two wards in the Tanga district namely Pongwe and Pingoni. A sample of forty smallholder dairy farmers was randomly selected from the two wards in the Tanga district. The survey questionnaires addressed issues related to milk production potential, milk collection, processing, consumption, milk marketing, cost of milk production, major problems associated with milk production, milk marketing gather background information of the smallholder dairy farmers regarding their age and level of education. Other information collected were on land size and a number of dairy cattle owned by the household. The structure of milk value chain and milk purchasing potential of the TDCU from its members and non- members were collected in the study area.

3.3.3 Case study

The following dairy actors, supporters and competitor of the TDCU were interviewed to gather the relevant required information on milk value chain in the study area.

1. *The interview made with Tanga district livestock development office*

The interviews were conducted with Tanga district/region livestock development officer in order to gather secondary data on the dairy population of the district, the trend of milk production, sources of animal feeds and other relevant information based on the research objective.

2. *The interview made with TDCU*

Depth interview was made with the Executive Secretary of TDCU in order to examine the factors causes the low volume of milk supply, currently processing capacity, the number of active members who deliver their milk, the principle of being membership and other associated problems which directly or indirectly affect the performance of the TDCU.

3. *The interview made with a competitor of TDCU*

Based on the information obtained from TDCU on the impact of a competitor in the supply of milk from their members. A major competitor of TDCU is Ammy Dairy Farm was purposively selected to conduct an interview. Data were collected focus on the volume of milk collection, purchasing price of raw milk from the smallholder dairy farmers, selling price and cost incurred during the milk collection and processing of raw milk and the problems faced during the milk collection, processing and marketing of the processed dairy products.

4. *The interview made with dairy products retailers*

An Interview was made with dairy products retailers which are found in the Tanga district to gather required information on the type of dairy products they handled, purchase price, selling price, potential suppliers and buyers of processed products.

3.3.4 Observations

Observations were made during survey interviews to check whether the data given was relative to what was on the ground. Dairy farmers were introduced as to the purpose of the interviews to avoid bias which was not relevant to the objective of the study. Around 45 minutes were spent on each dairy farmers and 5 farmers were visited per day.

3.4 Sample size and sampling procedures

The total sample size of the respondent's interviews were both from the urban and rural areas in the study area. The discussion was made with the Head of Tanga District of Livestock Office in order to make a proper selection of the respondents. 20 smallholder dairy farmers from urban and 20 from rural areas were purposively selected to generate the required information according to the research objective. 10 members of TDCU from urban and 10 members from rural and 10 non-members from rural and 10 urban were selected.
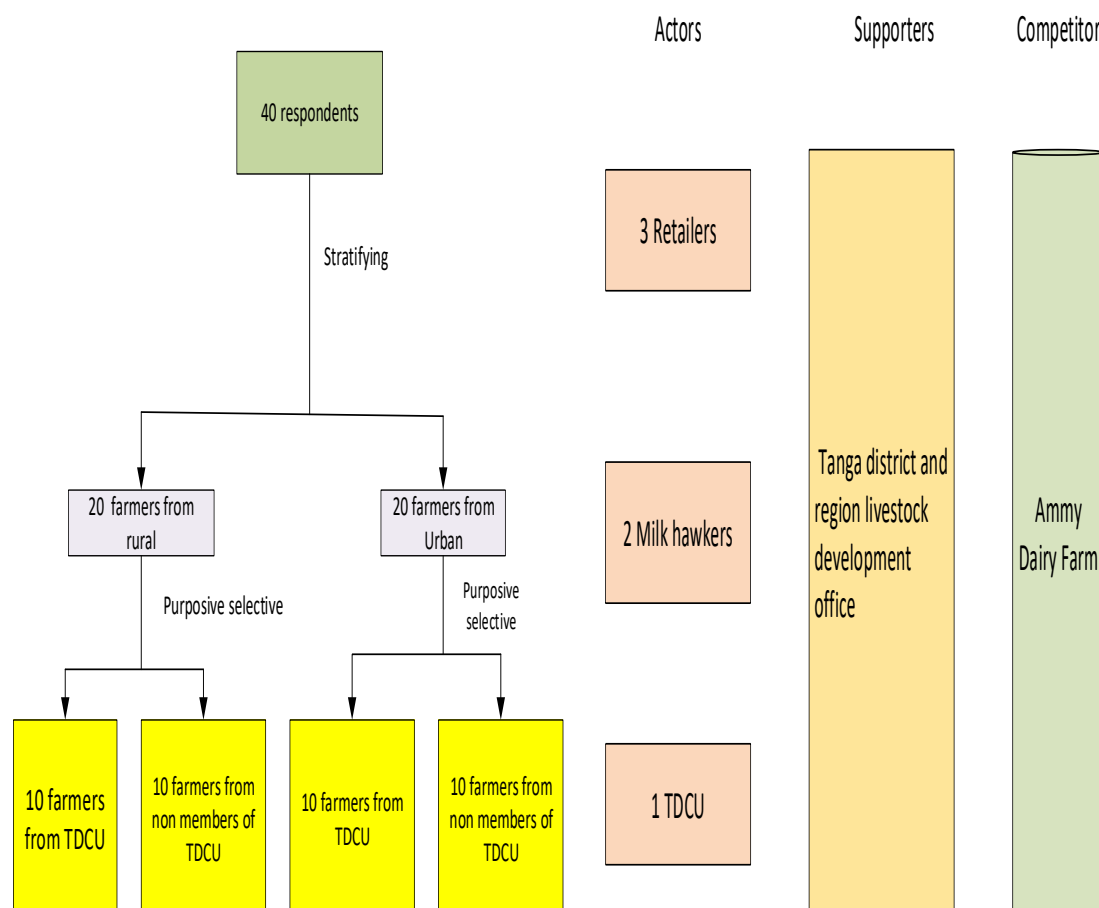
Figure 11: Sampling size and sampling procedures used for survey and case study.

Table 2: List of different dairy stakeholders were interviewed during the field study period.

NO	Stakeholders	Numbers of interview	Chain
1	Smallholder dairy farmers	40	Actors
2	TDCU	1	Actor
3	Milk traders	2	Actors
4	Retailers	3	Actor
5	Ammy Dairy Farm	1	Competitor
6	Tanga region livestock officer	1	Supporter
7	Tanga District livestock officer	1	Supporter
	Total	49	-

3.5 Data Processing and analysis

To process and analysis of the collected data value chain mapping, excel spread sheet, SPSS statistical software of 19 version and SWOT ware used.

- Value chain mapping was implemented to show the qualitative data as well as the quantitative data collected during the field survey in order to show the milk market channels in the study area.
- Excel spread sheet was used for the processing of financial data and to draw some graphs of the trend of milk production and the amount of milk collected by the TDCU and other findings.
- SWOT analysis tool was implemented to analysis the strength, weakness, opportunity and threat of TDCU in order to use that analysis which is findings to come out with the recommendations to the TDCU.

Table 3: Summary of information/data and their sources

Sub questions	Information /Data	Source of Information
1.1	What is the current potential of milk production in the study area	Interview with Chain supporters and Desk study
1.2	What is the role of the TDCU in milk value chain in the study area	Survey and interview with TDCU
1.3	What are the factors that cause dairy farmers to choose formal and informal milk value chain in the study area?	Desk study, Survey, and TDCU board members
2.1	What is the value share of different the actor gets from informal and formal milk value chain in the study area?	Desk study, interview with TDCU and survey
2.2	What are the challenges of milk collection and processing of TDCU.	The survey, interview with TDCU and chain supporters
2.3	What can be done to improve milk deliveries to the Tanga Dairy Cooperative Union	Survey and interview with TDCU

3.6 Limitations of the study

- The sample size of the study was limited only 40 smallholder dairy farmers were involved. This limited the statistical tests conducted on the data collected from the survey and case study which require large sample sizes. The collected information was therefore analysed mostly using charts, tables and graphs.

- The record keeping by smallholder dairy farmers was inappropriate. The availability of reliable data regarding the cost of milk production was very difficult.

- For the reason of strong competition on the supply of raw milk from dairy farmers, TDCU competitor like Ammy Dairy Farm did not want to give me much information on the cost they incurred to collect and processing of raw milk. As result it was very difficult to obtain reliable data in the cost and profit of milk processing.

- Unreliable of internet access. This creates an an unfavorable condition for the researcher to assess information from the internet.

CHAPTER FOUR: RESULTS

This chapter contains two sub sections: The findings of the survey study and a case study carried during the field study. Each section was separately presented under the following titles and sub titles according to the research questions.

4.1 Survey results

This section contains survey results of interviews made with 40 smallholder dairy farmers in the study area through a semi-structured questionnaire survey. The detailed findings of the survey result are presented in the following sections and sub sections.

4.1.1 Demographic characteristics

The section mainly summaries the respondent's demographic characteristics which contain age distribution, gender and the level of education of the households. This helps to place the background of the economic activities that influence dairy producing households in place, in order to assist in tailoring interventions with regard dairy farmers situation in order to improve dairy productivity.

Age distribution

The results show that, the average age of the interviews dairy farmers was fifty- three years an indication that dairy farming was generally in the hands of the old age. Retirement age from formal employment was on average 55 years and one of the major activities that retirees engaged in was a dairy farming business, confirming the high percentage of dairy farmers in that age category. Majority of the respondents were 53 years with a standard deviation of 9.244 which was significant. This research finding can be observed as a threat to succession in dairy production performance because most of the young respondents regard dairy business is not profitable thus why were not involved in the dairy farm business.
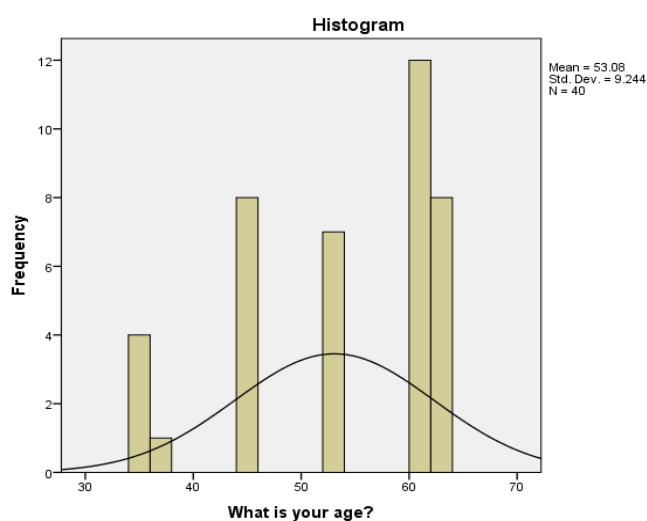
Figure 12: Age ratio of the respondents interviewed

Education level

From the survey results showed that 52.5% of the respondents have accomplished primary school level while 17.5% secondary level, 5% certificate level and 25% diploma and above level. The respondents were thus knowledgeable and could read and write. Most of the interviewed dairy farmers (50%) have the good local knowledge in making good farming husbandries like the heat detection, dairy rational decision and milk hygiene practice activities.

Table 4: Education level of respondents interviewed

Level of education	Frequency	Percent	Cumulative percent
Primary	21	52.5	52.5
Secondary	7.0	17.5	70
Certificate	2.0	5.0	75
Diploma	10	25	100
Total	40	100	

Gender

Table 5; shows that most (60%) of the proportion were male smallholder dairy farmers and 40% were female dairy farmers interviewed were engaging in the dairy farming activities as a main source of the household income.

Table 5:Proportion of male and female of respondents

Gender	Frequency	Percent	Cumulative percent
Male	24	60	60
Female	16	40	100
Total	40	100	-

4.1.2 Cost and returns of milk production from smallholder farmers

These findings show the currently cost of production of one litre of milk in the study area according to the data were obtained from the milk producers. Table 6; showed an average cost, return and profit margin of milk production per cow per month. A field study showed that most of the interviewed dairy farmers kept an average of two litres of milk for home consumption per day. On average, surplus milk of about five litres was sold to MCC and 10 litres of milk being sold through the informal channels such as neighbours, milk hawkers and restaurants/ small hotels per day. Milk price offered in the informal market ranged from Tsh1000 to 2000 per litre. MCC was offered Tsh700 per litre. The average cost of milk production was Tsh331.1per litre which was 47.3% of the milk price of the MCC and 33.1% of the milk prices offered in the informal market. The returns per litre wereTsh 368.9 when selling milk to the MCC per litre and Tsh668.9 from the informal price per litre. The average gross income was Tsh256,000 with the profit margin of 63.2% per month per dairy cow who produced 17 litres per day listed here below.

Table 6: Costs and returns of a dairy cow per month per farmer (1 Euro = Tsh.2600)

Operating cost	Average cost (Tsh) per cow per month
▪ Input supply	▪ Cost incur
Maize bran	150kgs@Tsh300 = 45,000
Sunflower seed cake	20kgs@ Tsh700 = 14,000
Maclic/Mineral block	1 pc@ Tsh4,000 = 4,000
Grazing, cleaning and milk cost	50,000
Veterinary cost	6,000
Transport cost	30,000
Total operating cost (TOC)	Tsh149,000
▪ Revenue from sell milk	Revenue receive from milk
Local consumers/Informal market	10L*30 days*Tsh.1000 = 300,000
MCC	5L* 30 day*Tsh.700 = 105,000
Sub total revenue(STR)	Tsh405,000
Gross income from milk(GI) (STR-TOC)	Tsh256,000
Gross margin	(GI/STR *100%) = 63.2%

The operating cost, Total revenues and Profit margin calculated based per dairy cow per Smallholder dairy farmers who were interviewed

The calculation of the cost of production of one litre of milk per dairy producer, based only on variable costs; the margin would be lower once fixed costs were included. Most of the smallholder dairy farmers mentioned that the barn was constructed a long time ago, and the maintenance costs are at a minimum. Hence its was very difficult to obtain a fixed cost from the smallholder dairy farmers because they don't keep a proper record.

Research revealed that, level education link very much with the milk production performance. Most of the interviewed milk producers have not sufficiency knowledge in general herd management. This eventually in one way to another affect the performance of dairy productivity in the study area.

4.2.3 Dairy activities and source of animals feed

The research findings showed that 72% of the interviewed respondents used family labour and 28% used hired labour for their dairy activities. Furthermore, the study revealed that 75% of the respondents were living in the rural area and 25% of the respondents were living in urban area. In urban areas, they do not have grazing land for grazing their cows. The dairy cows are kept under zero grazing system where smallholder dairy farmers in the rural area, have an average of 3.5ha of land used for grazing their animals, pasture and forage establishment conserved as hay and silage which is used to feed their animals during the dry season when there is a shortage availability of animal feeds.

Table 7: Labour division of smallholder dairy farmers in the study area

Activities	Male(%)	Female(%)	Children(%)	Hired labour (%)
Milk selling	10	30.5	0	59.5
Cleaning barns	19	5.5	15.5	60
Feeding cows	20	4.5	5.5	70
Purchasing of input	80	15	-	5
Control revenue from milk sale	90	10	-	-

The survey findings showed that 70% of the smallholder dairy farmers purchased animal feeds such as wheat bran, compound dairy feed, sunflower seed cake, maize bran, mineral block, hay and forages from the local input suppliers (Agri - canter) found in the district to supplement their cows during milking. Most of the smallholder dairy farmers provide an average of 2.5kg concentrates feeds per milking cow per day.

4.1.4 Milk produced and distributed by smallholders farmers

Survey findings showed that most of the interviewed smallholder dairy farmers mentioned that, milk yield is highest during the first four months of lactation and declines towards the end of the lactation period. Almost 90% of the respondents interviewed reported that the highest milk production was being experienced between the month of April and July due to the high availability of pasture and forage to feed their animals and the lowest between October and December because of low availability of pasture and forages for their animals. Most (60%) of the interviewed dairy farmers have an average of two milking cows which produced an average of 17 litres from improved breed cows and 3.5 litres of milk per day from local breed cows.

During the field study, most of the interviewed dairy farmer stated that, during the wet season the trend of milk production was higher due to the availability of pastures and forage to feed the cows. In the dry season, milk production was low due to the inadequate pasture and forage to feed their cows resulting in low milk production.

Similarly, the trend of milk production was still low due to the poor breeds dairy cows of low milk production potential, the high cost of input supply such as Artificial Insemination (AI) services, animal feeds, inefficient extension services and small herd size resulted to the low milk production in the study area. The interviews made with the region livestock development officer mentioned that, an approximate volume of milk production was standing at 20,315,219 litres per year in the study area.

Table 8: Average of milk production of dairy farmers during rainy and dry seasons per cow.

The volume of milk produce and distribute	Season	
	Rainy	Dry
Average milk produced per day	17	7.14
Average milk consumed per day	2.0	1.0
Average milk sold per day	15	6.14

Source: Compiled from a field study of milk yield by smallholder farmers in the study area, 2018.
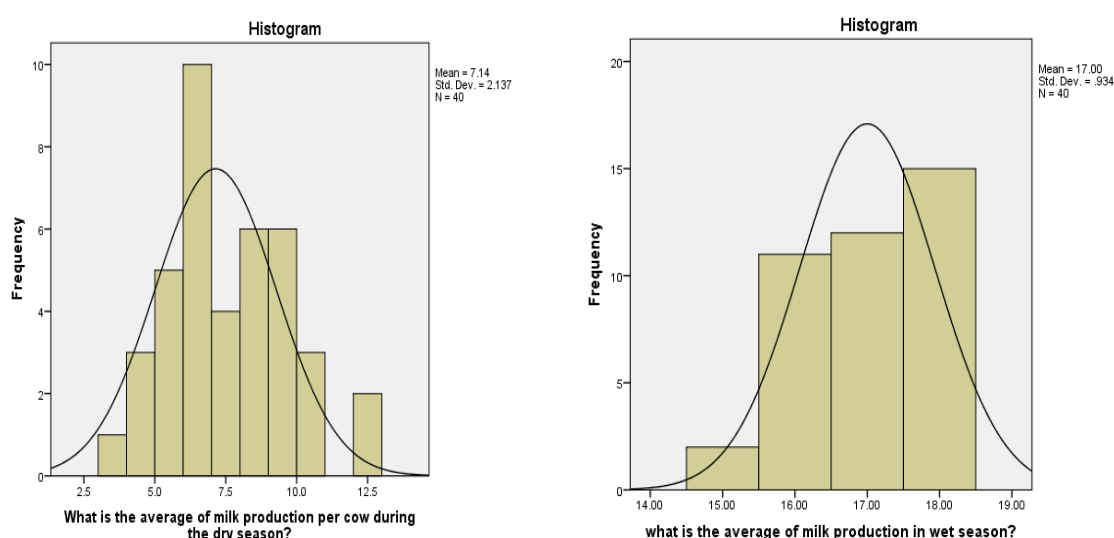
Figure 13: Average of milk production during the dry season and rainy season per cow

Picture 1: An interview made with the smallholder dairy farmers in the rural area

Source: Compiled from the survey result of smallholder dairy farmers in the study area, 2018.

4.1.5 Major problem of milk production in the study area

The research findings show that out of the total interviewed smallholder dairy farmers, 60% of the respondents said that in ranking, the major problem facing dairy production was the high cost of input supply (Mixed dairy feed, Hay, silage and feed ingredients), unreliable AI service from AI Center, which is due to lack of sufficient liquid nitrogen gas being used for semen conservation, 25% ranked poor dairy breed occasioned with low milk production potential and 15% mentioned insufficient extension service attention from TDCU and from the Government influences resulting to upsurge in the cost of milk production. This lead to a diminishing of further milk production in the study area.

Table 9: The problem face milk production in the study area

Problem	Frequency	Percent	Cumulative percent
The high cost of input supply	24	60	60
The poor breeds of dairy cow	10	25	85
Insufficient extension services	6	15	100

4.1.6 Factors that cause dairy farmers to choose formal and informal marketing

From the research findings, it showed that both formal and informal milk marketing channels were practiced by the smallholder dairy farmers in the study area. 37.5% of the smallholder dairy farmers interviewed said that they sell their milk through the informal marketing to milk hawkers, 20% sell milk to restaurants/hotels and 15% sell their milk through the formal marketing (MCC) and 10% sell their milk both in MCC and at the farm gate price. The price of milk offered through formal (MCC) market was Tsh.700 and informal market price offered ranged from Tsh.1000 to 2000 per litre of milk.

Nevertheless, research findings showed out that, the weak relationship of TDCU and its members, reduction in volume of milk produced by smallholder dairy farmers due to the high cost of input supply such as animal feeds and strong competitors are recognized as the major factors, which causes the low volume of milk supply to TDCU in the study area.

Table 10: Milk marketing channels of the farmers interviewed in the Tanga district

Milk consumers	Frequency	Percentage	Cumulative percent
Milk hawkers	15	37.5	37.5
Restaurants	9	20	57.5
MCC	6	15	72.5
Farm gate and MCC	10	27.5	100
Total	40	100	-

4.1.6.1 Benefits that dairy farmers obtain from formal and informal milk marketing chain

During the interviews made with the TDCU members and Tanga dairy cooperative development office, mentioned the advantages and disadvantages where the milk producers obtain from formal and informal milk marketing chain in the study area. In the study area, formal channel, dairy farmers directly deliver their milk to the milk collection center who buy milk from its members and send directly to the processing plant and informal channel, dairy farmers sale their milk to the milk hawkers and local consumers which are clear shown in table 11.

Table 11: Benefits that dairy farmers obtain from formal and informal milk marketing

Benefits that dairy farmers obtain from formal and informal milk marketing channel	
Formal milk marketing channel	Informal milk marketing channel
- Dairy farmers sign the contract agreement with the TDCU to deliver all the produce milk -Stable market through out the year -Dairy farmers obtain extension service (dairy training), credits with low interest in order to expand the dairy business	-Farmers have simple decision making for their milk where to sale (No any dairy farmers contract) -Low marketing cost -High milk price per litre -High consumer demand
Disadvantage	Disadvantage
-Low milk price -Unreliable service from the TDCU like extension service and credit -Lack of leaders transparency to its members in term of information sharing	-Unstable market -No quality control measure -High risks and loss of milk during the wet season (High milk season) -Lack of product traceability

Source: Author, 2018

4.1.7 Marketing information and market price

The survey study showed out that, 48% of the interviewed smallholder dairy farmers received milk market information from their corresponding dairy farmers and 31% received market information from the milk traders.

Table 12: Milk market information obtained from the respondents interviewed.

Source of market information	Frequency	Percent	Cumulative percent
Extension service officers	1	4	4
Other dairy farmers	19	48	52
Milk hawkers	13	31	83
MCC	7	17	100
Total	40		-

Source: Author, 2018

4.1.8 Major constraints of milk marketing channels

Field study revealed that, 72.5% of the smallholder dairy farmers mentioned low milk prices, 17.5% mentioned poor market information and 10% mentioned poor infrastructure to reach the market centre, were the major problems affecting milk-marketing channels. This resulted in increased marketing costs like transportation to reach the market centre.

Table 13: Major constraints of milk marketing in the study area.

Challenges of milk market	Frequency	Percent	Cumulative percent
Low milk price	29	72.5	72.5
Poor market information	7	17.5	90
Poor infrastructure	4	10	100
Total	40	100	-

4.1.9 Actors shares in the formal and informal value chain in the study area

The information gathered from the survey,(smallholder dairy farmers), case study (TDCU, milk hawkers) and secondary data were used to calculate the value share of different actors involved in formal and informal milk marketing channel in the study area as shown in table 13 and table 14. The data used to calculate the variable costs of smallholder dairy farmers incurred to produce one litre of milk per cow per month is indicated in table 6.

The following parameters were used to calculate simplified gross margins according to HPC (2007) and share of actors in milk value chain based on Kahan (2004).

- Gross output– milk produced by small holder farmers.
- Variable cost - a cost that is directly related to the amount of milk produced.
- Gross margin(gross profit)- gross output minus variable costs
- Profit/loss- gross out minus total cost (total variable costs+ total fixed costs) this can be expressed per unit of product (litre of milk)

All the costs used in this value share and net profit calculation is based on smallholder farmers and other chain actors approximation what they incurred to run their dairy business activities. Farmers and other actors in the study area do not well adapted in record keeping system because of this estimation of the cost they incurred is used for this net profit calculation. See Table 6.

Table 14: Value share of a dairy producer when marketing milk through formal channel

Chain actors	Revenue	Added value	Value share (%)
		Revenue – previous actors revenue	Added value x 100 /Retail price
Dairy farmer	700	700	50
TDCU	900	200	14
ADF	1250	350	25
Retailer	1400	150	11

Table 15: Value share of a dairy producer when marketing milk through an informal channel

Chain actors	Revenue	Added value	Value share (%)
	Selling price	Revenue – previous actors revenue	Added value x 100 /Retail price
Dairy farmer	1000	1000	77
Milk hawkers	1200	200	15
Kiosk	1300	100	8

When the dairy farmer sells milk through milk hawkers which in turn sells to the kiosk, the dairy farmers can earn Tsh300/litre extra than when the dairy farmer sells milk to TDCU which in turn sell to the retailers.
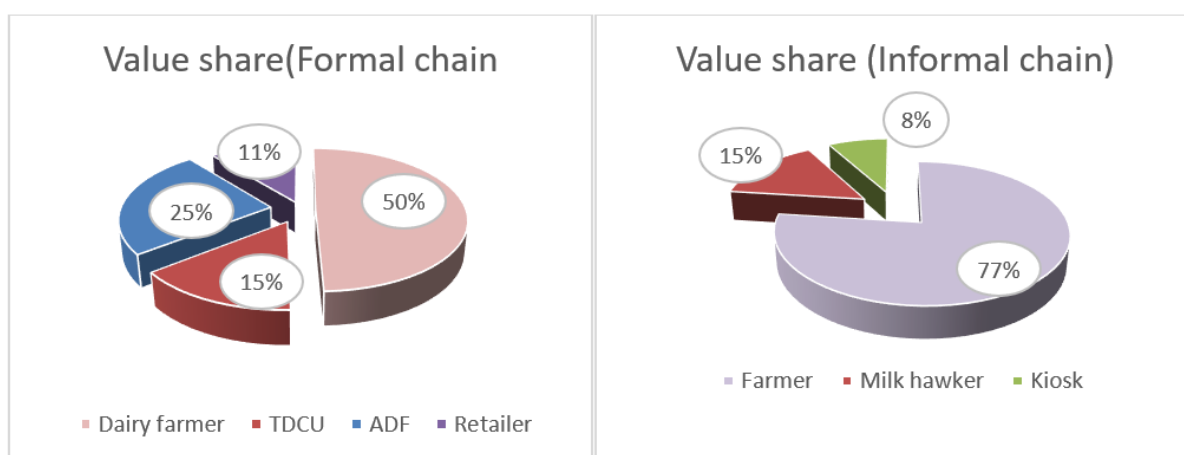
Figure 14: Indicate the Formal and the Informal milk value share

Source: Data compiled from the field result of the milk value chain in the study area, 2018

In the formal chain, half of the value shares are for the dairy farmers while the other half is shared between TDCU, ADF and retailer. In the informal chain, dairy farmers have a higher value share compared to the formal chain.

4.2 Case study results

4.2.1 Milk supply chain in the Tanga District

Dairy actors, supporters and competitors who are involved in milk value chain in the study area were interviewed to exemplify their position and roles in milk value chain in the study area. According to Tanga Dairy Cooperative Union, TDCU Competitors (Ammy Dairy Farm), Government Organisations like Tanga District/Region Livestock Development officer and Tanga District Cooperative development office who were interviewed during the field study time to find out the current formal and informal milk value chain in the Tanga area, the results were summarized in the following milk chain maps.
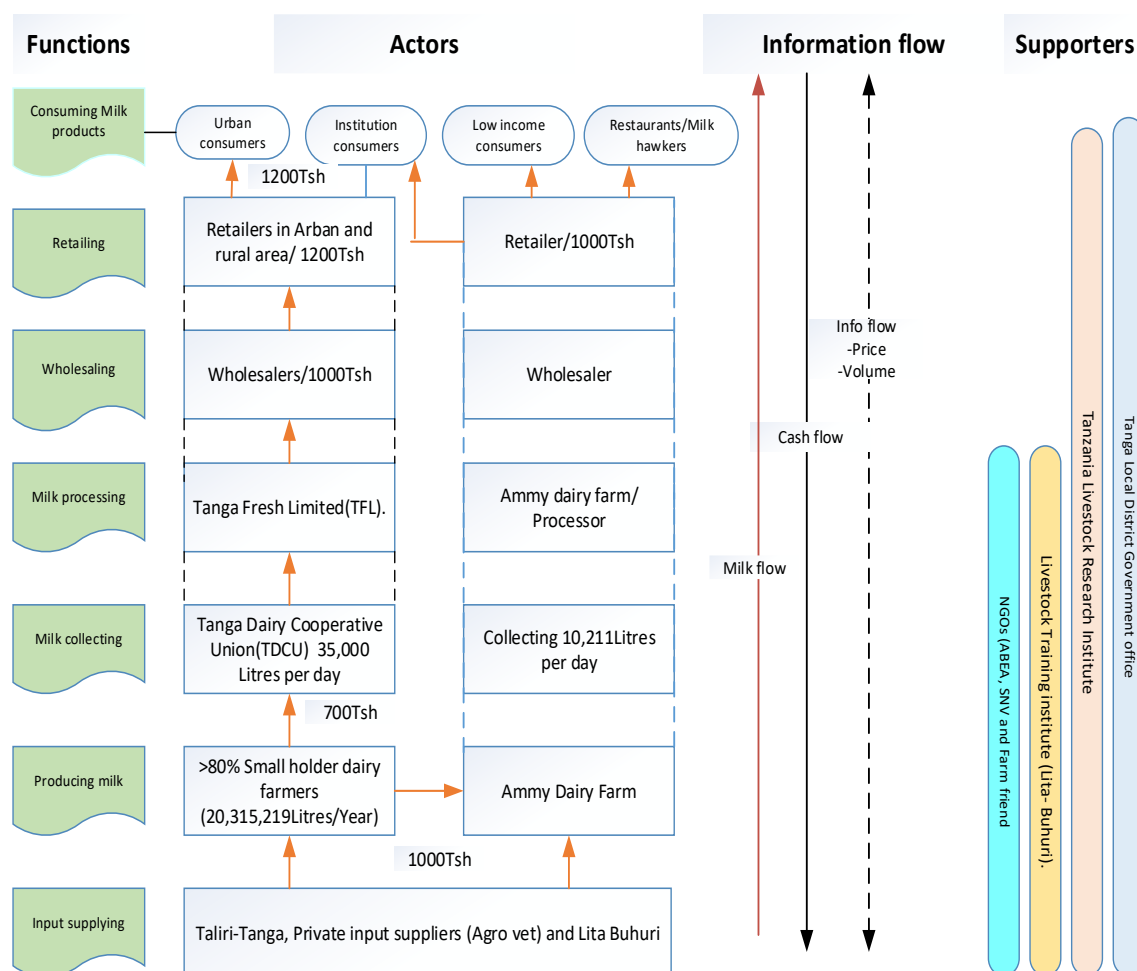
Figure 15: Formal milk supply chain

Source: Author, 2018

Functions	Actors	Information flow	Supporters

Functions column (top to bottom):
- Consuming Milk products
- Retailing
- Milk collecting
- Producing milk
- Input supplying

Actors column:
- Institution consumers
- Low income consumers
- Milk Restaurants/cafe
- Retailers (Urban and rural area).
- 1300Tsh
- 20%
- Milk hawkers
- 80%
- 1200Tsh
- >80% Smallholder dairy farmers
- Taliri-Tanga, Private input suppliers(Agro vet)

Information flow column:
- Info flow -Volume -Price
- Cash flow
- Milk flow

Supporters column:
- NGOs (ABEA,SNV, Farm Friend).
- Livestock Training institute (Lita- Buhuri).
- Tanzania Livestock Research Institute
- Tanga Local District Government office

Figure 16: Informal milk chain

Source: Author, 2018

4.2.2 Tanga Dairy Cooperative Union and its roles in milk value chain

According to the interviews conducted with the Executive Secretary of Tanga Dairy Co-operative Union (TDCU) during the field study, stated that TDCU is the umbrella organization for seventeen (17) Primary co-operative Societies found in the Tanga region. TDCU has a total membership of over 5000 smallholder dairy farmers who deliver their milk on a daily basis to their respective MCC. It was registered in 1993. The milk producers are smallholder dairy farmers mainly situated in rural areas. TDCU is autonomous, independent, non-governmental that is members owned. All primary co-operative societies varying in memberships are generally operating as members of a Milk Collection Center but complete with their own management system. To gather detailed information an interview was made with the Executive Secretary of TDCU. See Picture 2.

Picture 2: interviews made with the Executive Secretary of TDCU.

During the interview made with Executive secretary of TDCU stated that, main objective of TDCU during its establishment was to facilitate marketing opportunities for its members, provide financial assistance to their members, build the capacity of primary dairy societies in accounting, minimise the transaction cost, provides inputs services such as animal feeds like maize bran, cotton seed cake, veterinary services with affordable price, provide extension service to their members ,processing milk and marketing the processed products through the various region of Tanzania and neighbouring countries. From the year 2013 to date, the total number of members has increased, but the amount of milk supply to TDCU has decreased steadily because there is side selling of milk by its members.

4.2.3 Tanga Dairy Cooperative Union and its membership criteria

During the interview conducted with Executive Secretary of TDCU who mentioned that, TDCU membership is open to any dairy farmer who has at least one pure or crossbreeds dairy cow and lives in Tanga region and is capable of paying a registration fee of Tsh50, 000 and buys at least one share. The board of TDCU was elected after every three years from its members. The total executive committee of TDCU contains 5 people involving the Chairman, Vice chairman, Two members and one secretary. After every three years, the newly elected committee takes over the position of the previous executive committee according to the rules and regulations held by its members.

The study observed that their relation is based on building the trust with their members who should have to deliver all the volume of milk they produced to their MCC. TDCU owned five truck, which is used for transporting milk from MCC to the dairy plant and to distribute their processed dairy products to retailers in Tanzania region and export nearby countries like Kenya and Republic of Congo.

Table 16: The number of members from MCCs from 2015 to 2017.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2015	321	394	321	321	311	321	201	201	341	371	241	310	394	231	315	211	281
2016	341	421	341	383	301	311	311	291	301	310	32	278	304	315	212	311	303
2017	351	432	401	412	241	310	341	321	210	291	371	301	421	359	415	201	309

Source: TDCU internal database, 2018

4.2.4 Volume of milk supply to TDCU

During the interview conducted with the Executive Secretary of TDCU who mentioned that, currently TDCU has supply approximately 35,000 litres of milk per day. This affects the processing plant to running under its efficiency at 43.8% of its installation capacity of 80,000 litres of milk per day. On average, each primary MCC is delivering approximately 2058 litres of milk per day. From 2013 up to date, the volume of milk supply to TDCU fluctuated depending on the season. It was high during the wet season whereby they collected up to 42,000 litres of milk per day. During the dry season, TDCU collected approximate 35,000 litres of milk per day.

Table 17: The volume of milk collected for the last four year by TDCU

Year	2014	2015	2016	2017
Average volume of milk collected/day (Litres)	10,721,218	12,241,328	13,788,970	12,824,730

Source: Internal data at TDCU, 2018
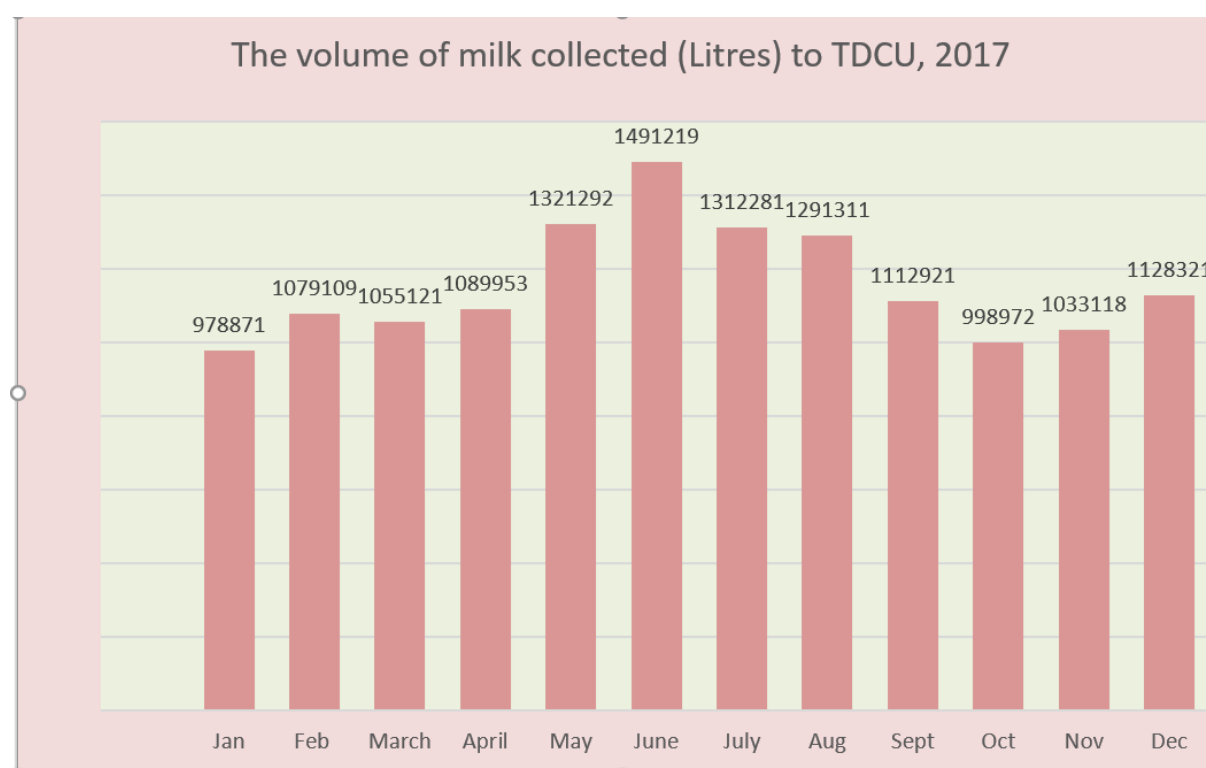
Figure 17: Trend of milk collected per month to TDCU by the year 2017

Source: Internal data at TDCU, 2018.

Milk collection time and milk quality measure

TDCU is collecting milk from all seventeen Milk Collection Center in the morning starting from 8.00 to 10:00 and in the afternoon from 3:00 to 5:00 and transports to the processing plant. 67% of dairy farmers interviewed delivered their milk by using plastic containers and 23% deliver their milk by using aluminium cans to their respective MCC. The research found out that, TDCU has allocated two workers at each primary MCC who is in charge of milk quality control and record keeping received from their members. The accepted milk was transported to the processing plant for the value addition to produce various dairy products.

Picture 3: Testing of milk with lactometer and alcohol test at MCC

Source: Collected from field study by TDCU,2018

4.2.5 Problems facing TDCU in MCC and milk processing

Intreviews conducted with Executive Secretary of TDCU, mentioned the following challenges in milk supply from their members and milk processing, which are;

- ✚ *Unstable milk supply.* Most of the TDCU members are not committed to delivering milk to the MCC; instead, they sell to the informal marketing channels.

- ✚ *Seasonality of milk supply.* During the dry season, milk production is very low due to the shortage of feed availability and competitors of TDCU like Ammy dairy farm and milk hawkers.

- ✚ *Adulteration of raw milk from their members*; Most of the TDCU members, added water to the milk in order to increase the volume delivered to the MCC and hence lower the quality of milk for processing dairy products.

- ✚ *The high cost of cold chain maintenance*; it's very expensive to maintain the cold chain throughout the year. Its cost nearby 2% of the annual operating cost.

- ✚ *Poor infrastructure*; This leads the processing plant to incur extra cost to collect the raw milk from the MCC which are located in the remote areas resulting to vehicle break down.

- ✚ *Facilities break down; t*his is another problem reported by TDCU, such as break down of cooling tanks and sealing machines hence cause raw milk spoilage consequently and increases the rate of milk losses and therefore increases the plant operating cost.

- ✚ *High processing cost of producing dairy products.* This is influenced by the processing plant to operate under its installation capacity of 43.8%. This results in the increase of the fixed cost of processing one unit per unit output.

Problems facing TDCU in MCC and milk processing

Category	Percentage
High cost of cold chain maintainance	5%
High processing cost	10%
Facilitaties breakdown	15%
Adulteration of milk	10%
Seasonality of milk supply	20%
Unstable milk supply	40%
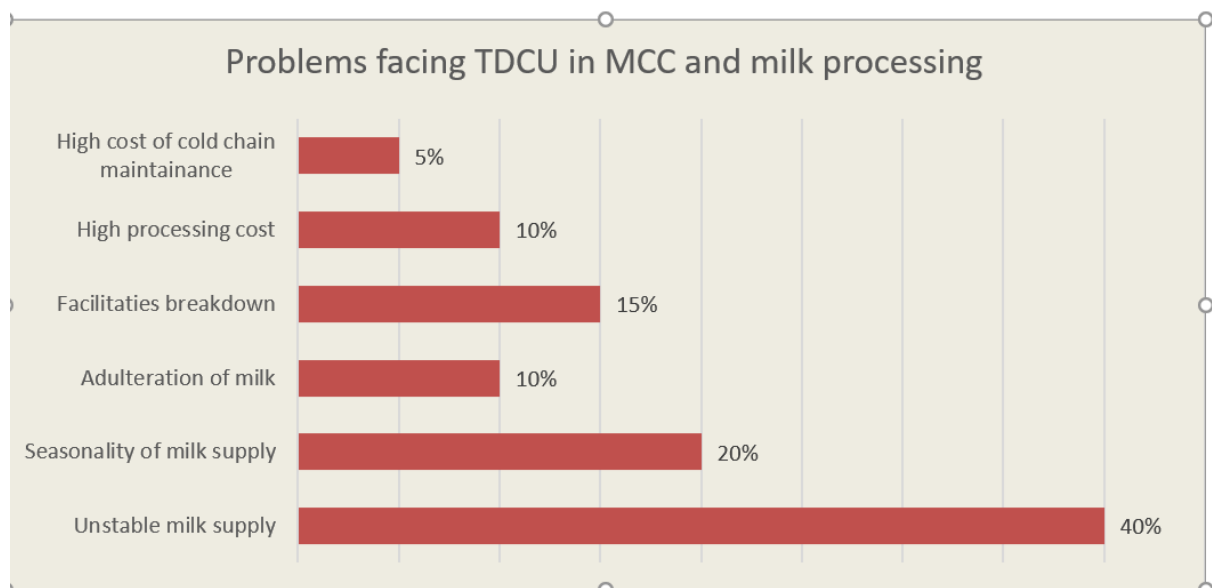
Figure 18: Problems facing TDCU in MCC and milk processing

During the interviews made with TDCU, mentioned that problems associated with milk collection and processing which are clearly presented in figure 20. Indicated that, seasonality in the supply of raw milk whereby very little milk is supplied in the dry seasons. Poor infrastructure lead to high transport costs involved in transporting the products to the markets, use of low technology whereby products can stay for very few days on shelves before being spoilt and lack of proper milk transportation facilities. The high cost of milk processing and packaging materials to handle milk products are the some of the challenges mentioned by TDCU being faced during milk collection and processing.

4.2.6 Milk processing and marketing of TDCU

Tanga Fresh is one the main Dairy processor in Tanga region and co-owned by Tanga Dairy Cooperative Union (TDCU). Tanga Fresh has an installation capacity of processing 80,000 Litres of milk per day, currently processing only 35,000Litres, which are equal to 43.8% of its installation capacity per day. See figure 21. Most of the interviewed members sell their milk to the informal chain due to the high return per litre compared to TDCU per litre of milk resulting in the processing plant operating under its efficiency.
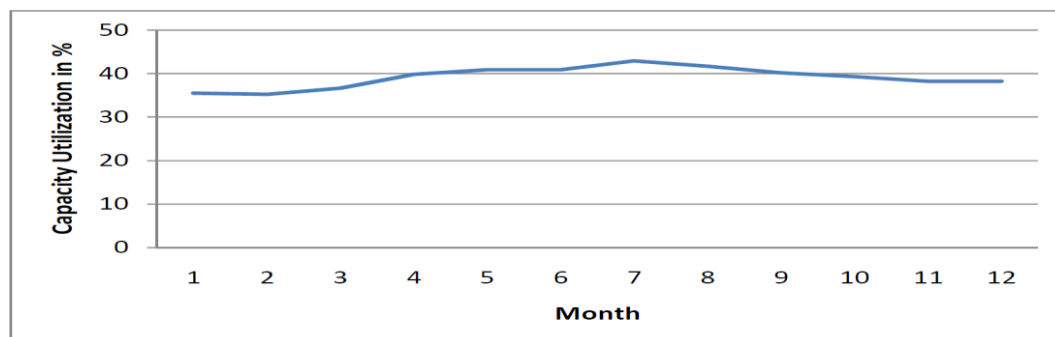
Figure 19: Processing capacity of TDCU by the year,2017

Source: TFL internal data, 2018

Presently the factory adds value to the raw milk and produces various dairy products like yoghurt, pasteurized milk, soft cheese, culture milk (Mtindi), UHT milk, Ghee and butter.

Table 18: Amount of raw milk collected, processed into different products (Litres).

No	Types of dairy products	Unit	Year		Remarks
			2016	2017	
	Total raw milk collected	Litres	13,788,970	12,824730	
	Processed products		-	-	16 Litres of milk =1kg of butter
	Pasteurized milk	Litres	7,577,015.5	6,423,325	
	Yoghurt	Litres	771,530.3	1,257,102	
	Cheese	Kgs	552,218.3	1,301,102	
	Culture milk/Mtindi	Litres	1,213,821.5	1875305.1	
	Butter	Kgs	1,897,967	1,421,237.9	

Source: TFL internal data, 2018

4.2.7 Annual FC full maximum capacity of the processing plant

Table 18: showed the annual fixed cost of milk processing plant by the year 2017. Research revealed that, there is a variation of fixed cost from the month of January to December of the year due to the variation of milk supplied per month by TDCU from its member's side. This variation leads to altering the fixed cost of milk processing per month.

Table 19: The annually fixed cost of milk processing by the year 2016

2016	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Litre	1.544.305	1.310.157	979.551	956.563	1.296.332	1.349.332	1.297.517	1.106.655	1.070.226	1.037.873	904.939	942.032
Tsh	315.2M	365.8M	386.9M	158.3M	482.6M	245.6M	309.7M	294.9M	328.7M	395.4M	323.6M	325.1M

Table 20: The Annual fixed cost of milk processing by the year 2017

2017	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Litres	850.348	704.177	824.551	891.684	955.172	1.037.319	1.277.052	1.236.130	1.162.671	1.127.732	1.217.572	1.385.253
Tsh.	221.7M	231.9M	214.3M	224.1M	243.8M	248.6M	264.8M	235.5M	301.1M	320.M	365.9	418.7M

4.2.8 Cost of processing one litre of milk

Table 18: showed the cost of processing one litre of milk per month by the year 2017. During the interview with the Executive secretary of TDCU, it's showed that, the cost of processing one litre of milk increases when the processing plant operates under its installation capacity. For instance during the month of July, the cost of processing of one litre of milk was 1.022Tsh and the volume supplied at that time was 1.28M litres of milk which positively affected the processing capacity of the plant and hence reduce the cost of processing one litre.

Table 20: The trend of the cost of processing one litre of milk by the year 2017

2017	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Litres	850.348	704.177	824.551	891.684	955.172	1.037.319	1.236.130	1.236.130	1.162.671	1.127.732	1.217.572	1.385.253
Tsh/litre	1.288	1.534	1.287	1.261	1.257	1.194	1.022	1.060	1.078	1.177	1.277	1.260

Table 21: The trend of the cost of processing one litre of milk by the year 2016

2016	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Litre	1.544.305	1.310.157	979.551	956.563	1.296.332	1.349.332	1.297.517	1.106.655	1.070.226	1.037.873	904.939	942.032
Tsh/Litre	970	1.052	1.322	1.489	1.093	1.091	1.088	1.514	1.611	1.097	1.097	1.316

4.2.9 Production cost per litre (Cost per litre)

Table 19: Showed the production cost of processing one litre of milk by the year 2017. During the interview with TDCU, the study noted that; In order for TDCU processing plant to operate under its profitable manner, it must operate above the break-even point according to the principle of economic of scale. The study showed that, according to the principle of Economic of scale, currently processing plant operates under its installation capacity of 43.8% due to the low milk supply from their member's side. This effect causes the increase in the total cost of processing one litre of milk per month.

Table 22: The production cost of processing one litre of milk by the year 2017

2017	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Litre	850.348	704.684	824.551	891.684	955.172	1.037.319	1.277.052	1.236.130	1.162.671	1.127.732	1.217.572	1.385.253
VC	1.288	1.534	1.287	1.261	1.194	1.02	1.078	1.060	1.078	1.177	1.277	1.260
IC	261	329	260	251	240	207	259	191	259	284	301	302
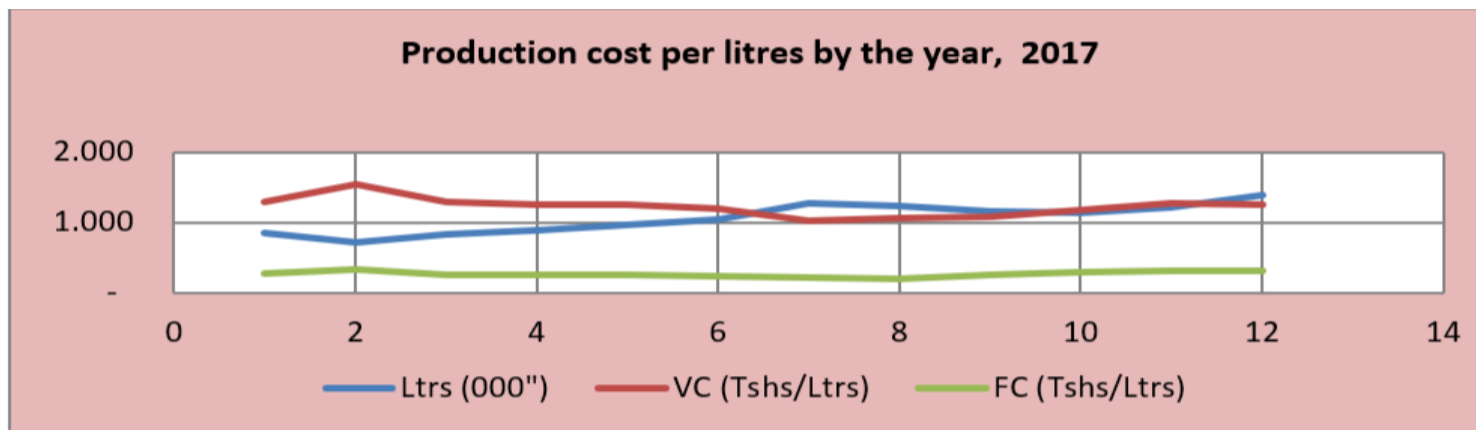
Figure 20: Production cost per litre by the year, 2017.

Table 23: The production cost of processing one litre of milk by the year 2016.

2016	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Liters	1.544.305	1.310.137	980	957.551	1.297.332	1.349.332	1.297.517	1.107..551	1.070.226	1.038.873	1.905.939	942.032
VC	970	1.052	1.322	1.489	1.091	1.091	1.088	1.514	1.611	1.097	1.306	1.316
IC	204	279	395	165	181	181	238	266	306	380	357	345
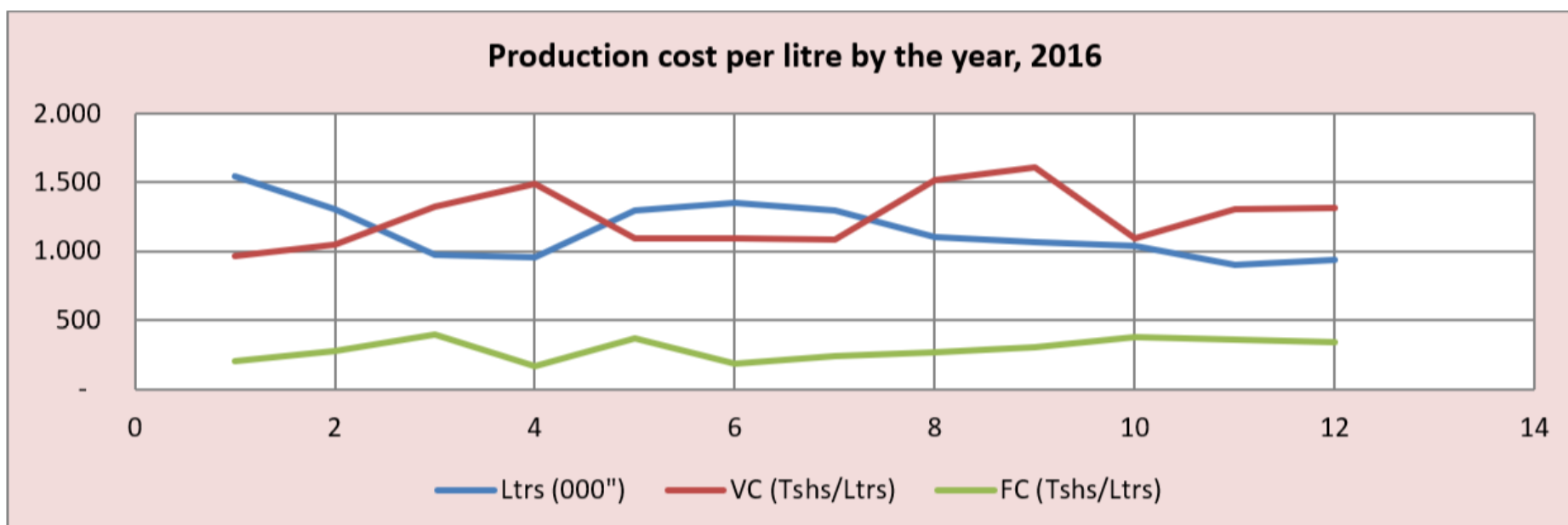
Figure 21: Production cost per litre by the year 2016.

4.3 Break even point analysis of Tanga Fresh Limited (TFL)

The break even point of the TFL were calculated based on the information obtained during the interview made with the production manger of TFL. This information based on the annually variable cost incurred during the milk collection, processing, fixed cost/indirect cost involves and sale price per sales products produce. Research findings out that, the processing plant does not obtain sufficient profit from what they get from processed dairy products marketing. The break even sales per unit during the year 2017was 26.214.056.30, this means that, the annual profit TDCU make is low. This report by the manger that, that the TDCU make a profit but is not sufficient for running the administrative activities as well as to improve the livelihood of their members though their milk delivers to the TDCU. During the interview made by the production manager pointed out that; This is because the volume of milk supply from its members is low. Currently milk supply to the TDCU is approximate 35,000Litres which make the factory to operate under its efficiency of 43.8% of its installation capacity. Table xx. Showed the annually break even point per units and sales products by the years 2016 and 2017 respectively.

Table 24: Break even point of TFL by the year 2016 and 2017

Break even point	2016	2017
Unit sold	13.788.970	12.824.730
FC	5.040.625	5.732.039
VC	17.096.415	15.493.723
Sales	22.437.186	19.829.752
Break even units		
FC/(Sales – VC)/Units sold	13,014.042,44	16,953,726,26
Break even sales		
FC/(Sales – VC)/Sales sold)	21.176.236.91	26.214.056.30

Source: Internal data of TFL, 2018.

During the field survey, the research noted various costs which included the variable costs and indirect costs incurred by the processing plant which is clearly shown in Table 24.

Table 25: Various cost incurs by the processing plant

Indirect cost	Variable cost
Business promotion	Transportation cost inward
Repairs and maintenance	Packing material and other inputs
Administration salaries and wages	Factory personnel costs
Office expenses	Distribution and sale expenses
Consultancies	Power and water
Board Meeting expenses and Directors fees	Factory production losses

Source: Compiled from TFL, 2018

4.4 SWOT analysis of TDCU

The SWOT analysis was undertaken during the field study inorder to identify the Strength and weaknesses which are internal factors that determine the success or failure of the TDCU. Opportunities and threats are external situational factors. The information obtained during the field study from TDCU, dairy farmers and other stakeholders has resulted in coming up with a SWOT analysis of TDCU.

Strengths
- TDCU has created a strong marketing opportunity for its members for sustainable marketing of processed dairy products.
- TDCU has established 17 milk collection centres which are easily accessible for its members to easily deliver their milk.
- The TDCU provides regular dairy training, credits with lower interest to their members in order to expand dairy production and extension services with the reasonable prices.

Weaknesses
- Less transparency and accountability from the management of TDCU inform its members on leadership
- Low obligation from members to deliver all volume of milk they produced to fulfil the capacity of the processing plant.
- Low linkage of TDCU with dairy stakeholders to get support from the different dairy business environments such as different NGO and actors because of poor commitment and poor financial management.
- Lack of enough cooling tanks and laboratory equipment at MCC for better milk quality control.

Opportunities
- Expand processing capacity to reach 120,000litres of milk per day at the end of the year 2018, to create an opportunity to collect a huge volume of milk from its members.
- Presence of good government policy which helps dairy cooperatives to improve its position
- Stable and reliable milk marketing.
- The existence of livestock research institute.

Threats
- High competition from informal/ local markets.
- There are strong competitors with TDCU and play a great role in collecting of high volume of milk from smallholder farmers around the Tanga region.
- Consumption of pasteurized milk by the local market and people is not familiarized prefer to drink boiled whole milk.
- Infrequency extension services and training.

Through the SWOT analysis in which the research findings mentioned above, will use that information in order to come out with the recommendation to the TDCU on the strategies or policies which can influence TDCU members to deliver their milk to the formal channel from the informal channel which is dominated in the study area.

4.4 Competitor of the Tanga Dairy Cooperative Union

The following were the results of the interviews made with Ammy dairy farm who is a competitor of TDCU, in collecting of raw milk from the smallholder farmers, milk processing and marketing of processed milk products in Tanga region.

Ammy Dairy Farm

The interview made with the manager of Ammy Dairy Farm showed that, the farm was a privately owned dairy farm, which was established in 2005. Since its establishment, the farm was started with 15 crossbred of Holstein-Friesian dairy cows.

Picture 4: Interview made with Manager of Ammy Dairy Farm

During the interviews with Manager of ADF mentioned that, currently, the farm has a total of crossbreed dairy cows of amounting to 85 dairy cows. At present only 70 milking cows produce nearby 1,072.5 litres of milk per day. The amount of milk produced per day is not enough to sell as raw milk at the farm's café and to process into different dairy products, so they need additional raw milk from the smallholder dairy farmers in the study area. The Ammy Dairy Farm (ADF) was started to supply milk from the smallholder dairy farmers since 2010 to date. ADF has six MCC in three districts namely Mheza, Tanga and Pangani districts, which collect an average of 11,792 litres of milk per day.

The manager of ADF mentioned that, the farm had made a contract with 379 smallholder dairy farmers from the Tanga region to supply additional milk in order to meet the capacity of processing milk into various milk products. Currently ADF processes an average of 13,503Litres of milk to produce pasteurized milk, yoghurt and culture milk (Mtindi). The ADF has its own two retailer's shop in Tanga town where they sell their processed milk products.

Table 26: The average milk collected by Ammy Dairy Farm from 2015-2017

Year	2015	2016	2017
Amount of milk collected	2,191,235.5	4,819,312	5,581,080

Source: Ammy Dairy Farm internal data, 2018

4.5 Milk product retailers

The interview conducted by TDCU Executive Secretary mentioned that, TDCU has own retailer shops. There are seven retailer shops located in different districts in the Tanga region and other retailers shops located all around Tanzania region. They sell their processed dairy products such as culture milk, pasteurized milk, yoghurt, soft cheese and butter. TDCU perform a wholesaling function to distribute the processed dairy products to the different retailer shops, which are located in the different parts of Tanzania.

Picture 5: Indicated processed milk products by TDCU

4.6 Tanga region livestock development office

The interview made with the head of Tanga region livestock development officer study revealed that, the annual milk production in the Tanga region was approximately 20,315,219litres. The support provided by the Tanga region livestock office to the smallholder dairy farmers as stated; are technical support such as good dairy management practice, extension service such as AI service, facilitate different inputs such as different varieties of forage and pastures establishment practices, different ways of animal feed conservation such as hay and silage making, improved dairy breeding potential through AI service with a affordable price, with the aim to improve the position of smallholder farmers in the milk value chain.

Picture 6: Interview made with Tanga region livestock development officer,2018.

During the interviews made with District livestock office, continuous stated the milk production in Tanga region as well as in the study area varies with season. Normally during the wet season, the milk production was high because of availability of animal feed such as pastures and forages to feed the animals. During the dry season, the milk production was low due to the low access of animal feeds like pasture and forages with poor quality and hence lowering the milk production. Other factors noted which lower milk production in the study area were the diseases such as Food and Mouth Disease (FMD), mastitis and poor dairy breeds with low milk production potential are the major factors resulting of low milk production in the study area.

The trend of milk production (Litres) in Tanga region, 2017

Month	Litres
Jan	1381013
Feb	1561338
March	2019450
April	1136500
May	1783156
June	1981751
July	2315018
Aug	1851246
Sept	1392315
Oct	1242567
Nov	1427971
Dec	1742079
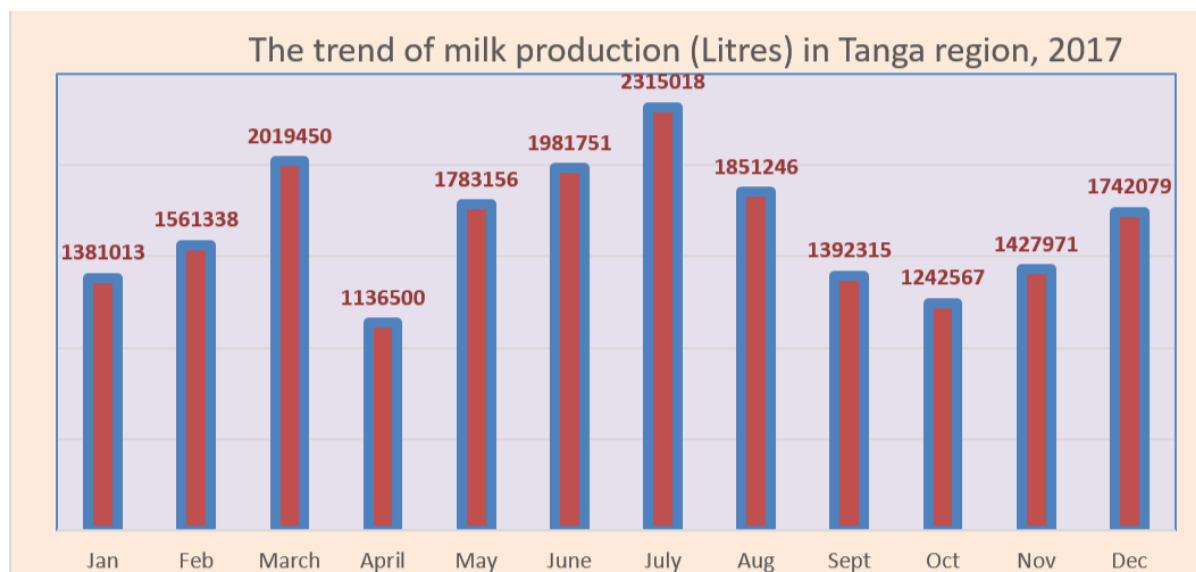
Figure 24: Trend of milk production in the Tanga region during the year 2017

Source: Tanga region livestock office internal data, 2018

Figure 24; indicate the milk production in the Tanga region varies from the month to month through out the year,2017. The variation of milk production influence mainly by the poor dairy breeds kept by the most of the milk producers, insufficient of extension services especially in general dairy management practices and seasonal availability of animal feed (pastures and forages). During the wet season (March to July, there are available of pastures and forage to feed the animals) and during the dry season (October to February, there are unavailable of pasture and forage to feed the animal, which resulted to lower dairy productivity in the study area.

CHAPTER FIVE: DISCUSSION

5.1 Background information of the respondents

The study affirmed that (90%) of the interviewed respondents were aged 35 to 65 years with the average age of 53 years. The age is significant in describing a households' "situation providing insights on the working ages of the households". Research findings out that, 10% of the interviews respondents were the youth of the average age of 27 years while 90% were elderly people with an average age of 53 years were engaged in dairy farming business as a source of household revenue. The study revealed that the youth reported that the dairy business is not profitable to the other business like clothes and mills business, thus why most of the youth were not engaged in dairy business in the study area. Age plays an important part to the benefit of the dairy farmer and a household in context of providing labour and growing the income status of the household (Chenyambuga *et al*., 2008).

5.2 Input suppliers to the dairy farmers

During the field study, it was affirmed that both Governmental and Non-Governmental Organization were involved in providing extension services to the dairy farmers such as Artificial Insemination (AI) service, veterinary services, pasture and forage establishment and improvement by diffusing and disseminating varieties of forages and pastures species. Among these actors were the Tanzania livestock research institute, Livestock Training Institute, Local Government and NGOs like ABEA(Artificial Insemination project), who are all currently involved in providing AI service to the smallholder dairy farmers in the study area and through out the in the Tanga region. TDCU and other small private veterinary shops are the major actors found in the study area who closely support smallholder dairy farmers in the provision of mentioned above inputs to improve dairy productivity. Similar findings are highlighted by Anteneh(2008) asserting that Governmental Organizations and the private sector play a vital role in the provision of different inputs services and products such as animal feeds, AI service, pasture and forages establishments, dairy training and demonstration of dairy technologies for the target dairy farmers.

Most of the smallholder dairy farmers (80%) showed that AI service provided by private inseminators is very expensive estimated standing at 25,000Tsh to 35,000Tsh per service per cow, as compared to AI service provided by TDCU which costs 20,000Tsh per cow although the service provided by TDCU is not as reliable as that provided by the private inseminators, partly justifying the lesser cost. This variation in the cost of AI service is attributed to crossed bred heifers which are costly and expensive to maintain. Due to this mentioned reason majority of the dairy farmers prefer to have crossbred heifers by inseminating with their local cows and having a crossbreed bull within the herd to reduce the cost of breeding.

5.3 Milk production in the study area

The research findings out that milk production in the study area was 20,315,219 liters of milk per year. However still most of the smallholder farmers were own local dairy breeds with low potential of milk production. Base in Tanga region comprises of smallholder dairy producers, the enormous majority of whom keeps "Zebu" traditional cattle (98% of the total available cattle). Precisely, "70% of the total national milk production originates from smallholder dairy farmers" (Quaedackers, 2010).

Field study results showed that, 70% of the interviews respondents were hindered by the meagre land size, poor dairy breeds, inadequate extension services and the high cost of input supply such as dairy mixed feed which contributes to the low milk production in the study area.

This finding was supported by Modderman(2010) who argues that low production and performance by farmers is linked to many attributes. Some of them include market, land size, quality of pasture and forage, milk quality, insufficient capital to invest in the dairy business and inadequate dairy training.

The field study showed that 50% of the interviewed smallholder dairy farmers produced an average of 17 litres per dairy cow per day from crossbred dairy cow and 6.5 litres per day from the local breed dairy cow. This finding is reflected in a similar study as noted by Anteneh(2008) who affirmed that the milk yield per cow from cross breed and the local cow was 9.63 and 2.10 litres per day respectively. This variation in the average milk yield per cow has been attributed to the difference in breeding and breeds, dairy management practices and feed systems. (KIT *et al.*,2010) asserts that the smallholder dairy farmers should add value to their product through vertical integration to earn more profit.

5.4 Milk marketing practices channels

The research findings out that, there are two milk marketing channels in the study area which are informal and formal marketing channels because of the higher price of one litre of milk compared to the price per litre offer by TDCU. 85% of the total interviews respondents were sale their milk through the informal marketing channel and 15% were sale their milk through the formal marketing channel and processed into dairy products.

5.4.1 Formal milk channel

Field study survey noted that 15% of the interviews dairy farmers were sale their milk through formal milk marketing channel through direct to the MCC and milk processing plant or to milk vendors who buy milk from the dairy farmers and sell it to the MCC. Retailers have the role of supplying the processed products that are mainly needed by the consumers that can influence the processor to produce more according to the consumer's demand. Formal milk marketing operates in a planned system of milk collection, by means of well-established bulking and transport infrastructure.

According to Elepu (2006), formal marketing channels have many advantages which include production and marketing of good and acceptable quality raw milk and dairy products, improved the shelf life of milk and milk products, enormous amounts of milk and easily controlled and managed quality standards. Likewise, formal milk marketing is contrained by several hinderances as reflected in the study including but not limited to low prices for the milk and delayed payment of the dairy farmers by TDCU affirmed as the main problems mentioned by its members.

5.4.2 Informal market channel

Research findings showed that, 85% of the interviews respondents sold their milk through the informal channel (direct to the local consumers and milk hawkers). However, most of the dairy farmers chose to sell their milk through informal chain due to the benefit of having a premium price per litre. Similarly (Tessema, 2010), reported that 98% of milk produced by smallholder farmers was sold through informal chain whereas only 2% of the milk produced is channelled through the formal chain.

Similarly findings reported by Rajendran *et al,* (2004) argue that 95% of the milk is marketed through the informal channels that are highly disjointed and includes milk vendors, wholesalers, retailers and producer themselves. In additional most of the milk producers do not prefer the formal channel because payments take several weeks and lack of the transparency with their Cooperative.

Nevertheless, this channel has a lot of faintness which includes: adulteration of milk with water, mix with cassava, lack of facilities for pasteurization, poor hygienic handling of milk, poor quality vessels used in transportation of milk (for example jerry cans), boiling of milk in very unhygienic environments, lack credit and difficulty in supervising quality standards.

Additionally, study findings showed that, dairy farmers who participated in informal marketing channels had a higher average price of Tsh.1000 -2000 per litre of milk and hence earn high return compared to dairy farmers who participate in formal marketing channel of receive the average of Tsh.700 per litre of milk. This price difference is due to the factor that, formal marketing channel incur a various cost from the point of milk collection until to deliver to the processing plant for the processing it to produce various milk products while in the informal marketing channel, there is low investment and there are not milk control cost incur by the actors participate in the informal marketing channels.

5.4.3 The benefit of formal and informal milk marketing chain

A field study showed that, Most of the interviews dairy farmers > 80% were sale their milk to the informal marketing due to the higher farm gate price compare to the formal marketing. But in formal marketing dairy farmers deliver their milk because it is a sustainable market throughout even the price offer is very low compare to the cost of production. This study supported by findings reported by Van der Valk and Tessema (2010) argue that, Formal milk marketing channel includes the route through which smallholder dairy farmers deliver their milk directly to a Milk Collection Center who buy milk from farmers and then sell to the dairy processing plant. The advantage of this informal milk marketing channel is high farm gate price for a dairy farmer, simple decision making by the farmers. However, the dis advantage of this channel of milk marketing way is no quality control and traceability of product, high risks and loss of milk during less demand for milk.

5.4.4 milk market Information

The survey study showed out that, 48% of the interviewed smallholder dairy farmers received milk market information from their corresponding dairy farmers and 31% received market information from the milk traders. Nevertheless, marketing information flows in both directions with actors proactively sharing relevant information. Furthermore, (Kotabe, *et al*.,2003) reported that communication and information sharing accelerates improvements in the chain coordination and efficiency through reduction of transaction costs and fast relaying of necessary information leading to achieving greater operational efficiencies

5.5 The role of TDCU in the milk value chain

TDCU is one of the milk collection and processing plants in the study area with over 5000 members who deliver their milk to the MCC. The study showed that, TDCU has collected an estimated 35,000litres of milk per day from its members. Presently, TDCU is involved in milk collection, processing and marketing of processed milk products such as pasteurized milk, butter, soft cheese and yoghurt and further distribute the processed milk products to its retailers in a various part in Tanzania regions. This finding supported by findings reported by Asfaw,2010) argue that, Co-operatives also provide farmers with a reliable market of milk produced, adequate access to market information through frequent visits of extension officers and regular dairy training.

5.6 Milk Processing by TFL

The exact cost of milk processing in Tanzania especially in Tanga Fresh Limited (TFL) is very difficult to determine considering that all financial data is confidential, and that competition is very strong, leading to confidentiality of data which may uncover margins and costs. The costs used in this study were estimated based on an interview made by production manager of TFL as internal data in order to determine annually break even point per unit produced. The processor producing a variety of products such as pasteurized milk, UHT milk, cheese, yogurt, ghee, cultured milk and exhibited different total costs of production per year.

In general, one of the main profitability drivers for any dairy processors is capacity utilization. Currently, the capacity utilization of TFL is low (at an average of ~43.8% of the installation capacity). In the dry season processing is as low as one-third of the milk processed in the wet season due to the low availability of pasture and forage to feed the dairy cow as result lower the milk production from the dairy farmers. The study found out that the fixed cost varies per month depending on the amount of milk supply per month. This has a negative impact on per-litre fixed cost allocation. According to the principle of economies of scale the processing plant could not get enough profit from what they produced due to the running under its efficiency. Similarly the finding of SNV (2008) who reported that most dairy plants in Tanzania were operating under the capacity of 50% due to low milk supply from the supply side.

5.7 Factors affecting the volume of milk supply to TDCU

5.7.1 Production cost

60% of the interviewed smallholder dairy farmers affirmed to a high cost of input, such as animal concentrate and poor genetic potential of the animal coupled with insufficient extension services were the main problems, which consequently affected milk production. Not only was the cost of animal feeds a difficulty but the availability too highly challenged the small-scale dairy farmers in feeding their animals. This is because of a big competition with a human population, which leads to the expansion of land for cropping production and construction. Similarly, UNIDO (2009) argued that due to severe shortages of animal feed supplies and poor dairy breeds, the cost of running a dairy farm is becoming more expensive and this affect farmer's welfare

A similar finding from SNV, (2008) reported that, in a dairy production system, feed costs constitute 74% of the total cost of farm production while labour cost accounts for only 6% of farm costs. Current research findings the reflect the status of milk production in the study area. This study highlights an average cost incur by smallholder dairy farmers to produce one litre of milk is 331.1Tsh and return per litre when sale through informal marketing is Tsh.368.1 and when sale through informal marketing return per litre is Tsh.668.9. >80% of the interviews dairy farmers mentioned that the cost of input supply such dairy mixed feed, veterinary services increases daily, but the revenue obtained from the sale of one litre of milk is low as compared with the cost of production of one litre of milk.

5.7.2 Selling price

This study observed that, 27.5% of the interviewed smallholder dairy farmers sell their milk directly to local consumers, 15% delivered their milk to the TDCU through MCC and 37.5% sell their milk-to-milk hawkers while 20% sell their milk to the restaurants. As a result, the TDCU did not get enough volume of milk from their member. This hinders the processing plant to operate under its normal installation capacity. Normally smallholder dairy farmers are always looking for a better price to sell their milk. TDCU buy one litre of milk by 700Tsh from its members whereas other competitors' like Ammy Dairy Farm buy one litre of milk by 1000Tsh. Due to this price difference per litre of milk attracts dairy farmers to sell their milk to the TDCU competitors.

5.7.3 Lack of transparency

The capability to manage the cooperative depends on the quality of the leadership and governance. Leaders should sacrifice time and effort for the better of the cooperative group to survive in a sustainable way. Leaders should use the knowledge they have had to improve the cooperative's development World development (2008). Based on the study survey result, it was observed that, there is a lack of transparency between TDCU and its members on income flow and feedback from the management meeting. 70% of the interviews members stated that, they did not receive any share/ benefit since the establishment of the TDCU in 1993. This matter made the members distrust the TDCU as the income generated from dairy products marketing business are not properly accounted for by the cooperative for the benefit of its members.

5.7.4 Competitors

Based on the information's provided by the Executive secretary of TDCU during the interview, currently the main competitor of TDCU is Ammy Dairy Farm who is a strong competitor with TDCU in purchasing milk from smallholder dairy farmers found in the study area. Due to strong competition especially with Ammy Dairy Farm, TDCU could not procure enough volume of milk to meet the processing plant capacity per day. Ammy Dairy Farm; uses 30% of its own farm milk and 70% is collected from the smallholder farmers which is then processed into different dairy products. Research findings showed that, Currently Ammy Dairy Farm supply milk from smallholder dairy farmers approximately 15,503 litres per day. ADF provides extension services with a very low price to the dairy farmers and purchases milk with premium price compare with TDCU. Hence, the justification why most of the dairy farmers in the study area sold their milk to the ADF.

5.7.5 Reduction in the volume of milk production in the study area

Research findings showed that 85% of the interviewed dairy farmers mentioned that, the trend of their milk production per cow is gradually decreasing. This is because most of the smallholder dairy farmers have the poor dairy breeds with low milk potential, poor dairy husbandry practices and insufficient extension service and the high cost of input supply such as animal feeds that contribute to the low milk production. This finding was supported by Modderman, (2010) who argued that the low dairy production performance of the smallholder dairy farmers is linked to many attributes. Some include low market price, small plots of land for pasture and forage, insufficient capital and inadequate training. KIT et al (2006) pointed out that the dairy farmers should add value to their product through vertical integration to earn more profit. Because of low milk production from the milk producers, the TDCU members could not deliver the same volume of milk as they have been delivering. Thus, causing the processing plant to operate under its capacity.

5.8 policies to improve milk procure to the formal supply chain.

From the field survey, the informal dairy supply chain plays an overriding role in milk marketing, handling and over 80% of raw milk vending. It is obvious that the formal chain will grow as the income of dairy farmer's increases. Consequently, it is likely that the informal marketing chain will be dominant for many years to come over formal marketing, in given trends of demand on the price advantages and high value of service. This strategy to improve milk supply to the formal supply chain should involve developing appropriate milk quality guarantee standards and formal approaches towards assimilating informal chains into the formal chains.

5.8.1 Enhancing milk supply to the processing plant

Field result showed that, over 80% of the interviews respondents in the study area were smallholder dairy farmers with a small herd size of 2- 7dairy cow with low potential od milk production. Most of the smallholder farmers were training on improving dairy productivity especially in good farming practices in feeding conservation practices. Furthermore, capacity building was developed through training in ways through which supplementary feeding practices are ensured during the dry seasons to feed their dairy cow when pastures availability is low with poor quality to animal grazing. However, the quality of natural pastures available in the dry and wet seasons for grazing dairy cow cannot meet the requirement for lactating cow without supplementary feeding in order to improve the milk supply to the TDCU.

5.8.2 Dairy Policy and regulations

The study showed that there is surely a need to revise the approaches of the dairy development policy framework on the inclusion of smallholder dairy farmers into the formal chain development. The scaling up of the process of the dairy farms will need to be accompanied by an effective use of available public support through extension services; financial services or consultancy, which is vital at a start up of a new initiative in the dairy sector. Private Public Partnerships will invite as dairy shareholders to support the development of the dairy sector. To create a good environment for initiatives for smallholder dairy farmers to participate in the dairy sector. Such a support reduces the related risks and stirs up a more favourable environment for the initiative. All the actors in the chain must change from being production driven to the final consumers.

This can help TDCU keep high quality standards for their milk products produce and dairy services in collaboration with other dairy stakeholders like Tanzania Food and Drug Authority (TFDA), Tanzania Bureau of Standard(TBS) and Consumer Council of Tanzania. Consumers education is important especially on food safety issues and promotion of consumption of milk and milk products.

5.8.3 Organization and networking

This comprises:
- Coordinating the dairy industry through dairy stakeholders' forums where they can sit, comprehend and admiration each other's role in the chain and improvement of networking between the dairy stakeholders.
- A milk production recording scheme can help recognize high potential areas for milk production through milk recording through the office of Central Statistics Bureau.
- Improving documentation, registering and traceability for herd development and order to avoid the risk related to the dairy development.

5.8.4 Better-quality provision of extension services

One of the challenges for the dairy industry is consequently to shift smallholder dairy farmers to formal markets in which markets are transparent and products of good quality grades. For this to ensue, the government together with dairy stakeholders should play the following role;
- Improve the skills and knowledge of dairy farmers through the dairy training in their Cooperatives especially in good herd management practices, milk hygiene will improve production on the farm and increase the supply base for both the formal and informal chains.
- A clear plan regarding management and marketing allows a more efficient organization in all processes along the formal supply chain.
- Continuous innovation strategies for dairy development. Its is an important factor for scaling up the dairy sector.
- Research is very important for development dairy sector, should be supported and given enough resources in the pasture and forage improvement system and dairy breeding upgrading.

5.8.5 Increasing milk supply base

According to Match Maker Associates Ltd (MMA, 2008), there is little guiding support for the dairy industry companies from the Tanzania Government. There are poorly organized programs to support the market demand for processed dairy products. The Government does not actively address the large informal market though selling milk informally, which is officially prohibited.
There is a need to improve management of TDCU to improve their trust in its members to increase milk procurement. Hence to reach the target of feeding the industry with 80% of its installation capacity of the milk deliveries from their MCC.

5.9 Break even analysis of TFL

Research findings out that, the processing plant does not obtain sufficient profit from what they get from processed dairy products marketing. This is because the volume of milk supply from its members is low. Currently milk supply to the TDCU is approximate 35,000Litres which make the processing plant to operate under its efficiency of 43.8% of its installation capacity. According to the economies of the scale, in order for the factory or company to make sufficient profits, its must operate above the break even point so as to fix out the all the cost incur during the production and start to make profits from what they produce (Landsburg, 2012).In the case of TFL, its is very important for TDCU to improve the volume of milk supply from its members at least to operate at 65% of its installation capacity. However when the processing plant able to operate at 65% (52,000 Litres of milk per day) of installation capacity can get more profit from their processed dairy products and can able to improve the raw milk price per litre to their members, extension service and another important aspect which will attract more members to deliver their milk to the TDCU.

5.9.1 Challenges facing TDCU in milk collection and processing plant

Table 27: Main problems faced TDCU in milk collection and processing milk in the study area.

Name of cooperative	Challenges of milk collection
TDCU	-Diseases like mastitis and FMD affect milk quantities and qualities -Raw milk adulteration by the farmers -Farmers refuse to attend milk quality training -Most of the farmers sale their milk to the formal channel -Lack of transparency between TDCU and its members -Low milk production in the study area -Vehicle break down as a result of milk spoilage
	Challenges of milk processing
	-High processing cost per litre of milk - High maintenance cost of cold chain facilities -Facilities break down like sealing machine -The high cost of package materials -Low milk supply from its members

Source: Survey result of TDCU, 2018

This supports the findings of Penrose, (2007) mentioned that mention some of the challenging facing cooperative including mistrust between members and leaders, lack of entrepreneurship skills. Thus, there is an essential external support especially from government agents and institutions to inspiring the cooperatives in order to operate in profitable.

CHAPTER SIX: Conclusions and Recommendations

This chapter lastly describes the conclusion and recommendations drawn from the case study, survey results and discussions.

6.1 Conclusions

From the field study conducted, the main causes of low milk supply by TDCU was identified and mentioned as follows:

1. Selling side of TDCU members, is one of the main causes of the low milk supply to TDCU. Research findings out that, most of the members (>60%) interviewed are involved in side selling their milk to the informal market because of higher price offer by informal market (Tsh 1000- 1200) campare to TDCU price offer per litre of milk (Tsh.700). This resulting to low milk supply to TDCU making the processing plant to be operating under its efficiency.

2. Lack of transparency between TDCU and primary societies. No clear information on how primary societies are going to benefit from the share, which is claimed to be 42% as a share holder of the industry. Because of this, the members do not trust the union and some members totally stop delivering their milk to TDCU and shift to sell their milk to the informal market where they can get a high price.

3. High competitors such as Ammy Dairy Farm and milk hawkers (In the Tanga region, there are approximate 201 milk hawkers each collect an average of 100litres of milk per day from smallholder dairy farmers) affected the volume of milk supply to TDCU. This is because most competitors found in the Tanga region increase the price of one litre of milk above TDCU price to attract primary societies members, this cut the quantity of milk procured per day.

4. The field result showed that the high cost of inputs especially feeds cost negatively affects dairy farming activities. This consequently affects overall the volume of milk produced by smallholder dairy farmers. The cost of milk production per litre was found to be high (Tsh.331 per litre) compared to the price offered by TDCU per litre to its members. However the research findings showed that due to the lack of sustainable breeding centers and inadequate extension services, the quantity of milk produced per cow is low in the study area. Due to these reasons most of the dairy farmers opt to sell their milk to the informal market which has a high price gain more profit, which can compensate for the cost of production. The situation clarifies the issue of the quantity of milk produced per cow and not the price of milk given by TDCU to its members. The more they will produce, the more they will benefit other than complaining to the TDCU to raise the price while they continue keeping poor dairy breeds with low potential of milk production

5. The research found out that the distance from the MCC to farmer household is far that is why most of the dairy farmers live in the remote areas; they fail to collect evening milk to the MCC due to the existing long distance. Farm households have no option of how to conserve their evening milk due to lack of cooling facilities. This cut the quantity of milk to be collected per day.

6. The field study revealed that, Most of the dairy farmers in the study area tend to have a short-time orientation regarding the sales of milk while the Cooperative/ processor has a more long term orientation with a specific focus on reliability and quality supply of raw milk. The short term orientation of the dairy farmers for profits makes them sell milk to the one who offers a high price.

7. The research findings out that, when the dairy farmer sells milk through milk hawkers which in turn sells to the kiosk, the dairy farmers can earn Tsh300/litre extra than when the dairy farmer sells milk to TDCU which in turn sell to the retailers. In the formal chain, half of the value shares are for the dairy farmers while the other half is shared between TDCU, ADF and retailer. In the informal chain, dairy farmers have a higher value share compared to the formal chain.

6.2 Recommendations

According to the objective of this study, appropriate recommendations towards improving milk supply to TDCU in order to improve the efficiency of the processing plant was given.

- To build commitment, good leadership and transparency of the Executive Committee of TDCU play to their primary societies. Therefore, there must be training for good leadership skills and the management must be willing to listen to the opinion of their members to create the trust of their members.

- Breed improvement program: Most of the TDCU members still owned local breed is major among the cattle breeds in the study area. Similarly, most of the dairy breeds among dairy farmers are local breed with low milk potential. The TDCU should improve wider AI coverage not only for the members but also for non-members with the affordable price. This incentive will help to improve and upgrade dairy local breed genetically with high potential of milk production. Improvement of the breed will enhance the productivity of the dairy farmers. Therefore, an increase in milk production will motivate most of the dairy farmers to become members indirectly. It thus benefits both the cooperative and the farmers eventually. Nevertheless this will solve the problem claimed by the most of the dairy farmers about the price per litre offer by the TDCU.

- TDCU should establish good agreements with major input providers available in Tanga region, to buy input supply like dairy mixed feed, dairy feed ingredients such as wheat bran, maize bran, sunflower seed cake and cattle mineral block and veterinary services at affordable prices to their members. This will reduce milk production cost from its members.

- Infrastructure development: The present chilling facility available in the milk collection center (MCC) is not adequate to handle the flush season milk especially during the wet season. So there is a need to increase the existing chilling facility to enhance the shelf life and quality of the raw milk. Different NGOs are available in the district are willing to provide support to the community on the basis of effort put in by the Union. The support provides by NGOs like SNV will benefit the TDCU and its members.

- TDCU should motivate the active members by giving them a reward for being faithful members who are bringing good quality milk throughout the year and improve milk price and extension services to their members in order to cover the cost of milk production. This will make TDCU to overcome the problem of their members to sell their milk to TDCU competitors which are founding in the study area.

- Members should have knowledge of dairy husbandry practices in order to improve their farm productivity. The research noted that there was insufficient training on dairy husbandry practices of dairy farmers. The dairy farmers should be trained based on how to keep records, determining disease symptoms, milk hygiene practice and important in delivering their milk produce to the formal channel. The training can be facilitated by TDCU, Government/Non Government Organisation.

- TDCU necessity to cooperate and network with other dairy stakeholders at regional, national and international level. Networking and collaborating will make TDCU to be innovative and knowing what is happening in the market through information sharing and the way of improving leadership and management skills to their members. By participating in other cooperative meetings having the same mission and interests will reinforce its position along the value chain through the sharing of experience.

- More research should be done on cooling facilities like household milk chillers, with simple technology of using solar or biogas technology to prevent the wastage of milk due to the distance from the farmers to the MCC who are located in the remote areas.

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Appendices

Appendix 1:Survey questionnaire for Dairy producers

1. Name of respondent--------------------------------Sex -------- Village------------------District……
2. Education background

Dairy farmer	Never been in school	Primary level	Secondary level	Certificate level	Diploma level & above
Education background					
Code Never attend school-1, Primary level-2, Secondary level-3, Certificate level-4 and Diploma &above - 5					

3. What is the total size of the land in acres?

Land	Less than one acre	1- 2 acres	3- 4 acres	5 acres & above
Size of grazing land				

4. Is dairy production is your main business? Yes /No
5. Do you use family labour to run your dairy business? Yee/No
6. Labour division in your dairy activities?

Activities	By whom			
	Male	Female	Children	Hired labour
Purchasing input				
Feeding the cows				
Cleaning the barns				
Selling milk				
Controlling revenue from the sale of milk				
Code= male-1, Female-2, Children-3, Hired labour- 4				

7. Dairy animals and milk yields/production

Dairy farmer	Exotic breed		Local breed	
	Rainy season	Dry season	Rainy season	Dry season
Average herd size				
Milk production/day/ cow				

8. What methods do you use for breeding your dairy animals?

Method of animal breeding	Artificial insemination	Natural method	Both AI and Natural method
Code=Artificial insemination-1, natural mating-2, Both AI and natural mating-3			

9. What are the sources of feeds for you dairy animals? 1= concentrate, 2= roughage, 3= both, Other specify .--
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10. What costs do you incur per month for your dairy production?

Particular	Amount/Number	Unit cost	Total cost
Cost of AI service per cow per year			
Concentrate feeds per kg			
Cost of grass/ bale/kg			
Cost of crop residues bale/kg			
Cost of service per/cow/per			

11. Milk production and consumption at the farm gate?

Milk	Rainy season	Dry season
Total produced/day		
Total consumed/day		
Total sold/day		

12. Do you organize into dairy cooperative? 1= yes, 2=NO
13. Do you get extension services from dairy cooperative? Yes =1, No= 2

14. Where do you sell your dairy product (raw milk)?

Milk buyers	Price per litre	Means of transportation used to sell your milk

15. Give the reason(s) for the choice above the channel of milk marketing in question number 13?

   ----

16. What are the major problems with milk production?
   …………………………………………………………………………………………………

17. What are the major problems in milk marketing?..

18. Who mostly provides you with information about dairy production and marketing

Information provider	Livestock extension service	Dairy cooperative	Traders	Other farmers	Other sources, specify.
Code= Livestock extension service-1, Dairy cooperative-2, Trader-3, Other farmers-4, From media-5					

Appendix 2: Checklist for interviewing of dairy cooperative union

1. From how many producers did you buy milk last year?
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2. From where do you commonly collect milk?

Types of producer	A number of producer sells to you?	Average volume of milk collected/day (lit.)	Number of times a day milk collected	Mode of payment
Small scale producer (<3 animal)				
Large scale producer (>3 animal)				
Mode of payment: cash-1; paid in 7 days-2; paid in 7-15 days-3; paid in 15-30 days-4; more than one month-5; other (specify)-6				

3. Apart from milk collection, do you provide other services to the producer? -------------------------

4. Month wise per day average milk collection last year by the dairy cooperative

Months,2017	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Litre/month												

5. The total volume of milk collected per day for the last three years

Year	Total volume (lit.)	Price per litre	Majors suppliers	Remark
2014				
2015				
2016				

6. Registered number of milk suppliers ----------------------------

7. No of workers involve in cooperative? ---------------------

8. Service provided by cooperative to the members -- -- --

9. Active number of milk suppliers----------------------------------

10. Number of collection centres---------------------------------------

11. Average distance of collection centres from cooperative------------------

12. What tests do you use for screening milk? ----------

13. What problems do you commonly find with the milk collection and processing? ------------------ ------------------- -- --

14. Is there a difference in price setting between the dry and rainy seasons? 1=Yes 2= No, give your explanation--

15. What type of dairy products do you sell and who are you main customers (market segmentation)? -- ---
16. From the total volume of collected milk how much volume are processing into different products ---
17. What is the daily capacity of dairy processing plant------------ ----------------
18. Who are the competitors and supporters of your dairy activities?-------------------------------- --- ---
19. Main problems with purchase and sale of dairy products -- -- --
20. What contribution has your dairy cooperative towards improving the position of small scale farmers in the milk value chain? -- ---
21. Suggestion to improve present collection and processing capacities -------------------------------- -- --
22. Who are the supporters of your dairy cooperative union? --- -- -- --
23. What is your basis to pay the price of the milk 1=. Quantity, 2=. Quality, 3= Others, specify --- -- --

Appendix 3: Check list for Tanga district livestock development office

1. What is the trend of a number of milking of a dairy cow and milk production for the last 3 years?
2. What is the potential for developing milk value chain in small holder dairy farmers in the district?

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3. What support do smallholder dairy farmers need to improve their position in milk value chain?
4. What do you think is the reason why many smallholder dairy farmers participating in informal
marketing channel?---

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5. Do you think formal chains can improve small scale dairy farmers' position /profits? Yes /no
Explain--

----

6. What kinds of service or support do you provide for the dairy cooperative?

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7. What do you think the relationship between the dairy cooperative and other chain actors in your
district? ---

Appendix 4: Checklist for interviewing of Competitor

24. From how many producers did you buy milk last year?
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25. From where do you commonly collect milk?

Types of producer	A number of producer sells to you?	Average volume of milk collected/day (lit.)	Number of times a day milk collected	Mode of payment
Small scale producer (<3 animal)				
Large scale producer (>3 animal)				
Mode of payment: cash-1; paid in 7 days-2; paid in 7-15 days-3; paid in 15-30 days-4; more than one month-5; other (specify)-6				

26. Apart from milk collection, do you provide other services to the producer? -------------------------

27. Month wise per day average milk collection last year by the dairy cooperative

Months,2017	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Litre/month												

28. The total volume of milk collected per day for the last three years

Year	Total volume (lit.)	Price per litre	Majors suppliers	Remark
2014				
2015				
2016				

29. Registered number of milk suppliers ---------------------------
30. No of workers involved in a cooperative? --------------------
31. Service provided by cooperative to the members --

----
32. Active number of milk suppliers----------------------------------
33. Number of collection centres---------------------------------------
34. The average distance of collection centres from cooperative------------------
35. What tests do you use for screening milk? ----------
36. What problems do you commonly find with the milk collection and processing? -----------------
------------------ --
----
37. Is there a difference in price setting between the dry and rainy seasons? 1=Yes 2= No, give your explanation--

38. What type of dairy products do you sell and who are you main customers (market segmentation)? --

39. From the total volume of collected milk how much volume are processing into different products ---

40. What is the daily capacity of dairy processing plant------------ ----------------

41. Who are the competitors and supporters of your dairy activities?-------------------------------- --- ---

42. Main problems with purchase and sale of dairy products -- ---

43. What contribution has your dairy cooperative towards improving the position of small scale farmers in the milk value chain? --- ---

44. Suggestion to improve present collection and processing capacities -------------------------------- ---

45. Who are the supporters of your dairy cooperative union? -- --

46. What is your basis to pay the price of the milk 1=. Quantity, 2=. Quality, 3= Others, specify --- ---

Appendix 5: Checklist for dairy wholesalers and retailers

What are the types of dairy products handled for selling?

Product(s) handled	Purchasing price	Added cost due to added value to the product	Selling price	Volume/day
Wholesaler	1.			
	2.			
	3.			
Retailer	1.			
	2.			
	3.			