ANALYSIS OF THE DAIRY VALUE CHAIN IN THE DAR ES SALAAM MILK SHED, TANZANIA

BY

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ABSTRACT

The general objective of this study was to analyze the dairy value chain in the Dar es Salaam milk shed in order to provide information for improving linkages between actors and efficiency in the value chain. Both primary and secondary data were used. Primary data were collected using Participatory Rapid Appraisal method and structured questionnaires administered to a sample of 125 dairy value chain actors. Concentration ratios were estimated to assess market power. Market margin was used to estimate the proportion of consumer price against producer prices while profit margin was estimated to assess efficiency at different nodes of the dairy value chain. The results of Descriptive statistics indicated that the dairy value chain was characterized by little value addition activities, small scale operations at all stages of the chain, seasonality of milk supply, poor quality control systems, poor handling, preservation and packaging practices of dairy products. Overall, the dairy value chain was weakly organized and coordinated. Analysis of market power using concentration ratio revealed higher market power for processors in terms of controlling prices and output than producers and marketing agents. Results of profitability analysis indicated variation in profit per liter of liquid milk equivalent with the highest profit obtained by processors, suggesting that, value addition could be a means of generating higher profits. However, opportunities for value addition were limited by several constraints including poor organization and coordination of the value chain, pricing constraints, low levels of milk hygiene, high operating costs, lack of milk collection centers, unreliable markets and poor infrastructure. These results suggest the need for promoting actors' groups to encourage coordination between actors, promoting value addition through processing and proper packaging, promoting managerial skills in controlling costs of milk production and processing, promoting establishment of milk collection centers, improving road infrastructure and public transport systems.

DECLARATION

I, GLORIA EMMANUEL MBIHA, do hereby declare to the Senate of Sokoine University of Agriculture that; this dissertation is my own original work and has neither been submitted nor concurrently being submitted for a higher degree award in any other University.

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The above declaration is confirmed

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Supervisor

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LIST OF ABBREVIATIONS

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BCS	Business Care Service
DAFCO	Dairy Farming Company
d.f	Degrees of Freedom
DPCS	Dairy Primary Cooperative Societies
ESADA	Eastern and Southern Africa Dairy Association
EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross domestic Product
GMM	Gross Marketing Margin
IIRR	International Institute of Rural Reconstruction
ILRI	International Livestock Research Institute
LIDA	Livestock Development Authority
Ltd	Limited
Ltr	Liter
Max.	Maximum
MDB	Marketing Development Bureau
Min.	Minimum
MoAC	Ministry of Agriculture and Cooperation
MWLD	Ministry of Water and Livestock Development
MLD	Ministry of Livestock Development
NGO	Non Governmental Organization
PRA	Participatory Rapid Appraisal
SACCOS	Savings and Credit Cooperative Societies
SHDDP	Southern Highlands Dairy Development Program
SIDO	Small Industries Development Organization
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
TAMPA	Tanzania Milk Processors Association
TAMPRODA	Tanzania Milk Producers Association
TDB	Tanzania Dairy Board
TDCU	Tanga Dairy Cooperative Union
TDL	Tanzania Dairies Limited
TMM	Total Marketing Margin
UHT	Ultra Heat Treatment
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
UWATA	Umoja wa Wakulima na Wafugaji, Tanga (Livestock Keepers Cooperative Society).

CHAPTER ONE

INTRODUCTION

1.1 Tanzania's dairy sector

The dairy sector in Tanzania is divided into two sub sectors. The first one is the traditional sector of indigenous Zebu cattle producing about 70% of the milk produced in Tanzania, 90% of which is consumed at home and 10% is marketed (Mutagwaba, 2005). The traditional dairy sub sector is dominated by smallholders with an average of 2-10 Zebu dairy cattle per household producing 1-5 liters of milk per day (TDB *et al.*, 2005). The second one is the improved dairy sub-sector also dominated by smallholders with an average of 1 -5 dairy animal per household and producing 6-10 liters of milk per cow per day. The milk produced in the improved sector makes a total of 30% of the milk produced in Tanzania, 57% of which is consumed at home and 43% is marketed as fresh milk to processors and other milk consumers (Mutagwaba, 2005).

The dairy sector has undergone several changes since the country's independence in 1961. The 1960's saw the establishment of the government Milk Act that aimed at regulating and monitoring milk processing. In the period between 1974 and 1983; the government established parastatal organizations such as the Livestock Development Authority (LIDA), Dairy Farming Company (DAFCO) and Tanzania Dairies Ltd (TDL) whose objectives were to control and regulate livestock development, establish dairy farms and milk processing plants respectively (TDB *et al.*, 2005). From the mid 1980's, government interventions including direct involvement in production in the sector and subsidies were systematically reduced. The government slowly withdrew from running these parastatals

and where feasible some of them were privatized. Most of the organizations had reached devastated conditions by the time they were privatized (Kurwijila and Henriksen, 1995).

During this period the established support infrastructures and services dropped. The commercial dairy farms such as the Dairy Farming Company (DAFCO) and the National Food Cooperation (NAFCO), livestock multiplication units and dairy cattle breeding stations such as the Mpwapwa breeding unit, Kagera Livestock Development Project and Tanga Dairy Development Project and agriculture-training institutes such as Buhuri in Tanga, Morogoro, and Tengeru in Arusha were slowly under financed and therefore could not provide needed services. Under these circumstances milk production dropped (TDB *et al.,* 2005). Milk production from parastatal farms decreased tremendously, from over 15million liters of liquid milk equivalent per year in 1984 to less than 4 million liters of liquid milk equivalent in 1994 and this affected milk availability in the country (Kurwijila and Henriksen, 1995).

The absence of parastatals encouraged formation of private sector milk associations such as the Tanzania Milk Processors Association (TAMPA) and Tanzania Milk Producers Association (TAMPRODA) in the early 2000. Despite the emergence of these associations, milk production of 900 million liters per year in Tanzania is still very low (UNDP/BCS/TetraPak, 2006) compared to 1.2 billion liters in Uganda and 3.5 billion liters in Kenya (FAO, 2006). The installed capacity of milk processing plants is estimated at 500 000 litres per day (MLD, 2006) while the utilized capacity is only 30% of the installed capacity per day (UNDP/BCS/TetraPak, 2006). Meanwhile, Tanzania imports a large volume of processed dairy products from South Africa, Kenya and EU countries. The

imported dairy products averaged 34 million liters per annum during the past six years (UNDP/BCS/TetraPak, 2006).

Poor access to both internal and external markets by milk producers and distributors and pricing inefficiencies are problems widely reported in various milk sheds (Maganga, 1995; Mullins, 1995; MoAC/SUA/ILRI, 1998; Mdoe *et al.,* 2000a; World Bank, 2000; FAIDA, 2000). In general the dairy value chain and the dairy sector in Tanzania as a whole have many challenges including lack of good management and capital for investment, poor quality control procedures, and unstable electricity and water supply (TDB *et al.,* 2005). Apart from the constraints that cut across the whole value chain, each segment of the dairy value chain has its specific characteristics as well as constraints that influence the efficiency and effectiveness of the chain and overall dairy sector performance. The identified constraints can be overcome by making use of available opportunities that include suitable land, climate, large cattle population, growing demand for milk and milk products especially in urban areas. This can be achieved by developing appropriate policies and development of strategies within the framework of the macro economic and policy environment prevailing in Tanzania (Kurwijila *et al.,* 1997). However the development of appropriate strategies and other interventions to improve value addition requires a thorough understanding of the dairy value chain in the country. This study analyzed the dairy value chain in the Dar es Salaam milk shed in order to generate empirical information needed to address the challenges facing the dairy sector in the country.

1.2 Problem statement and justification

The significance of dairying for income generation has been well documented (see for example Bennet *et al.,* 2003; MoAC/SUA/ILRI, 1998; Mdoe *et al.,* 2002; Kisusu *et al.,*

2002; Mutabazi, 2002; Omore *et al.,* 2004; Mdoe and Mnenwa, 2004). The significance of dairying can be realized through regular incomes obtained by those engaged in dairy related activities including producers, processors and traders of various dairy products. Market oriented smallholder dairying has higher returns than many traditional agricultural activities and thus offers important income opportunities for resource poor producers and for rural/ urban poor through their participation in production, processing and marketing. Mdoe and Mnenwa (2004) report that; smallholder milk marketing agents are more competent in realizing higher unit profits than other milk sellers and distributors. In their study Omore *et al.,* (2004) report that, reasonable profits are highly observed in nearly all market channels and market enterprises in Tanzania. Available data from the Ministry of Livestock Development indicate that, the dairy industry in Tanzania contributes 30% to the livestock Gross Domestic Product (GDP). The potential opportunities for considerable growth in demand constitute an important element to income generation prospects in dairying. The potential demand stems from the persistently notable gap between the supply of dairy products and the human population increases. Demand for dairy products is expected to grow very rapidly with urbanization and increased income. Similarly MoAC/SUA/ILRI (1998), observed that, irrespective of income levels, urban consumers consume more dairy products than rural consumers.

Despite high demand for milk in urban areas, smallholder milk producers have little or no access to the niche urban markets for dairy products. This is due to a number of problems including inadequate production, marketing and processing problems that limit yield growth at the production level and increase in costs within the dairy value chain, poor infrastructure, failure to meet quality standards, poor organization and weak linkage with other actors in the dairy chain (MLD, 2006).

According to a study on dairy value chain by UNDP/BCS/Tetrapak (2006), the problem for Tanzania is that the integration between milk production; milk processing and milk consumption is not functioning. Because of poor integration, most of the milk produced in Tanzania is consumed at the farm level or sold to neighbors, and milk that cannot be disposed of, is often spoiled especially during the rainy season. The government's policy strategy is however, to channel surplus milk to dairy plants for commercial processing, with a view to supplying urban markets with hygienic milk and milk products (UNDP/BCS/TetraPak, 2006). In the past, processing plants operated by the Tanzania Dairies Limited (TDL) organized rural milk collection through a network of milk collection centers equipped with cooling facilities for processing (Mdoe and Wiggins, 1997). This system of milk collection and processing stopped after the collapse of TDL in 1994 due to several reasons; including inability to afford high operating costs of processing and the inability to import milk powder which was the major raw material for milk processing in the 1980's (Mdoe and Wiggins, 1997).

Although private local processors have emerged following market liberalization, value addition through processing is still very low in Tanzania. Consequently, most of the processed dairy products consumed in the country are imported from Kenya, Netherlands and South Africa. Inability to collect milk from producers in all milk producing zones is of critical concern of dairy processing in Tanzania. Most small processors still cannot afford cooling centers in milk producing areas, reducing their collection capacity; hence concentrate on a few dairy-producing areas. Lack of milk collection and cooling facilities affects milk quality and development of dairy processing as a whole (Kurwijila *et al.*, 1997).

It is clear from the above background that, most of the past studies concentrated on one or two aspects of the dairy value chain. Although the study by UNDP/BCS/Tetrapak (2006) analysed the dairy value chain in Tanzania in an integrated manner, it emphasized more on capacity and participation of its upstream-downstream parallel stakeholders and the public sector. The study did not only adequately address issues of efficiency, organization and coordination of the dairy value chain but it also had a limited geographical coverage excluding regions which have high potential in dairy production, where producers are currently facing problems of marketing milk probably owing to inefficiency and poor coordination among actors in the dairy value chain. It is against this background that the present study was undertaken to analyze the dairy value chain in the Dar es Salaam milk shed in order to provide information that would be used to address challenges, improve efficiency and coordination in the dairy value chain.

Moreover, in order to realize the growth potential of smallholder dairying, concerted efforts are required throughout the value chain, from production to consumption. Developing appropriate actions however, requires reliable information and active collaboration between the government and private sector to make policy and implementation decisions on the basis of this information. This study analyzed the dairy value chain in the Dar es Salaam milk shed in order to provide information that would be used to address the challenges faced by actors in the dairy value chain in Tanzania.

1.3 Objectives of the study

1.3.1 Overall objective

The overall objective of the study was to analyze the dairy value chain in the Dar-Es-Salaam milk shed in order to provide information for improving linkages between actors and efficiency of the dairy value chain.

1.3.2 Specific objectives

The study was guided by the following specific objective;

(i) To characterize the dairy value chain in the Dar-Es-Salaam milk shed from production to consumption.

(ii) To examine how the chain is organized, coordinated and functioning including linkages between the key actors along the value chain.

(iii) To determine prices and margins obtained by actors at various nodes of the dairy value chain from production to consumption.

(iv) Identify constraints and challenges faced by actors and suggest interventions for improving both linkages and efficiency of the dairy value chain.

1.4 Research questions

The study was guided by the following research questions;

- What characterizes the dairy value chain in the Dar es Salaam milk shed from production to consumption?
- Who are the key actors in the dairy value chain and how are they organized and coordinated?
- What are the prevailing prices, marketing and profit margins along the value chain?

- What determines the price differences and margins at various nodes in the chain?
- What are the key challenges and constraints facing actors along the value chain?
- What specific interventions are appropriate at each stage in the value chain for improving linkages and efficiency of the dairy value chain?

1.5 Organization of the dissertation

The dissertation is organized into five chapters. The second chapter comprises the review of literature entailing concepts of value chain and value chain analysis, past studies on dairy value chain, milk production, processing, marketing and consumption, the organization and coordination of the dairy sector and methodological aspects. The third chapter presents the methodology including description of the study area, data collection, questionnaire design, pre-testing, sampling, questionnaire administration and data analysis. The fourth chapter discusses the results of the study while chapter five presents conclusions and recommendations based on the main findings of the study.

CHAPTER TWO

THEORY AND LITERATURE REVIEW

2.1 Overview

This chapter consists of five sections. The first section describes the value chain concept as referred to by different authors. The second section explains aspects of value chain actors and chain governance including descriptions of power relationships between dairy value chain actors. The third part reviews past studies on the different aspects of the dairy value chain including milk production, milk collection and handling, milk processing, milk marketing and milk consumption. The fourth section discusses how the dairy value chain is organized and coordinated. The last section reviews methodologies used in past studies of value chain analysis.

2.2 The Value chain concept

Different authors define the concept of value chain differently. Thompson (1998) defines the value chain as the full range of activities that are required to bring a product or service from its conception, through the different phases of production. McCormick and Schmitz (2001) define value chain as a chain of activities required to bring a product from its conception to its final consumption. In his study on linking of the value chain, Stamer (2004) defines value chain as the sequence of business activities that turn raw materials into products that are sold to final customers. Other authors like Barnes (2000) and Kaplinsky and Morris (2001) define the term value chain as the entire chain of productive activities, from production to consumption.

Wastelake (2005) referred to value chain as a supply chain or marketing and processing chain. He defines the value chain as the conduit that runs from a farmer down to a final user, through which the commodity passes and embodies the transactions and activities. According to Wastelake (2005), the term value chain has been used to characterize a vertical alliance or strategic network between independent business organizations within a supply chain implying that, a value chain is within a supply chain. In a study on milk supply chain in Kenya, Abucheli *et al.* (2006) defined value chain as supply chain consisting of activities and processes including production, processing, trading and consumption.

Fabre (1994) emphasized that; production per se is only one of the value added links. There is a range of activities within each link of the chain. Although often depicted as a vertical chain, intra-chain linkages are most often of a two-way nature. For example, specialized design agencies not only influence the nature of the production process and marketing, but also are in turn influenced by the constraints in the downstream links in the chain. According to Kamuzora (2006), the value perceived by the end consumer of a product is derived in part from each step in the chain, although not all steps create the same amount of value to deliver the same profit potential. According to Porter (2001), profit is determined by value of a product, and value is what buyers are willing to pay for a product or service and the costs of performing the activities involved in creating it.

The present study has adopted the definition by Kaplinsky and Morris (2001) as it emphasizes on assessment and analysis of the entire value chain from production, to consumption.

2.3 Value chain actors and chain governance

Chain actors are those involved in producing, processing, trading or consuming a particular product (IIRR *et al.*, 2006). They include direct actors which are commercially involved in the chain (producers, traders, retailers, consumers) and indirect actors which provide financial or non financial support services, such as bankers and credit agencies, business service providers, government, researchers and extension people. In terms of chain actors, a value chain may be explained as a specific type of supply chain, where by the actors actively seek to support each other so that they can increase their efficiency and competitiveness. They invest time, effort and money, and build relationships with each other to reach a common goal of satisfying consumer needs so that they can increase their profits (IIRR *et al.*, 2006). A study by UNDP/BCS/TetraPak (2006) on analysis of value chain for milk in Tanzania identified main actors in the chain to be farmers, milk collection centers, dairy processors, milk distributors and retailers and consumers. However, the study did not explicitly describe how these value chain actors are linked to each other and how their organization and coordination would influence the dairy sub sector development.

According to Geraffi (2001a), different actors exert different levels of control over the activities making up the value chain. He identifies two main types of value chains namely the buyer driven and producer driven chains. In the buyer driven value chains, the buyer at the apex of the chain plays the critical governing role. This is mainly characteristic of the labor-intensive industries. In the producer driven chains, producers with critical technology play the main role of coordinating the various links and take the responsibility of checking the efficiency of their suppliers and customers. Producer driven chains often have significant foreign direct investment, and are more often capital and technology intensive

industries. These different levels of control over the activities of the value chain are what bring about the importance of chain governance (Geraffi, 2001b).

Governance is the pattern of direct and indirect control in a value chain. Within the value chain, governance is a central concept. It is the non-market coordination of economic activities. In the global chains, some firms directly or indirectly influence the organization of the global production logistics, and marketing systems. Through the governance structures that they create, they can take decisions that have consequences for the access of the less developed country firms to international markets and the range of activities that they can undertake. Examples of value chain governance are in garments, processed fruits, and horticulture (Geraffi, 2001b). Like Geraffi (2001b), Gibbon (2001) has emphasized in most of his works that it is the governance structure that makes the Global Commodity chain different from other analyses of economic production and exchange because such analysis introduces the notion of producer driven and buyer driven Global Commodity chains. Governance in value chains is important for the purpose of market access, fast track to acquisition of production capabilities, distribution of gains and to channel technology assistance. Chain governance has a lot to do with the exercise of control along the line. The parameters defining what is to be done at any time are product definition, how it is to be produced (production process), when it is to be produced and how much is to be produced (McComirck and Schmitz, 2001).

Value chain analysis does not only enable the understanding of actors and their relationship but also the distribution of benefits. According to IIRR *et al.* (2006), some individuals and firms can grow rich if they can exploit advantages in the chain. Supermarkets or processors

are often powerful players that can dictate terms to their suppliers and force down prices while producers are often at a disadvantage in such chains. Many farmers grow crops or raise animals on an individual basis, so they have little bargaining power vis-à-vis traders or input suppliers. Disadvantages for producers are mainly due to lack of market information and lack of an understanding of the market so they may not know how much their produce is really worth, and how much more they might earn if they were to transport it to the nearby town rather than sell to the trader who arrives at the farm gate in a truck. This implies that, there is no knowledge of who the other players in the market are, what happens to their produce after they sell it, or what types of products consumers want.

As generalized by IIRR *et al.* (2006) the dairy producers do not control the terms on which they participate in the chain. And this is particularly true for smallholder farmers in Africa who are often involved only in producing the crop or animal, and not in processing it to add value. But it does not have to be so, smallholder farmers in Africa can benefit from their value chain in several different ways. They can do more of the activities in the chain, for example; they may process their product before selling it. They can also take more control over the management of the chain itself, for example; by negotiating better prices and terms of trade, seeking new markets and controlling product quality.

Sampled actors for this study included milk producers, milk processors, milk marketing agents and milk consumers. In many developing countries, Tanzania inclusive buyer driven chains mostly dominate the market. This is mostly due to lack of capital and technology among producers and other actors in the chain. Similarly, this has been the case and still is the case for the dairy value chain in the Dar Es Salaam milk shed which is

buyer driven. The milk producers and processors who are key players in the dairy value chain certainly do not have much control on the product price.

2.4 Past studies on dairy value chain in Tanzania

Studies that examined the dairy value chain in Tanzania in an integrated manner from production to consumption are limited. In the available literature, only one study by UNDP/BCS/Tetrapak (2006) examined the dairy value chain in Tanzania in an integrated manner. The study was conducted in six regions of Tanzania including Iringa, Tanga, Kilimanjaro, Arusha, Dar es Salaam and Coast region. The study found that, a lot of raw milk goes to waste due to lack of adequate cooling, transportation and processing facilities, especially during the rainy season. According to the study, the lack of processing facilities that could prolong the shelf life of milk also makes it impossible to even out the supply between dry and rainy seasons and some areas do not have access to milk at all while the lack of raw milk in the milk processing industry forces dairies to rely on imported milk powder, which makes their business very vulnerable. The study concludes that, lack of integration between production, processing and consumption has contributed much to the slow development of the dairy industry in Tanzania. Despite its emphasis on integration between the various stages in the value chain, the study failed to address critical issues of the value chain including how the chain is organized, coordinated and functioning as well as efficiency and competitiveness of the dairy value chain. Also the study did not assess or compare any prices and margins gained by the different actors along the dairy value chain across the studied regions. Comparing prices and margins gained by different actors is one of the important aspects that would determine the benefits and challenges of every node in

the dairy value chain. This is an essential factor which can identify which strategies to use so as to improve the Dairy sub sector in Tanzania.

2.4.1 Milk production

Tanzania has experienced slow growth (relative demand) in both domestic and improved dairy production over the years (Table 1). Milk production is still low and does not meet the growing demand from the increasing human population (MLD, 2006). This slow growth in production has contributed to the low per capita milk availability. The low level of milk availability is explained, at least in part, by large areas of the country where cattle are not kept and consumption of milk is not a traditional habit, and to the relative lack of adoption of grade cattle outside the northern highlands (MoAC/SUA/ILRI, 1998). Due to low dairy productivity, Tanzania has continued to be a net importer of dairy products. Though it is not appealing to say out right that the past efforts were a total failure, it is not difficult to admit that the pre liberalization policy attempts were not a successful story at all (Mutabazi and Mdoe, 2002). The following table shows the trend in milk produced in Tanzania which, mainly comes from the traditional sector as shown in Table 1. One of the factors that hinder the growth of this sector is the fact that milk production has mainly been for the domestic market. Although part of the annual milk off take is exported, a large amount of milk products consumed in the country today still remains to be imported.

Table 1: Milk production trends in Tanzania

Types of cattle	**Annual milk production (in 000 liters)**			
	1998/1999	**1999/2000**	**2000/2001**	**2001/2002**
Indigenous cattle	437 000	445 000	514 000	578 000
Improved cattle	250 000	265 000	300 000	322 000
Total milk production	687 000	710 000	814 000	900 000

Source: Ministry of Water and Livestock Development files, 2001.

Kurwijila *et al.* (1995) argues that, milk production in Tanzania is highly seasonal especially in the traditional sector where grazing on natural pasture and rangeland is the main source of feed for cattle and therefore in the dry season milk production can be 1/3 of what is produced during the wet season. Most of the milk produced in Tanzania as identified in a study by Mishili *et al.* (2002) is from northern regions of Tanzania (Kilimanjaro, Arusha, Mwanza and Mara) with only small amounts of milk produced coming from the Eastern parts of Tanzania including Morogoro. The argument of Kurwijila *et al.* (1995) is mostly observed through the negative effects faced by dairy value chain actors due to seasonality. In the dry season, due to low rainfall levels, there is low availability of pasture, this causes low levels of milk produced, low availability of milk for processing, marketing and consumption. The wet season effects causes over supply of milk, hence much of the milk produced is sold at low prices because supply exceeds demand, also low or lack market for milk for milk producers as well as processors and marketing agents.

From the period before independence in 1961, the government of Tanzania has tried to encourage more domestic milk production to achieve national self sufficiency (Mdoe and Wiggins, 1996). In their study in Hai district, Mdoe and Wiggins (1996) observed that most milk production activities were organized at the level of household. The study further explains about the financial attractiveness of dairying activities. Since the mid 1970's, dairying in Hai district has intensified in milk availability due to improved cattle breeds and feeding practices. Many smallholder farmers in Hai district were reported to prefer raising Friesians because of their high potential for milk yield. Better technical results were however achieved by larger scale farmers using more intensive management and more

specialized breeds. Nevertheless, the returns to larger scale dairy farmers were partially contributed by government subsidies. It is reported in the study by Mdoe and Wiggins (1996) that, during the late 1970's large-scale milk production on farms run by Tanzania Dairy Farming Company (DAFCO) using relatively intensive production system was encouraged. At similar times, another state enterprise, Tanzania Dairies Limited (TDL) was set up to collect, process and market dairy products. Unfortunately the outcomes were disappointing; DAFCO farms were often poorly managed and ran at high costs; whilst TDL built large modern processing plants close to the consumers which produced good quality pasteurized products, but at a relatively high cost. This in turn made it difficult for TDL to offer attractive prices to local farmers for their milk, and so capacity could only be maintained by using imported skimmed milk powder (SMP). When SMP imports declined in the 1980's, owing largely to national economic problems and the loss of ability to import, the plants started to operate substantially below capacity, with correspondingly high overheads per liter of milk processed (Mdoe and Wiggins, 1996).

Milk yield and quality are reported to be largely influenced by types of feeding and production systems. Main feeding systems in Tanzania dairy farming sub sectors are recognized as zero grazing (intensive), partial grazing (semi intensive) and free ranging (extensive) (Urassa, 1999; Kurwijila, 1990). Animals under partial grazing system have higher milk yielding capacity than zero grazing (Urassa, 1999). A study by Sarwatt and Njau (1990) reported mostly about the positive influence of semi grazing to milk yield. For the benefit of improving milk yielding and quality, it is important to use at least semi grazing if not extensive grazing. However, this proves to be difficult due to seasonality

effect on dairy farming and lack of pasture and grazing land in some parts of Tanzania where dairy farming is one of their major activities.

The influence of production system on milk quality is straightforward. Milk quality depends on the type of the production system in question and the respective milking practices and hygiene conditions imposed during milk production (Loth, 1998). Good milking practices are essential for obtaining optimum amount of milk from the lactating cow, maintaining the health of the cow, utilizing labor and equipment efficiently and for production of milk of high quality (Kurwijila, 1990). Besides low quality of milk products, problems facing milk production in Tanzania are well recognized. These problems include; low genetic potential of indigenous animals, and inadequate feeding especially during dry season (Biwi and Shamhuna, 1986), which is aggravated partly by infestation with external and internal parasites; clinical and sub clinical diseases, diets comprising of poor quality roughages and generally low levels of livestock management (Massawe *et al.*, 1997); poor marketing outlets, infrastructure, and lack of cooling points for small scale dairy farmers leading to a high level of wastage of unprocessed milk (UNIDO, 2002).

Losses of milk in Tanzania amount to 60 million liters per year, worth over 14 million US$ (FAO, 2005). Reducing losses involves a concerted effort to educate small-scale producers about good production hygiene and the use of low-cost technologies for storage and shipment. For example, over the years Food and Agriculture Organization (FAO) has helped to implement milk-hygiene programs for small producers in East Africa, and to explore the adoption of an inexpensive milk preservation system called the lacto-peroxides system to extend shelf life of milk produced by smallholder producers (ILRI, 2003).

Despite the constraints faced in dairy production, Tanzania has some promising dairy areas especially in areas where tsetse flies are absent, heat stress on cows is limited, and ample rainfall provides the potential for abundant fodder production (Mdoe, 1993). In Tanzania small holder dairy production is well developed in areas where farmers have opportunity to obtain improved heifers through assistance from dairy development projects under Heifer-in – trust (HIT) schemes (Lekule *et al.*, 1998; Rutamu and Uden, 1999). In Hai district, for example as reported by Mdoe and Wiggins (1996), many smallholder dairy producers and large scale farmers prefer raising Friesians because of their high potential in milk yield. In order to sustain milk production, efforts to increase production should go hand in hand with efforts to dispose milk surpluses above local requirements in dairy producing villages (Mdoe, 1993). Dairy farming can be a business and the business does not stop at the farm gate (Bath, 1985).

2.4.2 Milk collection and handling

A study by Ashimogo and Greenhalgh (2007), described in detail the milk collection system in Tanga region. The Tanga Dairy Cooperative Union (TDCU) handles most of the milk while ownerships of milk collection centres is multi-modal. In Tanga, primary cooperatives are prominent because most centres were established under dairy projects. In Iringa district where the centres are less developed, processors are the major owners, whereas in Kilimanjaro and Arusha regions there is a combination of farmer-owned and processor-owned centres. A study by UNDP/BCS/Tetrapak (2006) found that there was no significant variation in performance among the various ownership modes of collection centres. Competition among processors has enabled farmers in Tanga to improve price and marketing conditions for their milk.

High levels of hygiene are very essential during milk collection and handling. Milk should be handled properly so that the consumer is assured of a safe and wholesome product and gets the intended benefits of consuming milk and milk products. A study by FAO (2004) reports the situation for the Tanzanian Dairy Board in Tanzania. The Tanzania Dairy Board regulates the safety and quality of milk and milk products. Satisfactory hygienic quality depends first, on minimizing the risk of contaminating milk with microorganisms by ensuring cleanliness at all times during milking and subsequent handling. According to a study by FAO (1994), cleanliness of equipment used to handle milk is an important aspect to be considered in dairying activities. It is obvious that most of tropical environment is subject to high ambient temperature in such a way that milk can be spoiled in a very short time (Loth, 1998). Thus preservation, processing and milk collecting techniques have to be tailor made during the entire system of milk value chain (Maganga, 1995).

Mdoe and Mnenwa (2004) observed that, milk was normally handled using plastic containers, which are prone to bacterial contamination. Omore *et al.* (2004) reported a similar observation about the use of plastic containers for milk handling. However in the study by Mdoe and Mnenwa (2004), some of the milk producers and marketing agents preferred the use of non-plastic utensils such as metal, glass, and clay and polythene materials. In their view, a wide use of plastic containers for handling milk and milk products has the potential of contributing to low quality of milk. Plastic containers normally tend to develop microscopic scratches, which harbor bacteria and result in poor milk hygiene.

A study by Joseph *et al.* (2003) recommended that, in order to provide consumers with good quality milk especially in developing countries such as Tanzania; producers and milk traders must be certain that milk comes not only from disease free animals but also from healthy udders, properly sanitized equipment, marketed in good hygienic premises and maintained in its best flavor, nutritional values, free from drug and chemical residues with least possible microbial contamination. This can be one of the many ways to improving the milk dairy sub sector in Tanzania; however there are a lot of challenges, which also differ depending on the specific area. Therefore, there can not be one particular way of improving dairy sub sector, unless, the whole value chain is analyzed and assessed so as to understand exactly what the consumers and the other actors including, milk collection centers, processors and milk marketing agents really face.

Despite the many challenges of the dairy sub sector, it should not be hard to recognize that, there are few actors in the dairy value chain who although they are a small scale plant, they have shown an impressive effort and contributed a lot to the dairy industry. Such Small Scale enterprises include plants such as the Shambani Enterprises in Morogoro, who do both collect and process milk. Their efforts have been recognized both nationally and internationally. One such recognition includes their winning of an award from Bid satellite award in 2007 and 12 million Tanzania shillings in the Business Development challenge (ESADA, 2008). Another prize won by Shambani graduates is the Yara Prize 2008, recognizing achievement and dedication. Established in 2003 by local university graduates, Shambani graduates dairy has been a blessing to the farmers in Morogoro municipality and Dar es Salaam city. The enterprise creates employment, promotes milk consumption and pioneers for graduates to create wealth and jobs through agricultural based

entrepreneurship (Mfinanga, 2007). However, like many other enterprises, Shambani graduates who despite their efforts and technical insights also faces many challenges including low or lack capital and low market availability.

2.4.3 Milk processing

Milk is a highly perishable and complex product to handle due to the fact that it is a perfect medium for microbiological contaminants. However milk has the advantage that it is easily convertible into various dairy products like cheese, yogurt, butter oil and cream. The transformation process at times involves a series of sequential investment activities that are targeted at meeting specific consumer demand (Jaffee and Morton, 1995). The value addition options also provide a way of dealing with inter-market price differentiation occurring due to spatial factors.

The first level of creating value is improving production or processing efficiency so that the same labor yields more or a higher-quality product. An important aspect of this is improving the storage and handling of products to reduce losses and improve quality (FAO, 2005). Milk processing can play a major role in improving milk and dairy product safety, mainly through a variety of heat treatment processes.

Normally, fluid milk prices are lower as one move away from the source due to the high bulkiness for fluid milk. The bulkiness of water which amounts to 87% in milk result to increases transfer costs i.e. handling and transportation costs. Less perishable products can have less transportation costs thereby making them cheaper away from the source. The increased need for sophisticated specialized haulage system in transporting fluid milk makes the issue of value addition options more lucrative for smallholder producers in

remote areas. Smallholder farmers could therefore diversify into value addition and convert raw milk into processed dairy products (Jaffee and Morton, 1995).

Studies by Staal *et al.* (2003) and Mdoe and Mnenwa (2004), indicated that less than 10% of milk produced in Tanzania is formally processed. Most of the processing is simple process such as boiling and natural fermentation. Prior to 1990's, formal milk processing was under the Tanzania Dairies Limited, a government parastatal charged with the responsibility of processing milk from large-scale farms as well as small-scale farms so as to enable centralized processing of milk products. At that time, TDL owned 7 processing plants with an installed capacity of 309 000 liters per day (MoAC/SUA/ILRI, 1998). Due to management and economic problems, TDL's processing capacity declined from 60% of capacity utilization in 1986 to less than 20% of utilization in 1994 (Kurwijila *et al.*, 1995). After the collapse of TDL in 1994, there were 22 small, medium and large scale milk processing plants with an installed capacity of 510 000 liters per day (Kurwijila *et al.*, 1997). According to Ashimogo and Greenhalgh (2007), there are 35 milk-processing plants (registered and none registered) in Tanzania with capacities higher than 1000 liters per day.

Despite the increasing involvement of the private sector in milk processing, the size of processing operation in Tanzania is still small (Kurwijila *et al.*, 1997). Formal processing has failed consistently in many parts of Africa, including Tanzania. Even in liberalized markets, informal processing and marketing practices are still predominant. Such predominance is based on the fact that in developing countries where most of the populations are poor, consumers are always not willing to pay for the extra costs of formal processing or packaging (Staal, 1999). The reluctance of consumers to pay for the costs of

industrial processing seems to be the main hindrance to the development of the processing sector in Tanzania (MoAC/SUA/ILRI, 1998; Mdoe and Kurwijila, 1998).

Other problems in the processing sector include the relationship between farmers and manufacturers in the value chain. Due to the low level of integration of the different activities along the value chain, the relationship between dairy farmers and dairy processors changes along with the market demand and seasons for their conflicting interests. Dairy processors tend to price the raw milk according to demand and supply, but not quality based. Such pricing system has transferred the market risks to dairy farmers, which results in low efficiency of dairy farming and lack of incentives for dairy farmers to improve raw milk quality and farm management. Consequently, dairy processors are not able to get high quality raw milk (FAO, 2006). In his study in Morogoro, Chimilila (2006) reported that majority of small-scale dairy processors are constrained by standards conformity. Apparently the problem was mostly observed among processors due to negligence of quality control measures by the small processors.

A study done by De Wolff (2002) in Tanzania identifies insufficient milk supply and lack of experience as reasons for the small size of operation of the dairy processing. Most processors have underestimated the role of the producers, an example being Royal Dairies and Tommy Dairies, which were recently shut down. Due to insufficient milk supply, nearly all processing plants are operating below capacity and thereby increasing processing costs tremendously. The lack of experience was found in milk processors who were having the required capital available but not the technical insight in the milk trade and processing. This has led to using of unrealistic business plans, which in the end cause loss for both the processor and the producer.

2.4.4 Milk marketing

According to Czinkota *et al.* (1997), marketing is a process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create and maintain exchanges that satisfy individual, organizational and societal goals in the systemic context of global environment. Milk marketing in Tanzania, has been studied by several researchers including Mdoe and Wiggins (1996), Kurwijila *et al.* (1997), Mdoe *et al.* (2002), Omore *et al.* (2004), Mutabazi and Mdoe (2002) and Kurwijila and Boki (2003).

As documented by Mutabazi and Mdoe (2002), non-traditional activities like market-oriented dairying are becoming important in the economies of Sub-Saharan Africa such as Tanzania. In their study on milk marketing in Mbeya and Iringa regions, milk-marketing agents were found to realize positive net returns though at varying levels with Mbeya being more competitive than Iringa markets. This variation however was due to variation in the levels of capital, access to market and business management skills. In their observation, milk-marketing activities could yield more positive net returns through involvement in cooperatives and self help groups. The rationale behind cooperative and group marketing is the propensity of members to manage market risks and lower costs of transacting through risk pulling and cost sharing.

As identified by Omore *et al.* (2004) raw milk is the primary product sold in most areas, although in some parts of Tanzania like Mwanza, cultured milk is important. The milk markets studied by Omore *et al.* (2004), displayed a wide variety of interactions between market agents and market channels. In the simplest example, milk producers sold raw milk directly to consumers, with no other intermediaries. At the other extreme, three

intermediaries could play a role between producer and consumer. This was particularly true when market chains were long, bringing milk from distant areas. According to observations by Omore *et al.* (2004), the traders also played the role of the middlemen, who played a very important role in Dar es Salaam by selling directly to the consumers. This channel was reported as the oldest of all channels in the milk-marketing system; it involves milk selling by producers to household consumers at the farm gate or at the local market in the producing areas. In the process of marketing, quality control measures were very rarely used, although in Mwanza there was significant use of lactometers with plastic buckets and jerry cans being more preferred than proper metal containers, except among retailers in some cases (Omore *et al.*, 2004). Kurwijila and Boki (2003) report the quality of milk in Tanzania to be an issue of concern. In their observation, the quality of a considerable proportion of raw milk and other products marketed is below standard and the problems of adulteration, particularly in Mwanza region, and the presence of antibiotic residues in both Mwanza and Dar es Salaam milk shed areas are above permissible maximum.

Over 97% of milk marketed in Tanzania is unprocessed raw milk (Loth *et al.*, 1998). This finding is supported by Mdoe *et al.* (2000a) who found that; most of the milk marketed in the Dar es Salaam milk shed is either unprocessed or informally processed. A study by UNDP/BCS/TetraPak (2006) reports that, after liberalization of the dairy industry in Tanzania, direct sales of raw milk from producers to consumers or through hawkers has been on the increase despite the public health risks associated with the consumption of untreated milk and milk products. In their view, milk producers may not necessarily benefit from a short marketing chain; also milk processors may be paying producers the same price as hawkers. As a result, milk producers sometimes prefer selling milk to hawkers because

of factors such as prompt payments and inaccessibility to formal market outlets such as producer co-operatives or lack of nearby milk processing factory. The biggest disadvantage of direct milk sales to consumers by hawkers is the total lack of quality control and the frequent rate of adulteration of milk with (dirty) water, which is illegal (UNDP/BCS/TetraPak, 2006).

A study by FAO (1999) described an efficient milk marketing chain as one, which enables farmers to receive at least 50% of the retail price of milk. In their observation, the number of intermediaries involved will have a bearing on both producer and consumer milk prices. The shorter the channel the more likely that the consumer prices will be low and the producer will get a higher return. In general as described by Mdoe and Nyange (1995), the overall picture of milk marketing system in Tanzania is characterized by multitude of channels and relatively long market chains, which tend to increase in complexity in larger urban areas where demand may be more differentiated.

Mdoe and Mnenwa (2004) point out that, constraints in milk marketing appear to dominate the advantages, despite the opportunities available for dairying in Tanzania. Some critical constraints are associated with dairy processing and marketing systems. Market inefficiency due to the small quantities of milk marketed coupled with low propensity to consume industrially produced or value added products have been acting as barriers to smallholders' access to dairy products market.

As observed by Mdoe *et al.* (2002), most development economists seem to believe that, improvement in milk marketing systems is desirable for small dairy producers and traders, and more generally the poor in low income countries. Yet in allocating resources to

promote dairy development in poor communities, the tendency has been to emphasize production and neglect investment in marketing. They argue that, relatively large investments are made in research, training and extension to promote milk production without similar investments designed to improve the performance of milk marketing systems. Mdoe (1993) argues that, efficient marketing of milk is dependent on the performance of the milk marketing system, which in turn is affected by the physical market infrastructure. As reported by Mdoe *et al.* (2002), a general belief has been that the market would somehow develop to absorb whatever is produced. The apparently less emphasis on developing marketing infrastructure in Tanzania has been due to a failure in understanding the role of marketing systems in development. However, in recent years, there has been an increasingly growing interest in improving marketing systems (institutions, infrastructure and information flow) and researchers have begun to research on various issues, one such research project was the milk marketing and public health project in Tanzania, Kenya and Ghana which was implemented in Mwanza and Dar es salaam milk sheds for Tanzania (Mdoe *et al.,* 2002). Broken (1990) argues that, dairy marketing is a key constraint to dairy development throughout sub Saharan Africa. Hence in order to realize the full potential of dairy marketing, marketing problems must be addressed so as to provide food and stimulate broad based agriculture and economic development (Broken, 1990).

2.4.5 Milk consumption

Besides its large cattle population of 17 million, which ranks the third in Africa after Sudan and Ethiopia, per capita milk consumption in Tanzania is only 39 liters. This milk consumption level is relatively low compared to consumption levels in countries like Kenya (84 liters), Uganda (40 liters) and Zimbabwe (45 liters) (MLD, 2006). FAO recommends per capita milk consumption of 200 liters per year. However, the per capita

consumption of milk varies from one area to another with urban areas and areas with dairy cattle having high levels of milk consumption (FAO, 1998). A study by UNDP/BCS/TetraPak (2006) identifies two dimensions of milk consumption in Tanzania namely social and commercial. In the social dimension, milk drinking is based on its value on health while in the commercial dimension profit making motivates all participants in the chain.

The main reason for the low milk consumption in Tanzania is that most Tanzanians, especially from non- cattle keeping communities do not have a milk drinking habit. A study by Mwijarubi (2007) reported that, most people in Dar es Salaam, Tanzania consume milk only once or twice a week. In his observation, the low milk consumption is attributed by high prices of milk in which the average price per litre of processed milk was around 1000 Tshs while for unprocessed milk the price was 500Tshs per litre. This is also close to the average of income per day of most people living in developing countries including Tanzania. Rumanya (2007) also reported high prices of milk particularly processed milk as one of the major reasons for low consumption of milk. Similarly as reported by Mdoe *et al.* (2000b) reasons for low consumption of milk include low income and inefficient marketing systems. A study by Omore *et al.* (2004) identified lack of quality assurance of milk products and milk handling problems as the major contributions to low milk consumption in Tanzania.

A number of studies have examined household milk consumption patterns in urban areas of Tanzania (See for example, Kurwijila *et al.*, 1995; Mrema *et al.*, 1995; Mdoe and Wiggins, 1996; MoAC/SUA/ILRI, 1998; Mwijarubi, 2007). Mrema *et al.* (1995) found that, high-income households consume significantly large quantities of fresh milk than low-income

households. MoAC/SUA/ILRI (1998) as well as Mdoe and Wiggins (1996) reported consumption of milk to be increasing as income of an individual increases. Similarly, Kurwijila *et al.* (1995) found that, income of the consumer influences the type of dairy product consumed. According to Kurwijila *et al.* (1995) wealthier consumers consume expensive processed dairy products such as packed yogurt and ice creams. On the other hand, poor consumers were found to consume mostly boiled milk and fermented milk, popularly known in Swahili as 'mtindi'. The study further found that, consumption of dairy products away from home in Dar es Salaam was higher for boiled fresh milk, fermented milk, ice cream and milk in tea/coffee. Majority (86%) of the households interviewed in this study preferred and consumed raw fresh milk while UHT, powdered milk and other imported dairy products were consumed by less than 10% of the sampled consumers.

Mdoe *et al.* (2000b) found that milk consumed in urban areas such as Dar es Salaam comes mainly from herds of indigenous cattle kept in hinterland and improved cattle kept in urban areas. Apart from the hinterland sources the city also receives milk from neighboring regions of Morogoro, Iringa and Tanga. MoAC/SUA/ILRI (1998) found that prices of all locally produced milk products are higher in Dar es Salaam than in other cities. Mullins (1995) also reported similar findings of Dar es Salaam milk prices being higher than those in other East African cities. The relative price of milk compared to the incomes and purchasing power was low. While most of the milk in the country appears to be sold to neighbors there comes a point when a surplus of milk develops and this suppresses prices and farmers have difficulties in disposing of milk (Burrel, 1995). According to Mwijarubi (2007), consumption of processed milk products is very much influenced by income of the head of the household, number of children under five years in a household and education.

Generally, as observed by Ngasamiakwi and Kishenkya (2003), milk consumption in Tanzania is low. In specific period of the year, Ngasamiakwi and Kishenkya (2003) found that there was apparent low demand for milk and hence farmers and/or processors complained about lack of markets for their produce. This is particularly so during the rainy season. In order to promote milk consumption, the dairy industry stakeholders have, since 1997 been celebrating a milk promotion week in early June of every year. Recently, the promotion of school milk programmes has also been pursued in Arusha and Kilimanjaro in order to create a milk drinking habit among children and youths (Ngasamiakwi and Kishenkya, 2003).

2.5 Organization and Coordination

For a business to be successful some degree of organization is required as organization and coordination of business enterprises has an influence on its business performance (Mdoe *et al.*, 2000b). Tanzania's dairy sector is an emerging industry with a promising potential to develop. An institutional framework guided by the National Livestock Policy (1997), the Tanzania Dairy Industry Development Policy (2002) and the Dairy Act (2004) is in place. Milk producers and processors are also coordinated through Tanzania Milk Producers Association (TAMPRODA) and Tanzania Milk Processors Association (TAMPA) respectively. However, milk traders and consumers associations are not yet in place (UNDP/BCS/TetraPak, 2006). One of the regulatory frameworks of the Tanzania Dairy Board (TDB) is the Dairy Act of 2004. The Dairy Act of 2004 gives TDB powers to regulate the industry without demarcating responsibilities of other agencies with similar roles i.e. Tanzania Food and Drugs Authority (TFDA) and Tanzania Bureau of Standards (TBS). One of the weaknesses in the dairy chain had been how to enforce regulations. To effectively enforce regulations, however, the Act requires presence of national

organizations of the various actors in the dairy sector. A study by UNDP/BCS/TetraPak (2006) recommended that, a tripartite consultative forum be put in place so as to devise regulations. Furthermore, enforcement should be done by TFDA which already has the needed technical and outreach capacity. Given the geographical coverage of the dairy industry in Tanzania, TFDA is in a better position to absorb the cost of enforcing dairy regulations than the Board or even TBS (UNDP/BCS/TetraPak, 2006).

Below national associations, there are a number of organizations at zone level (e.g. Arusha-Kilimanjaro Dairy Development Network and Southern Highlands Livestock Development Association), regional level (e.g. Tanga Dairy Cooperative Union) and at district, division, ward and even village level (UNDP/BCS/TetraPak, 2006). A study by Kurwijila and Henriksen (1995) reported that, producer co-operatives or associations could be very essential to dairy development. In their opinion, dairy farmers need to organize themselves to overcome the problem of collection, transport, processing and marketing of milk. Organization is also important to enhance the bargaining power of the individual smallholder to achieve a strong economical and social influence to ensure a full exploitation of the profitability in their dairy enterprise. According to Mdoe *et al.* (2002), vendors and other small milk traders can also benefit like the producer and processor groups, through formation of their own associations in order to reduce transaction costs. On the other hand, the government can play a big role in the formation of these associations/ groups particularly for small producers who are often disadvantaged if they are not vertically coordinated with other operators along the value chain.

2.6 Review of methodologies used in past studies

2.6.1 Value chain analysis approach

Value chains differ both within and between sectors. It is for this reason that there is no mechanistic way of applying the value chain methodology. Each chain has particular characteristics whose distinctiveness and wider relevance can only be effectively captured and analyzed through an understanding of the broader issues, which are involved. The methodologies applied in value chains address different issues and begin with understanding the nature of final markets, which are increasingly the driver in many value chains. These include; the point of entry for value chain analysis, mapping value chains/ gross output values, products segments and critical success factor's in final markets, benchmarking production efficiency, governance of value chains/market power, distribution of returns from the different activities of the chain like design, production, marketing and coordination, and upgrading in value chains (Kaplinsky and Morris, 2001).

Each stage of the value chain analysis involves identification of the chain players, their functions, role and relationships; determination of the chain governance or leadership to facilitate chain formation and strengthening; identification of value adding activities in the chain, assigning costs and added value being assigned to different activities (McCormick and Schimtz, 2001).

Value chain as an analytical tool can provide important insights into various policy challenges. It can help to identify factors; both internal to the firm or sector and outside that influences the competitiveness of a firm or sector. It is also useful in analyzing the role of policy in enhancing the competitiveness of a firm and analysis of returns to different activities in the chain. Through the value chain analysis, the roles of the different actors can

be identified. All these are important stages in analyzing chain performance (Ikiara and Ndirangu, 2002). Within the value chain, it is those parties who are able to protect themselves from competition who earn primary returns. Firms can insulate their activities due to possession of scarce attributes that form barriers to entry and enable them to earn rent. Firms can also earn rent when they innovate to create new conditions or combinations providing greater return from a product. Such returns to innovation are a form of super profits, which act as an inducement to replication (Kaplinsky and Morris, 2001).

Porter (2001) distinguishes between primary activities and support activities. Primary activities are directly concerned with the creation or delivery of a product or service and support activities are to improve the effectiveness or efficiency of primary activities. However a typical value chain analysis can be performed in the following steps: Analysis of own value chain – which costs are related to every single activity, identifications of potential cost advantages in comparison with competitors and identification of potential value added for the customer – how can the product add value to the customers value chain– where does the customer see such potential (Porter, 2001). In value chain analysis, the main issues are the assessment of market power and measurement of returns (margins) at various nodes in the value chain. The following sections present review of literature on these aspects.

(i) Profit margin analysis

Within the whole value system, there is only a certain value of profit margin available. This is the difference of the final price the customer pays and the sum of all costs incurred with the production and delivery of the product/service. How this margin spreads across the

suppliers, producers, distributors, customers, and other elements of the value system depends on the structure of the value system (Porter, 2001). Each member of the system will use its market position and negotiating power to get a higher proportion of this margin. The term "margin" implies that organizations realize a profit margin that depends on their ability to manage the linkages between all activities in the value chain. In other words, the organization is able to deliver a product/service for which the customer is willing to pay more than the sum of the costs of all activities in the value chain (Porter, 2001). According to Scott (1995), returns are calculated on the basis of estimated or actual costs and selling price per unit of sale and the volume of products sold.

According to Pomeroy and Trinidad (1995), analysis of profit margin or net returns aims to verify the existence of above average profits. If the market were perfectly competitive, net returns would roughly equal a fair return to one's capital. However, oligopolistic market structure would tend to increase returns as price distortions as well as bias buying and selling practices.

As documented by Mutabazi (2002), profit levels from the economic theory point of view indicate productive and allocative efficiencies of the business firms. Although a business can have other objectives apart from profit making for attaining economic viability and growth, any business must make a profit in the long run. In a perfectly competitive market, actors behave such that the net profit received is not larger than is required to keep them in business. If profit is supernormal, other firms would be attracted in to the industry and profits would be scaled down.

It is generally accepted that due to scarcity of resources, producers tend to allocate more resources to sectors, which give high returns per unit resource. Thus high returns will warrant future production of a given product as transferable resources are switched from low paying sectors to high paying ones.

(ii) Marketing margin analysis

Marketing margin measures the share of the final selling price that is captured by a particular agent in the marketing chain. It includes costs and typically, though not necessarily some additional net income when there are several participants in the marketing chain. The margin is calculated by finding the price variations at different nodes in the chain then comparing them with the final price to the consumer. The consumer price then is the base or common denominator for all marketing margins (Griffith and Moores, 1991). Tomek and Robinson (1981) defines marketing margin as the price difference between two market levels. According to Tomek and Robinson (1981), marketing margin can be affected by a number of factors such as distance to be covered, adequacy of transport, effectiveness with which the various separate activities are carried out and services are provided. Griffith and Moores (1991) emphasizes that a critical check is required in the analysis of marketing margin so that the prices at different levels of the marketing system are in terms of an equivalent quantity of product.

A study by Timmer *et al.* (1983), defines marketing margin in absolute and relative terms. Absolute marketing margins can be defined as the difference between the price paid by the consumers and that obtained by producers based on the absolute levels of prices. Marketing margins expressed in percentage terms are dependent on the relative levels of prices. In this

study absolute marketing margins analysis is employed. A study by Pomeroy (1989) highlights the effect of demand and supply forces on marketing margins, while that of Scheid and Sutinen (1981) emphasizes marketing costs and risks. According to Mdoe and Mnenwa (2004), high marketing margins may imply high marketing costs and/ or profits. They argue that, if one or two or both are extremely high or low, it indicates that the market is not efficient in coordinating allocation of resources. For an efficient market, marketing costs and profits ought not to be too low or too high, and so do marketing margins. However, according to Mendoza (1995), high marketing margin may sometimes result in little or no profit or even loss for the seller involved, depending on the marketing costs as well as the selling and buying prices. On the other hand, basic economic sense tells us that, prices adjust depending on demand and supply forces and imperfect market conditions result in artificial chains on prices.

Pomeroy and Trinidad (1995) generalizes that; components of marketing margin are of interest and use especially to policy makers. In their study knowledge of marketing margins components can serve as the basis for reducing inefficiencies in markets.

(iii) Concentration Ratio

Market power can be measured by different measurements; one of them being concentration ratio. According to Pomeroy and Trinidad (1995), concentration ratio plays an important role in determination of market behavior within an industry because it affects the interdependence action of firms. The greater the degree of concentration, the greater is the possibility of non-competitive behavior such as collusion. Similarly according to Kohls and Uhl (1990), the concentration ratio of over 50% is an indicator of strong monopolistic

industry; between 33% and 50% indicates weak monopolistic industry while less than 33% is an indication of unconcentrated industry. In her study on spice marketing, Mshote (2006) explains concentration ratio to be determined by looking at the proportion of total purchase accounted for by few largest buyers to the total volume handled. It was revealed that, concentration ratio for both wholesalers and retailers of spices were high, implying that the markets were strongly monopolistic. The study further indicates that market structure tends to influence conduct and for that the high concentration will affect the competitive behavior.

However, Kamugisha (2006) in her study on supply chain of green beans used efficiency measures of returns and rate of access to market information to measure market power. In her observation, high access to market information made supply chain actors powerful among each other. Information sought in the study includes prices of products and amounts of product delivered. On the other hand, a study on production and marketing of paddy by Gabagambi (1998) found that, there was no group of traders strong enough to control the market hence an indication of competitive situation. He then concluded that, in the marketing system the number of buyers could be high enough to break monopolistic tendencies among traders.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter presents the methodology of the study. It consists of three sections. The first section describes the study area. The second section entails how, and when data was collected. This section includes description on secondary and primary data collection, questionnaire design and pre testing, sampling methods used and questionnaire administration. The third section explains how the collected data was analyzed. The analyzed methods described include both qualitative and quantitative analyses such as the concentration ratio, marketing margin and profit margin analysis.

3.2 The study area

The study was conducted in Dar es Salaam, Morogoro and Tanga regions. The regions are in the Dar es Salaam milk shed. According to MOAC/ SUA/ ILRI (1998), milk shed are catchments areas for milk production. In another definition partly obtained from the Oxford dictionary from the words “milk” and “shed”, milk shed means the flow of milk from one point to another. The choice of the milk shed in the present study was based on the fact that Dar es Salaam is the major market for milk in the country. A study by UNDP/BCS/TetraPak (2006) reported that Dar es Salaam consumes 90% or more of daily milk output in Tanzania. Dar es Salaam is the largest city in Tanzania. Dar es Salaam has three districts namely Temeke, Kinondoni and Ilala. All the three districts were covered in the study. The districts were further divided into 52 wards, 32 of which lie in the urban area. In Morogoro and Tanga regions, the study was conducted in Morogoro Urban and Tanga Urban districts respectively (Figure 3.1).

Apart from the study area the Dar es Salaam milk shed comprises all areas, which supply milk to Dar es Salaam city. These areas include Coast region, and Iringa. Kurwijila and Henriksen (1995) identified the following five major sources of milk for the Dar es Salaam milk shed:

(i) Milk produced from purebred and crossbred dairy cattle kept within Dar es Salaam by landless civil workers, politicians and private businessmen.

(ii) Milk produced by peri-urban dairy farmers and traditional cattle keepers in areas surrounding Dar es Salaam such as Coast region.

(iii) Milk and milk products from upcountry areas such as Tanga, Kilimanjaro, Morogoro, Iringa, Mbeya and Mwanza.

(iv) Processed milk products such as cheese, ghee and fermented milk from on farm and small-scale milk processing units in the main milk producing areas.

(v) Milk imports from neighboring countries particularly Kenya and abroad such as Europe, America, New Zealand, South Africa and Australia.

Milk produced around Dar es Salaam reaches the consumers through direct producer to consumer sales of fresh raw milk or via retail outlets when sold as processed or semi processed milk. Moreover, milk produced in the Dar es Salaam milk shed is being processed in several plants within the milk shed. The plants include; ASAS Dairies Ltd in Iringa, Tan Dairies and Azania Fresh in Dar es Salaam, Tanga Fresh, Ammy Brothers Dairies and Morani Dairies in Tanga.

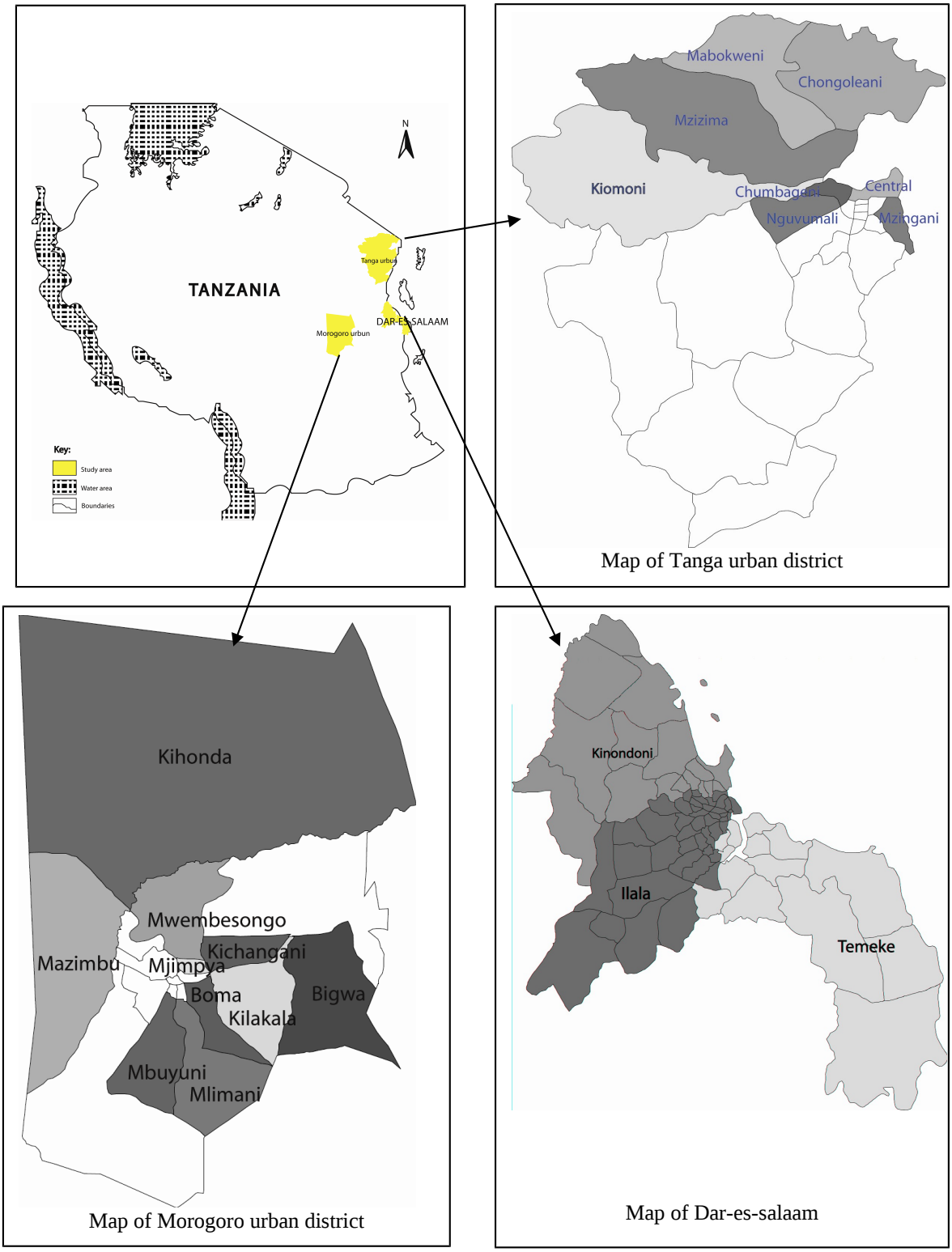

Figure 1: Maps showing studied areas in Dar-es-salaam milk shed.
[1]

[1] Areas marked with dark colors are the surveyed areas in the respective districts.
Areas marked with dots are the water areas within the surveyed areas.
Areas with random lines represent boundaries within the surveyed area.

3.3 Data Collection

Both secondary and primary data were collected for the study. Primary data were collected using Participatory Rapid Appraisal (PRA) methods and formal questionnaire surveys. A preliminary visit to the study areas was made to conduct PRA and to pre-test the questionnaire so as to check relevance of the questions.

3.3.1 Secondary data collection

Secondary data were collected to enhance the understanding of the dairy value chain in the study areas. The main sources for secondary data were reports and documents from district livestock offices and Sokoine National Agricultural Library in Morogoro. Secondary data collected included information and findings from past studies on the dairy sector, dairy value chain and its aspects including milk production, collection, handling, processing, marketing and consumption.

3.3.2 Participatory Rapid Appraisal (PRA)

According to Narayan *et al.* (1998), PRA is an approach and a family of methodologies, which enable development practitioners; government officials and local people to share knowledge, analyze conditions and plan together appropriate measures to take for a certain situation. The PRA was conducted in January 2007 before the actual data collection. It was designed to capture data and information that were used to identify the constraints facing the actors along the dairy value chain and to identify marketing channels and contractual arrangements. The PRA exercise started with discussions with officials from the Ministry of Agriculture, Food Security and Cooperatives and Ministry of Livestock Development to obtain their views on the general status of the dairy sector and dairy value chain.

This was followed by focus group discussions involving groups of 15 milk producers in Morogoro district, 5 processors in Tanga district and 10 milk marketing agents and 10 milk consumers in Kinondoni and Ilala districts. Depending on availability and willingness of respondents to participate in the PRA; selection of members of focus group discussions followed purposive sampling where members were selected from a population of actors who kept dairy animals, processed, sold or bought milk products. The respondents were asked several questions as shown in Appendix 1. During the PRA, a number of issues on milk value chain were discussed including, seasonality and volumes of milk sales, milking practices, main milk marketing channels, milk prices, transaction costs, milk handling equipments, milk preservation methods, milk quality aspects, reliability of market for dairy products, contractual arrangements, consumer preferences and constraints faced. Apart from discussions held with groups of actors along the dairy chain, discussions were also held with leaders from Tanzania Milk Producers Association (TAMPRODA), Livestock Keepers Cooperative Society/Umoja wa Wakulima na Wafugaji, Tanga (UWATA) and Tanzania Milk Processors Association (TAMPA).

3.3.3 Questionnaire survey

3.3.3.1 Questionnaire Design

A structured questionnaire was designed to collect both qualitative and quantitative data from the sample actors. The questionnaire was designed and inscribed in English language. It consisted of five sections (Appendix 2). The first section was designed to capture general background information of the respondent while section two was intended to collect information on milk production. Section three was for capturing information on milk processing. Section four aimed at gathering information on milk marketing while section five was designed to collect information on milk consumption. With the exception of

section five, all the remaining sections incorporated cross cutting information such as milk handling practices, preservation and membership to associations.

3.3.3.2 Questionnaire pre-testing

The questionnaire was pre-tested by the author in Morogoro region so as to check accuracy and validity of the questions and to make necessary modifications to the questionnaire. Depending on their availability, 32 value chain actors including 10 dairy producers, 2 milk processors, 10 milk market agents and 10 milk consumers were interviewed. These actors were excluded from the samples used for the study analysis. The interviews done in pre testing lasted for about one hour per questionnaire. Time taken during the pre-testing of questionnaires was then adjusted to 45 minutes per questionnaire so as to accommodate a larger number of respondents to be interviewed during data collection. Some questions were modified to make them clearer and few questions were added in order to get adequate data, which would respond to the research objectives. Questions such as those on milk handling, milk preservation methods and operating costs were added and questions on background information of the respondent were summarized so as to make them more simple and clear.

3.3.4 Sampling

Selection of the sample of dairy value chain actors was done by the method of stratified random sampling. Based on organizational considerations and availability of value chain activities, selection of sample areas depended on the kind of activities conducted in the sample areas. The choice of respondents was also based on the available resources to undertake the study, which led to choosing minimum selection of sample for a certain group of respondents. For instance 30 people are the minimum number of sample that can

be used to represent a population. However, sampled processors had the most minimal presentation of 15 respondents. This was due to their availability in the study area as explained in section 3.3.4.2. The selection of sample areas was specifically in relation to places that involved any of the activities conducted along the dairy value chain. The sample structure by sample area is shown in Table 2. A total sample of 125 value chain actors consisting of 40 milk producers, 15 milk processors, 40 milk market agents and 30 milk consumers were selected for the study as described below. The sampling frames included lists of producers (smallholder farmers keeping dairy animals), processors (those registered and self help dairy groups), marketers (wholesalers/retailers/vendors/milk bars/hotels/restaurants and milk shops and kiosks) and consumers.

Table 2: Detailed sample structure by sample area

Value chain Actors	Temeke district		Ilala district		Kinondoni district		Morogoro district		Tanga district		Total	
	n	(%)	n	%	n	%	n	%	n	%	n	%
Producers	0	0.0	0	0.0	0	0.0	2020	50.0	20	50.0	40	100.0
Processors	2	13.4	2	13.3	4	26.7	3	20.0	0	0.0	15	100.0
Wholesalers	0	0.0	8	16.6	0	0.0	0	0.0	0	0.0	8	16.6
Kiosk/milk bar/ milk shop owners.	0	0.0	12	33.3	7	17.5	0	0.0	0	0.0	19	50.8
Hotel/Restaurant owners	0	0.0	3	7.8	7	17.5	0	0.0	0	0.0	10	25.3
Vendors	3	7.5	0	0.0	0	0.0	0	0.0	0	0.0	3	7.5
Consumers	14	46.7	4	13.4	12	40.0	0	0.0	0	0.0	30	100.0

3.3.4.1 Selection of sample dairy producers

From a sampling frame of milk producers provided by TAMPRODA in Morogoro and UWATA in Tanga and with the assistance of ward and village officers, 40 milk producers were randomly selected. The sample consisted of 20 milk producers from Morogoro municipality and 20 milk producers from Tanga urban to cover a larger area of the Dar es

Salaam milk shed. The choice of milk producers from the study areas was based on the high availability of milk producers in those areas. Moreover, the selected area is active in all milk production, milk processing and milk marketing hence, convenient to assess and analyze the dairy value chain. None of the sampled milk producers were selected from Dar es Salaam. This is because; the region is more active for processing, marketing and consumption activities.

3.3.4.2 Selection of sample milk processors

In accordance with the sampling frame provided by TAMPA in Dar es Salaam, a total 15 milk processors were purposively selected from Dar es Salaam, Tanga and Morogoro. The distribution in selection based on location is as shown in Table 1. However, contrary to the initial expectation of the existence of 35 processing plants in the Tanzania processing sector as reported in literature (Ashimogo and Greenhalgh, 2007), the number of identified milk processors was smaller than previously expected. This was partly due to some of the milk processing industries such as Royal and Tommy Dairies stopping processing operations.

3.3.4.3 Selection of sample milk-marketing agents

A total of 40 milk marketing agents were randomly selected from the sampling frame provided by TAMPA officials in Dar es Salaam (Table 2). TAMPA officials also assisted in the identification of the marketing agents including their locations and contacts. Because marketing agents were agents/outlets of several types, respondents were selected from the different categories of milk marketing agents/outlets. These include milk bars/shops, hotels, restaurants, wholesalers, and Kiosks.

3.3.4.4 Selection of sample consumers of dairy products

Two approaches were used to sample consumers. In the first approach, consumers were selected from households/ homes. Second approach involved selecting consumers at milk bars and restaurants. A total of 30 milk consumers were randomly selected from Dar es Salaam region where there are more than 90% of milk consumers in Tanzania. For both consumer samples, the same instrument (questionnaire) was used to gather information for their respective households.

(i) Household consumers

Fifteen sample consumers of dairy products from households were purposively selected with the assistance of dairy products sellers. The sellers assisted through identifying the interviewed consumers from the many milk consumers who purchased milk from them. Moreover, some of the household consumers came from neighborhoods of dairy cattle keepers who were also sellers.

(ii) Consumers away from home

Fifteen sample consumers of dairy products were randomly selected from selected milk market outlets such as milk bars and restaurants. Respondents from milk bars responded to questions with respect to their households' milk consumption status.

3.3.5 Questionnaire administration

The interviews with the above respondents were conducted from early February to early April in 2007. The author with the help of two enumerators with experience in dairy related research administered the questionnaire. Though the questionnaire was inscribed in English language, the interviews were conducted in Swahili. This is due to the fact that; Swahili is

the national language spoken by almost every Tanzanian. The interviews with milk producers, processors and milk marketing agents were conducted at the farmers' houses, processing plants, milk bars, and restaurants respectively. For consumers, some interviews were conducted at milk consumers' houses and others in restaurants, milk bars and kiosks while they were consuming dairy products.

3.3.6 Study limitations

Some limitations were encountered during field interviews. Most of the urban respondents particularly milk processors and market agents were reluctant when asked to give information on costs and returns for their business. This might be associated with their belief that, this information was asked for taxation purposes. In overcoming this limitation, an assurance was given to them that the information would be treated confidential and was not for taxation purposes.

3.4 Data analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) computer software. The data were subjected to both qualitative and quantitative analyses as described in subsequent sections.

3.4.1 Descriptive statistics

Descriptive statistics including percentages, frequency distribution, cross tabulation; correlation analysis and comparison of means were employed. Volumes of milk products traded through each channel were presented in different illustrations with respective average prices. Graphical illustration was used to portray seasonality of milk sales across markets. Other aspects analyzed qualitatively included socio economic characteristics of

value chain actors, exchange arrangements, sources of milk marketed along the chain, location of markets for milk, mode of transportation, and quality control measures.

3.4.2 Quantitative analyses

In value chain analysis, the main issues were the computation and measurement of market power and returns at various nodes in the value chain. The following sections describe how market power, profit margins and marketing margins at each node in the chain were measured or assessed.

3.4.2.1 Concentration ratio

This measure was used to examine the marketing power in the value chain. It is the proportion of the total purchase/market accounted for by few largest buyers to the total volume/value handled.

Concentration ratio was estimated using the following formula:

$C = (XP/IP) \times 100$

Where;

C= Concentration ratio

XP= Volume/Value of milk/ milk product purchased by selected big buyers along the dairy value chain.

IP= Total Volume/Value of the milk/milk product marketed in the area of study.

3.4.2.2 Marketing margin analysis

Marketing margin measures the share of the final selling price that is captured by a particular agent in the value chain. It is the cost of providing a mix of market services by market participants. The margin is calculated by finding the price variations at different

nodes in the chain and then comparing them with the final price paid by the consumer. This study used gross marketing margins. For the purpose of this study, this was an adequate indicator for costs. It is useful to introduce here the idea of actor's participation, which is the portion of the price paid by the end consumer that belongs to the farmer as a producer. The consumer prices were held as common denominators in calculating all gross marketing margins. The total gross marketing margin (TGMM) and the actor's gross marketing margins (GMM) were calculated using the following formula:

$$TGMM = \frac{CP - PP}{CP} \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$GMMi = \frac{SP_i - SP_{i-1}}{CP} \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where: TGMM = Total gross marketing margins in (%)

CP = Consumer price in Tanzanian Shillings (Tshs)

PP = Producer price in Tshs

GMM_i = Gross marketing margin of ith agent at a given point in the value chain in (%)

SP_i = Selling price by ith agent at a given point in the value chain in Tshs

SP_{i-1} = Selling price by a preceding agent (i – 1), is the buying price paid by ith agent at a preceding point in the value chain in Tshs.

3.4.2.3 Profit margin analysis

Profit margin is the difference between revenues, (Quantities × prices the customer pay) and the sum of all costs incurred with the production and delivery of the product/service including fixed costs, variable costs and intermediate costs. Profit margin analysis was

aimed at determining net returns obtained by actors at various nodes of the milk value chain from production to consumption.

At each stage of the dairy value chain, profit margin was obtained by subtracting the estimated total cost, fixed as well as variable costs of production/ processing/ marketing from the value of total output as shown in the following formula:

$PM_i = TR_i - (TVC_i + TFC_i)$

Where;

PM_i= Profit margin at stage i

TR_i= Total revenue at stage i

TVC_i= Total variable cost at stage i

TFC_i= Total fixed cost at stage i

i = represent stages along the dairy value chain where i = 1, 2 and 3 refer to dairy production, processing and marketing stage respectively.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter presents and discusses the results of the study. The chapter is organized in four sections. The second section describes the characteristics of the dairy value chain in the Dar es Salaam milk shed from production to consumption. The third section discusses results of the analysis of prices and margins at various nodes of the chain as well as results of the analysis of degree of concentration by using concentration ratio. The last section discusses how the dairy value chain is organized, coordinated and functioning.

4.2 Characteristics of the dairy value chain in Dar es Salaam milk shed

This section describes the characteristics of the dairy value chain at each stage in the chain as presented in the subsequent sections.

4.2.1 Dairy production

4.2.1.1 Socio economic characteristics of sample dairy producers

(i) Age distribution

Age can affect experience, wealth and decision making which in turn affect how one works and hence can influence individual productivity (Singh *et al.,* 2003; Hoppe, 2002). Table 3 reveals that, a large proportion (45%) of the sampled dairy producers' was aged between 45 and 64 years, with 47 years being the average age for sampled dairy producers. Most (63.6%) of those aged 45 to 64 years of age were found in Morogoro district.

Table 3: Age structure of sampled dairy producers

Variables	District		
	Morogoro Urban (n=20)	Tanga Urban (n=20)	All districts (n = 40)
Age (Years)			
Maximum age	72.0	74.0	74.0
Minimum age	23.0	38.0	28.0
Mean age	53.0	38.0	47.0
% of respondents who are:			
Below 30 years old	9.1	18.8	12.5
30 to 44 years old	9.1	62.5	30.0
45 to 64 years old	63.6	12.5	45.0
Above 64 years old	18.2	6.3	12.5

(ii) Gender distribution

Table 4 indicates that, most (70%) of the sampled dairy producers were male, with Tanga district having most (87.5%) males participating in dairy production. Mishili *et al.* (2002) in their study on dairy production in Morogoro municipality reported similar findings that more males than females were involved in milk production.

Table 4: Gender structure of sampled dairy producers

Gender (%)	Morogoro Urban (n=20)	Tanga Urban (n=20)	All districts (n=40)
Male	54.5	87.5	70.0
Female	45.5	12.5	30.0

(iii) Education level and experience in milk production.

Level of education in milk production is relevant in learning and understanding new milk production practices. About 50% of the sampled milk producers attained secondary level education (Table 5). Morogoro district had more (68.2%) respondents with secondary level education while in Tanga; most (75%) respondents had primary level education.

Table 5: Education level and experience in milk production

Variables	% Distribution by district		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
Education level			
Primary	13.6	75.0	37.5
Secondary	68.2	25.0	50.0
Post secondary	18.2	0.0	12.5
Total	100.0	100.0	100.0
Experience in milk production			
1-2 years	4.5	12.5	7.5
3-4 years	9.1	12.5	10.0
More than 5 years	86.4	75.0	82.5

Table 5 reveals that, most (82.5%) of the sampled milk producers had experience of more than 5 years in milk production. Experience of more than 5 years is an indication of gradual development of competence in milk production. Longer experience in dairy business would enable the milk producers to increase productivity and improve quality of products.

(iii) Household size and age structure.

Table 6 shows household size and age structure. The total average household size for sampled households in Morogoro district was 8 household members while the total average household size of sampled households in Tanga district was 10 household members. The total household size included household members of both below and above 18 years of age. It appears that, the average number of people in a household for Tanga district was higher compared to Morogoro district. The table reveals that, the average number of members in the sample households for Morogoro district was 1 person for children below 10 years, 2 people for children between 11 and 17 years, 4 people for adults between 18 and 70 years and 1 person for adults above 70 years. However adults of between 18 and 70 years had more presence in a household with 5

members being their maximum number. Tanga district sampled households had an average size of 4 and 6 people for the age of below 18 years and above 18 years respectively. Similar to Morogoro district, the maximum number of people in a household for Tanga district was greater (6) for members with ages between 18 to 70 years. This is an indication that, there were more adults in the sample households. The large number of adults in households enhanced labor availability. For the whole study area, the average total household size was 9, the minimum size was 4 and the maximum size was 13. In most households, members were husband wife and children. However some households had relatives as well as laborers working on farm or attending cattle.

Table 6: Household size and age structure

Districts	Age in years	Number of members per household		
		Average	Minimum	Maximum
Morogoro Urban (n=20)	**Below 18 years**			
	Children below 10 yrs	1	1	2
	Children btn 11 and 17	2	1	4
	Above 18 years			
	Adults from 18 to 70	4	2	5
	Adults above 70 years	1	1	2
	Total household size	8	5	13
Tanga Urban (n=20)	**Below 18 years**			
	Children below 10 yrs	2	1	2
	Children btn 11 and 17	2	2	3
	Above 18 years			
	Adults from 18 to 70	4	1	6
	Adults above 70 years	2	2	3
	Total household size	10	6	14
All districts (n=40)	**Below 18 years**			
	Children below 10 yrs	2	1	2
	Children btn 11 and 17	2	1	4
	Above 18 years			
	Adults from 18 to 70	3	1	5
	Adults above 70 years	2	1	2
	Total household size	9	4	13

(v) Occupation of heads of sampled households

Dairy cattle keeping was reported as the primary occupation by 53.2% of sample dairy producers (Table 7). A slightly higher proportion (56%) of the sample dairy producers in Tanga district indicated keeping cattle as their primary occupation compared to sample households in Morogoro (49.1%). Only few (7.7% and 10%) in Morogoro and Tanga districts respectively reported dairying as their secondary occupation. Most (68.7%) households reported business activities as their secondary occupation. Since dairy cattle keepers were purposively sampled, it was expected that most would report dairying as their primary occupation.

Table 7: Distribution of household heads by occupation

Occupation	% Distribution by district		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
Primary occupation			
Wage employment	14.5	0.2	7.1
Dairy cattle keeping	49.1	56.0	53.2
Business	27.3	12.5	18.5
Crop production	9.1	31.3	21.2
Secondary occupation			
Poultry keeping	7.7	0.0	3.8
Dairy cattle keeping	7.7	10.0	8.8
Business	69.2	70.0	68.7
Crop production	15.4	10.0	13.7
Fishing	0.0	10.0	5.0

4.2.1.2 Source of initial capital for dairy production

Capital is essential and enables people to utilize opportunities that emerge in production or marketing of a product. The source of capital can be from own savings or credit (Schrader *et al.*, 2005). According to Table 8, own saving was the main source of start up capital reported by 80% of sampled dairy producers, with Morogoro district having the highest proportion of respondents using own saving. Only 7.5% and 2.5 % of sampled dairy producers reported use of informal and formal credit respectively for dairy production.

Table 8: Source of initial capital for dairy production

Source of capital	% Distribution by district		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
Own saving	86.4	68.8	80.0
Family/ friend	0.0	18.8	7.5
Formal credit	1.8	3.5	2.5
Informal credit	7.3	9.0	7.5
Pension income	4.5	0.0	2.5

4.2.1.3 Cattle herd size and structure

The dairy herd size and structure in the study area is shown in Table 9. According to Sarwatt and Njau (1990), herd size is an important determinant of milk production. The table shows that, most interviewed households in Morogoro district kept an average herd size of 4 cows, 3 heifers, 2 bulls and 2 calves. However the maximum herd size in a dairy unit was 10 cows, 5 heifers, 2 bulls and 3 calves while the minimum herd size was 1 cow, 2 heifers, 1 calve and no bull. The absence of bulls in some cases was because some producers could not afford to keep one; hence they opted to rent one only for breeding purposes when needed. The average total herd size was 11 dairy cattle for Morogoro district; however the average total herd size for Tanga district was slightly higher at 15 cattle. In Tanga district, the average dairy herd size consisted of 5 cows, 3 heifers, 2 bulls,

2 steers and 3 calves. In this case, the maximum herd size was 12 cows, 7 heifers and 3 bulls. The minimum herd size was 2 cows, 2 heifers and 1 bull.

Table 9: Distribution of cattle in the dairy herd

Districts	Cattle category	Number of animals in each cattle category		
		Minimum	**Average**	**Maximum**
Morogoro Urban (n=20)	Cows	1	4	10
	Heifers	2	3	5
	Bulls	0	2	2
	Calves	1	2	3
	Total herd size	4	11	20
Tanga Urban (n=20)	Cows	2	5	12
	Heifers	2	3	7
	Bulls	1	2	3
	Steers	1	2	3
	Calves	1	3	2
	Total herd size	7	15	27
All districts (n=40)	Cows	1	4	11
	Heifers	2	3	6
	Bulls	1	2	3
	Steers	0	2	3
	Calves	1	1	3
	Total herd size	5	12	26

For all districts in the study area, the minimum size of dairy herd was 5 dairy cattle while the average size was 12 dairy cattle and the maximum size was 26 dairy cattle. Data also shows that, the sampled milk producers in Tanga district kept more cattle than producers in Morogoro district.

4.2.1.4 Dairy cattle feeding management

Most (60%) of sampled dairy producers practiced zero grazing as a feeding system with Morogoro district having more producers (81.8%) practicing this feeding system than Tanga district (Table 10). A study by Urassa (1998) in Tanga noted that animals are zero grazed and partially grazed on nearby pastures. Availability of grazing land influences farmers to send out animals to graze. Farmers however still have to purchase other feeds to supplement grazing. Table 10 shows that, most (92.5%) of the sample milk producers used purchased feeds such as seed cake and maize bran for their animals. This implies that, most farmers realize the importance of purchased feeds for increased milk production.

Table 10: Dairy cattle feeding management

Variables	% Distribution by district		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
Type of feeding system			
Zero grazing	81.8	37.5	60.0
Semi grazing	9.1	25.0	15.0
Grazing	9.1	37.5	25.0
Use of Purchased feeds			
Yes	95.5	87.5	92.5
No	4.5	12.5	7.5

4.2.1.5 Animal diseases and treatment

Majority (66.7%) of the sampled milk producers were visited by veterinary doctors in their homes for treatment of sick animals (Table 11) with Morogoro district having more of the sample dairy producers who were visited by veterinary doctors and treated their animals at home. Only 10.3% of the sample dairy producers took their animals to the veterinary clinics for treatment. This was done in order to avoid the extra costs of paying transport, over and above the costs of treatment. After administering drugs to the animals, most

(30%) of the sample milk producers reported that they waited either between 1 to 2 days or 3 to 5 days before milking the treated animals. The recommended duration is to wait for 2 days before milking a treated animal. This practice was more evident in Tanga district than Morogoro district. The commonly treated diseases were mastitis and foot and mouth disease.

Table 11: Distribution of sampled producers by mode of treatment of animals

Variables	% Distribution by District		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
Animal Treatment			
Own treatment by use of purchased drugs	18.2	26.7	23.1
Take animal to vet doctor	0.0	26.7	10.3
Visited by a vet doctor at home	81.8	46.7	66.7
Time taken before milking a treated cattle			
Less than 1 day	22.7	31.3	25.0
1 to 2 days	27.3	25.0	30.0
3 to 5 days	27.3	37.5	30.0
6-8 days	22.7	6.3	15.0

4.2.1.6 Milk production by season

Table 12 shows how milk production varies with season. The table indicates that, the average milk produced per day in the study area was 28 liters of liquid milk and 36 liters of liquid milk for the dry season and wet season respectively. However in Morogoro district, milk production levels were higher than in Tanga district, with Morogoro sampled dairy producers producing an average of 34 and 28 liters per day during the wet and dry season respectively while Tanga sampled dairy producers produced an average of 38 and 28 liters per day during the wet and dry seasons respectively. The dry season occurs from June to October whilst wet season occurs from November to May with short dry spell for January and February.

The amount of milk a cow can produce is directly related to the quality and quantity of feed she eats. The average milk production per cow per day for the sample producers in Morogoro district in the wet and dry seasons were 16 liters and 10 liters respectively while milk production per cow per day in Tanga district were 20 liters and 8 liters for the wet and dry seasons respectively.

Table 12: Milk production by season

Variables (in liters)	District		
	Morogoro Urban (n=20)	Tanga Urban (n=20)	All districts (n=40)
Quantity of milk produced/day/household			
Wet Season			
Average	34	38	36
Minimum	7	15	7
Maximum	80	75	80
Dry Season			
Average	28	28	28
Minimum	3	10	3
Maximum	60	55	60
Quantity of milk produced/day/cow			
Wet Season			
Average	16	20	18
Minimum	2	8	2
Maximum	30	40	40
Dry Season			
Average	10	8	9
Minimum	1	4	1
Maximum	24	20	24

In the dry season the quality and sometimes the quantity is not enough, thus it is expected that the cow will produce less milk (Mtengeti and Urio, 2006). The maximum amount of milk produced per household in the dry season was 20 liters below the maximum quantity produced during the wet season (Table 12).

4.2.1.7 Milk handling and preservation practices

Milk handling and preservation practices are among the important factors influencing milk hygiene and shelf life of milk. The type of utensils used, cleaning methods and preservation methods are essential in ensuring quality during milk handling. Plastic utensils were identified as the most common type of utensils used for milk handling by milk producers.

Most (77.5%) of sampled milk producers indicated using plastic utensils (Table 13). All of the sampled dairy producers in Tanga district used plastic utensils for milk handling and preservation. This is probably due to the fact that plastic utensils are relatively cheaper than aluminum utensils and therefore more affordable. Hygienically, however, plastics are discouraged due to the difficulties in cleaning them. About 47.5% of the sampled milk producers indicated that they cleaned their utensils with warm water and soap. A study by Nyagori (2001) reported a similar finding, that cleaning of utensils was among the few quality control strategies used by small-scale farmers.

Apart from cleaning utensils, hygiene was observed during milking. All the sample milk producers reported to wash their hands before milking and straining the milk after milking. Milk is a highly perishable product; it requires special treatment to avoid deterioration of quality and total spoilage. Such treatment adds value to milk. The results in Table 12 show that there is very little value addition to raw milk at the producer level. Treatments done after milking were mainly refrigeration and boiling. Refrigerating and boiling of milk was done to increase shelf life of milk. None of the sample households reported formal processing of milk into products of high value. Only natural fermentation of milk into sour milk was practiced by few (10.3%) of the sample producers (Table 13).

Table 13: Milk handling and preservation methods

Variables	% Distribution by district		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
Milk handling equipments			
Plastic only	68.2	100.0	77.5
Aluminum only	22.7	0.0	15.0
Both Plastic and Aluminum	9.1	0.0	7.5
Cleanliness of equipments			
Warm water and soap	86.4	0.0	47.5
Warm water	13.6	68.8	37.5
Cold water and soap	0.0	31.3	15.0
Milking hygiene			
Washing hands before milking	100.0	100.0	100.0
Straining milk after milking	100.0	100.0	100.0
Treatment of raw milk			
Natural fermentation	0.0	26.7	10.3
Refrigerating	95.5	53.3	76.9
Boiling	4.5	20.0	10.3
Processing by use of culture	0.0	0.0	0.0

4.2.1.8 Means of transporting milk

Due to the perishable nature of milk, the success of dairy businesses depends highly on the efficiency of transportation (Omore *et al.*, 2004). Most (62.5%) of the sampled dairy producers used bicycles as means of transporting milk during milk selling with all of the sampled dairy producers in Tanga using this means of transporting milk. Other means of transporting milk in Morogoro region included own vehicles and delivering milk on foot as indicated in Table 14. The domination of bicycle as means of milk transportation implies lack of access to other means of transport and therefore high losses due to milk spoilage particularly when moving long distances. On foot delivery implies larger share of the buyers are from the neighborhood. As a result this leads to lack of competition within the local milk market since milk is consumed and traded only within small radius and hence slow growth in milk supply. In most cases however, milk was collected by the

consumers from the producers compared to producers transporting milk to the consumers. In most cases, consumers collecting milk from producers happened within short distances such as their neighborhoods.

Table 14: Means of transporting milk

Mode of transport	% Distribution by district		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
On foot	13.6	0.0	7.5
Bicycle	40.9	100.0	62.5
Own vehicle	13.6	0.0	7.5
Did not transport	31.8	0.0	20.0

4.2.1.9 Constraints faced by dairy producers

Identification of constraints was necessary so as to recommend strategies, which will ensure improvement of milk production activities in the dairy sub sector. Table 15 shows major factors that constrained dairy production in the Dar es Salaam milk shed. Constraints that were reported by relatively large proportion of respondents were diseases and deaths of animals (19.1%) and unreliable fodder availability especially in the dry season (18.1%). The problems of animal diseases and deaths were more evident in Tanga than Morogoro district.

Table 15: Constraints faced by dairy producers in the Dar es Salaam milk shed

Constraints	% Distribution by district		All districts (n=40)
	Morogoro Urban (n=20)	Tanga Urban (n=20)	
Animals diseases and deaths	5.2	50.0	19.1
Lack of capital	6.9	3.6	5.3
Unreliable fodder availability	20.7	14.3	18.1
Low selling prices	1.7	10.7	6.4
Unreliable market	5.2	7.1	7.4
Theft of animals	24.1	0.0	14.9
Lack of improved cattle breeds	3.4	3.6	3.2
Consumer payment problems	1.7	0.0	1.1
High running costs	12.1	10.7	12.8
Unreliability of labor power	19.1	0.0	11.7

Other constraints mentioned in their order of importance as indicated in Table 15 were theft of animals (14.9%), high running costs (12.5%), unreliable labor (11.7%), unreliable market for milk (7.4%), low milk selling prices (6.4%), lack of improved cattle breeds (3.2%) and consumer payment problems (1.1%). High running costs resulted from feeds and drugs costs. High drug costs contributed to animal diseases. This is because in some cases, livestock keepers could not afford drugs, medicines and vaccination.

4.2.2 Milk processing

4.2.2.1 Characteristics of sample milk processors

(i) Age distribution

According to Table 16, eleven out of the 15 sampled milk processors fell in the age ranging from 45 to 55 years with Tanga and Temeke districts having all of the sample milk processors in that age group. This is similar to milk producers who had most of them in the age from 45 and above. However, contrary to milk producers, sampled milk processors did not have many actors below 30 years.

Table 16: Age distribution of sampled milk processors

Variables	Distribution by district				Total (n=15)
	Morogoro Urban (n=3)	Tanga Urban (n=4)	Kinondoni (n=6)	Temeke (n=2)	
Age (years)					
Maximum age	35	50	63	59	63
Minimum age	28	44	29	34	28
Mean age	31	47	52	47	46
Number of respondents who were;					
Between 30 to 44 years	2	0	1	0	3
Between 45 to 55 years	1	4	4	2	11
Above 55 years	0	0	1	0	1

The minimum and maximum ages for milk processors were 28 and 63 years respectively with an average age of 46 years for the whole sample whilst milk producers involved more elderly people with sampled producers up 74 years of age (Table 16).

(ii) Gender distribution

At the processing level, there were more females (10) than males (5) with Kinondoni district having more (5) females milk processors (Table 17). These results imply that, females are more involved in milk processing activities compared to males. This is different from milk production where more males were involved. Contrary to milk producers where by more males dominated in the whole study area, sampled milk processors had an equal distribution of males and females in Tanga and Temeke districts, while more females were found in Morogoro and Kinondoni district.

Table 17: Gender distribution of sampled milk processors

Gender of respondents	Distribution by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Male	1	33.3	2	50	1	16.3	1	50	5	33.3
Female	2	66.7	2	50	5	83.7	1	50	10	66.7

(iii) Occupational distribution

Thirteen of the 15, (86.7%) sampled processors reported milk processing as their primary occupation (Table 18). This was more obvious for the milk processors in Kinondoni and Tanga district than Morogoro and Temeke districts. On the other hand, only one milk processors out of the 15 sample processors reported milk processing as a secondary occupation.

Table 18: Occupational distribution of sampled milk processors

Occupation	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Primary Occupation										
Wage employment	1	33.3	1	25.0	0	0.0	0	0.0	2	13.3
Milk processing business	2	66.7	3	75.0	6	100.0	2	100.0	13	86.7
Secondary Occupation										
Milk processing business	0	0.0	0	0.0	1	16.3	0	0.0	1	6.7
Wage employment	3	100.0	4	100.0	5	83.7	2	100.0	14	93.3

(iv) Experience in milk processing

Table 19 indicates that, eight out of 15 (53.3%) sampled milk processors had experience of more than 5 years in milk processing business. The table indicates that, milk processors in Temeke and Tanga districts had more experience than milk processors in Kinondoni and Morogoro districts. None of the sample milk processors in Morogoro district had experience of more than 5 years. This is an indication that, milk processing is not well developed in Morogoro district.

Table 19: Experience in milk processing

Year of experience	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
1 to 2 years	0	0.0	0	0	2	33.3	0	0.0	2	13.3
3 to 4 years	3	100.0	1	25	1	16.7	0	0.0	5	33.3
More than 5 years	0	0.0	3	75	3	50.0	2	100.0	8	53.3

(v) Education level of sampled milk processors

Eleven out of the 15 (73.3%) sampled milk processors had post secondary level of education with Tanga and Kinondoni districts having a larger proportion of milk

processors with post secondary education than Temeke and Morogoro districts (Table 20).

Table 20: Education level of sampled milk processors

Education level	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Secondary	2	66.7	0	0.0	1	16.7	1	50.0	4	26.7
Post Secondary	1	33.3	4	100.0	5	83.3	1	50.0	11	73.3

4.2.2.2 Source of initial capital for milk processing business

Like producers, majority (8) out of the 15 or (53.3%) sampled milk processors also used own savings as the start up capital (Table 21). Their dependency on own savings is as well associated with inability to access financial support from credit institutions. For those who obtained credit, Temeke and Kinondoni districts had more respondents who reported access to credits either informally or formally than respondents in Morogoro and Tanga districts. Other important sources of initial capital were family or friends and pension income.

Table 21: Source of initial capital

Source of Initial Capital	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Own saving	1	33.3	3	75.0	4	66.7	0	0.0	8	53.3
Family/ friend	3	66.7	0	0.0	1	16.7	0	0.0	4	26.7
Formal credit	0	0.0	0	0.0	1	16.7	0	0.0	1	6.7
Informal credit	0	0.0	0	0.0	0	0.0	2	100.0	2	13.3
Pension income	0	0.0	1	25.0	0	0.0	0	0.0	1	6.7

4.2.2.3 Scale of milk processing enterprise

Table 22 shows that, most (7) out of the 15 (46.7%) sampled milk processing enterprises were small with capacity of handling less than 3000 liters per day. UNDP/BCS/TetraPak

(2006) reported a similar finding. Whilst only 7 out of the 15 processing plants had capacity of less than 3000 litres, processed less than 2000 liters of milk per day, suggesting that they were operating below their installed capacity. Operating below capacity of the particular processing machines was more critical during the dry season when raw milk supply is low due to scarcity of livestock feeds.

Processing of milk in the study area can be categorized into formal and informal processing. Formal processing means regulated and organized ways for milk processing or registered/ official business entity while Informal milk processing is unregistered non official business or for this case it means unregulated and unorganized milk processing (Joseph *et al.*, 2003).

Table 22: Scale of processing enterprise

Variables	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Scale of milk processing operation (in ltrs/day)										
Small (less than 3000)	2	66.7	2	50.0	2	33.3	1	50.0	7	46.7
Medium (between 3000 and 10 000)	1	33.3	1	25.0	1	16.7	0	0.0	3	20.0
Large (above 10 000)	0	0.0	1	25.0	3	50.0	1	50.0	5	33.3
Volume of milk currently processed in liters										
Below 2000	3	100.0	3	75.0	4	66.7	1	50.0	11	73.3
Above 5000	0	0.0	1	25.0	2	33.3	1	50.0	4	26.7
Form of processing										
Formal processing	1	33.3	2	50.0	5	83.3	1	50.0	9	60.0
Informal processing	2	66.7	2	50.0	1	16.7	1	50.0	6	40.0

In other words informal milk processing is processing which bypasses government regulatory activities. Most of the sampled processors practiced formal processing especially

in Dar es Salaam. Informal processing was more prevalent in Morogoro than the other study areas.

4.2.2.4 Source of raw materials and processing equipment for milk processors

Overall, 7 out of 15 (46.7%) sampled milk-processing plants mainly obtained raw milk from Tanga followed by Morogoro (4) and own production (2). All processors in Dar es Salaam obtained milk from sources outside Dar es Salaam with Tanga being the major supplier. This is due to the fact that, Tanga has a lot of people involved in milk production as well as processing, also many of livestock projects initiated in Tanzania were done in Tanga region. On the other hand, most of the sampled milk processors in Morogoro and Tanga districts obtained raw milk from sources within their own districts (Table 23).

Table 23: Source of raw materials and processing equipment for the sampled milk processors

Variables	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Source of raw milk										
Tanga	0	0.0	3	75.0	3	50.0	1	50.0	7	46.7
Morogoro	2	75.0	0	0.0	1	16.3	1	50.0	4	26.7
Pwani	0	0.0	0	0.0	1	16.3	0	0.0	1	6.7
Dar es Salaam	0	0.0	0	0.0	1	16.3	0	0.0	1	6.7
Own production	1	25.0	1	25.0	0	0.0	0	0.0	2	13.4
Source of Packaging material										
Imported	2	75.0	2	50.0	3	50.0	1	50.0	8	53.3
Dar es Salaam	1	25.0	2	50.0	3	50.0	1	50.0	7	46.7
Source of Processing equipment										
Dar es Salaam	2	75.0	2	50.0	0	0.0	2	100.0	6	40.0
Imported	1	25.0	2	50.0	6	100.0	0	0.0	9	60.0
Sufficiency raw milk supply for processing										
Sufficient	2	75.0	0	0.0	3	50.0	0	0.0	5	33.3
Not sufficient	1	25.0	4	100.0	3	50.0	2	100.0	10	66.7

Nevertheless, two of the sampled milk processors were engaged in milk production so as to supplement the amount of raw milk supply, which was reported as insufficient by 10 of the sampled milk processors. All the processors in Temeke and Tanga experienced the problem of inadequate supply of milk. As can be seen from Table 23, most equipment was imported. Eight and nine of the sample milk processors reported to have imported packaging materials and machinery for processing respectively. These were imported from countries like Italy, Kenya, France, India, China and Belgium.

4.2.2.5 Types of processed milk products

Table 24 shows different milk products processed in the study area. The table shows that sample milk processors in Tanga district processed more products than their counterparts in Dar es Salaam (Kinondoni and Temeke) and Morogoro. The table indicates that, about 7 types (46.7%) of milk and products were processed in Tanga, 6 types (40%) were processed in Kinondoni, 5 types (33.3%) in Temeke and 4 types (26.7%) in Morogoro.

Table 24: Types of milk products processed by location

Milk product type	Number of sample milk processing enterprises				Total counts
	Morogoro Urban	Tanga Urban	Kinondoni	Temeke	
Fresh milk	0	4	2	2	8
Packed pasteurized milk	0	1	1	0	2
Packed fermented milk	1	2	0	0	3
Yogurt	2	3	3	1	9
Cheese	0	2	2	1	5
Cream	0	1	1	1	3
Sour milk	1	3	1	2	7
Total	4	16	10	7	37

However milk products like yogurt, cheese and cream were largely processed in Kinondoni district in Dar es Salaam region and Tanga district where dairy business is reported to be more developed than in the other districts (Omore *et al.*, 2004).

4.2.2.6 Modes of milk processing

On the other hand, the mode of processing these milk products differed, with formal processing being the most common method used for most milk products except for sour milk. Table 25 shows that, sour milk was the common informally processed milk product. The table shows that 9 out of the 15 sampled milk processors processed yogurt both formally and informally, followed by 7 sampled processors who processed sour milk. Other milk products such as packed milk; cheese and cream were reported as formally processed.

Table 25: Mode of processing milk products

Type of milk products	Formally processed	Informally processed	Total counts
Fresh milk	4	4	8
Packed pasteurized milk	2	0	0
Packed fermented milk	3	0	0
Yogurt	6	3	9
Cheese	5	0	5
Cream	3	0	0
Sour milk	0	7	7

4.2.2.7 Quality assurance and marketing techniques for processed dairy products

Aside from helping to ensure the standard of produced milk, hygiene and quality assist in boosting the image of milk generally as a healthy product and thus may have a promotional effect on milk consumption. The results in Table 26 show that, the methods of quality assurance in the study area varied. Some processors did test the milk quality and some did not use any clear method of quality control. In some cases, visual observation was the only

method used to determine quality. This method was used by 5 (33.3%) of the sampled milk processors. In Tanga district in particular, two (13.3%) of the sampled milk processors used more advanced methods such as density measurements for testing milk quality (Table 26). However, one (6.7) of the sampled milk processors in Kinondoni district did not perform any quality check. Moreover, the formally processed milk products had a Tanzania Bureau of Statistics label.

Regarding marketing techniques for the processed dairy products, promotion by advertisement was the major marketing technique practiced by 7 (46.7%) of the sample milk processors. However, a large proportion of sample milk processors in Tanga district did not use any marketing techniques as indicated in Table 26.

Table 26: Quality control measures and marketing techniques of processed milk

Variables	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Strategies to ensure quality of raw milk										
Density measurement	0	0.0	2	50.0	1	16.3	1	50.0	4	26.7
Use of alcohol	1	33.3	0	0.0	2	33.7	0	0.0	3	20.0
By visualization	1	33.3	2	50.0	1	16.3	1	50.0	5	33.3
Tasting	1	33.3	0	0.0	1	16.3	0	0.0	2	13.3
No quality check	0	0.0	0	0.0	1	16.3	0	0.0	1	6.7
Marketing techniques for processed products										
Promotion by advertisement	2	66.7	1	25.0	3	50.0	1	50.0	7	46.7
Promotion through school milk feeding	1	33.3	0	0.0	2	33.7	0	0.0	3	20.0
None	0	0.0	3	75.0	1	16.3	1	50.0	5	33.3

4.2.2.8 Means of transporting processed milk products

Six of the sampled milk processors used own/company vehicles to transport milk products to the buyers (Table 27) with Dar es Salaam having more sampled processing plants using this mode of transportation. Other transportation modes used include public transportation, bicycles and in a few cases products were sold at the processing places. In transportation of milk and milk products, it was observed that it was more common for the consumers to follow milk from processors rather than the other way round. This was so because; many processing plants had transport, which was for milk products distribution, which was also one way of advertising their milk products.

Table 27: Means of transporting processed milk products

Means of transport	Number of respondents by district								Total (n=15)	
	Morogoro Urban (n=3)		Tanga Urban (n=4)		Kinondoni (n=6)		Temeke (n=2)			
	n	%	n	%	n	%	n	%	n	%
Own vehicle	1	33.3	1	25.0	3	50.0	1	50.0	6	40.0
Public transport	1	33.3	2	50.0	1	16.3	0	0.0	4	26.7
Bicycle	0	0.0	0	0.0	1	16.3	1	50.0	2	13.3
Did not transport	1	33.3	1	25.0	1	16.3	0	0.0	3	20.0

4.2.2.9 Constraints to milk processing

Unlike producers, processors reported the problem of high competition with imported milk products as one of the major constraints in milk processing business. Overall, this problem was reported by 18.8% of the sample milk processors with Morogoro district having a high (44.4%) proportion of the sample milk processors facing this problem (Table 28). This is an indication that, there is a challenge to the local processors and other actors to improve milk quality, standards, and prices of milk so as to be able to compete with the imported milk products, which are of high quality standards. Other constraints reported by the

sample milk processors in their order of importance include; power rationing/unstable electricity, low availability of raw materials, taxation problems and poor government regulations, low quality of milk products, unreliable market and insufficient milk supply (Table 28). The problem of insufficient milk supply in Tanzania was also reported by De Wolff (2002) as one of the factors contributing to the small size of operation of dairy processing enterprises in Tanzania.

Table 28: Constraints faced by the sampled milk processors

Variables	Distribution of respondents by district				Total (n=15)
	Morogoro Urban (n=3)	Tanga Urban (n=4)	Kinondoni (n=6)	Temeke (n=2)	
Lack of capital	0.0	5.9	0.0	0.0	2.1
Unreliable market	0.0	4.7	10.5	14.3	7.0
Theft of animals	0.0	0.0	6.3	0.0	2.1
High running costs	11.1	0.0	6.3	0.0	4.2
Unreliable labor power and low education levels	0.0	5.9	6.3	0.0	4.2
Competition with imported milk products	44.4	17.7	6.3	16.7	18.8
Power rationing	11.1	23.5	18.8	0.0	16.7
Low availability of processing machinery	11.1	17.6	12.5	16.7	14.6
Insufficient raw milk supply	11.1	0.0	6.3	16.7	6.3
Low quality of milk products	11.1	5.9	18.8	0.0	10.4
Lack of milk drinking habit	0.0	2.0	2.5	1.4	2.1
Taxation problems and poor government regulations	0.0	17.7	6.3	33.4	12.6

4.2.3 Marketing of milk and milk products in the Dar es Salaam milk shed

4.2.3.1 Characteristics of sample milk marketing agents

(i) Age distribution

Table 29 shows age distribution of the sampled milk marketing agents. The table shows that, most (75%) of the milk marketing agents interviewed were aged from 31 to 50 years old with 22 and 60 years being the minimum and maximum ages respectively.

Table 29: Age distribution of sampled milk marketing agents

Variables	District			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Age (years)				
Maximum age	55	60	59	60
Minimum age	30	22	42	22
Mean age	43	40	53	42
Proportion % of respondents who were:				
Below 30 years old	21.4	26.1	0.0	22.5
Between 31 to 50 years old	78.6	69.6	100.0	75.0
Above 50 years old	0.0	4.3	0.0	2.5

(ii) Gender distribution

Overall, most (72.5%) of the interviewed milk-marketing agents were males. In Temeke district, however, most of the sampled marketing agents were females (Table 30). Similar to milk producers but contrary to milk processors, males dominated milk marketing in the study area.

Table 30: Age distribution of sampled milk marketing agents

Gender of respondents (%)	District			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Male	71.4	78.3	33.3	72.5
Female	28.6	21.7	66.7	27.5

(iii) Education level

Table 31 shows that, most (48.7%) of the sampled milk marketing agents had attained secondary level education. Temeke district had most (63.6%) of the sampled milk marketing agents with post secondary level education while Kinondoni district had fewer sampled milk-marketing agents with secondary level education. These results show that,

secondary level of education was common except for the case of Kinondoni district where many (35.7%) marketing agents had primary level education.

Table 31: Education level of sampled milk marketing agents

Education level	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Primary	35.7	18.2	0.0	23.1
Secondary	28.6	63.6	33.3	48.7
Post secondary	35.7	18.2	66.7	28.2

(iv) Occupational distribution

Milk marketing was the primary occupation for only 10% of the sampled milk marketing agents with none in Kinondoni district reporting it as a primary occupation (Table 32). Most shops/kiosk/hotels or restaurants sold milk together with other products such as food and drinks other than milk such as sodas, water and juices. Majority (92.5%) of the sampled milk-marketing agents were involved in milk marketing business as a secondary occupation. This suggests that, marketing agents could not entirely depend on milk business alone for their livelihoods.

Table 32: Occupation distribution

Variables	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Primary Occupation				
Wage employment	100.0	87.0	66.7	90.0
Milk business	0.0	13.0	33.3	10.0
Secondary Occupation				
Wage employment	0.0	13.0	0.0	7.5
Milk business	100.0	86.9	100.0	92.5

(v) Experience in milk marketing.

Most (62.5%) of the sampled milk market agents had experience of more than 3 years in milk marketing (Table 33). Milk marketing agents in Temeke and Kinondoni districts had more experience in milk marketing compared to Ilala district where most (43.5%) marketing agents had experience of less than 3 years. These results suggest that, marketing of milk in a large part of the study area has existed for a long time although very few improvements are seen in milk marketing as a business.

Table 33: Experience in milk marketing

Experience in milk marketing	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
1 to 3 years	35.7	43.5	0.0	37.5
4 to 10 years	14.3	21.7	66.7	22.5
11 to 15 years	42.9	17.4	0.0	25.0
More than 15 years	7.1	17.4	33.3	15.0

(vi)Types of business ownership

Table 34 shows the type of milk business ownership by marketing agents. The table shows that, most (70%) of the sampled milk-marketing agents conducted their businesses individually. Only 10% of the sampled milk-marketing agents had partnership type of ownership. Partnership involves two or more persons associating to conduct a non-corporate business. On the other hand, about 20% of the marketing agents were doing business as associations.

Table 34: Type of business ownership

Type of business owners	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Individual	85.7	60.9	66.7	70.0
Partnership	7.1	13.0	0.0	10.0
Cooperative/association	7.1	26.1	33.3	20.0

4.2.3.2 Source of initial capital for milk marketing business

Table 35 shows that, most (60%) of the sampled milk market agents used formal/informal credit as a start up capital with Ilala district having a higher proportion of agents with access to credit. This is different from the other dairy value chain actors (milk producers and processors) who mostly used own savings to start their business. At retail level, market agents accessed credit that was usually in form of refrigerators from large processing companies such as Tanga Fresh and ASAS Dairies Ltd.

Table 35: Source of initial capital for milk marketing business

Source of initial capital	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Own saving	17.4	7.1	33.3	15.0
Family/ friend	36.0	20.4	53.6	20.0
Formal/ Informal credit	42.0	66.0	13.1	60.0
Others/pension	3.6	6.5	0.0	5.0

4.2.3.3 Source of milk marketed by the sample marketing agents

Marketing agents had several sources of obtaining milk and milk products as shown in Table 36. The table shows that, 40%, 50%, 50% and 70% of the sampled marketing agents obtained fresh milk, packed pasteurized milk, and packed fermented milk from Morogoro, abroad, Tanga/ Dar and Tanga. The results in Table 36 generally show that, Coast region and Tanga are major sources of fresh milk while Dar es Salaam was a major source of packed fermented milk and Iringa a source of packed pasteurized milk.

Most of the sampled milk marketing agents who obtained fresh milk from Morogoro were hotels and restaurants (66.7%) and vendors (65.7%). Other milk marketing agents who obtained milk from Morogoro were milk bars, viosks and whole sellers.

Table 36: Source of milk marketed by sampled milk marketing agents

Type of milk product	Source of milk product	% Distribution of source of milk and milk products by Marketing agent type				
		Wholesaler	Milk bar/ Kiosk	Hotel/ Restaurant	Vendor	All marketing agents
Fresh milk	Morogoro	16.7	40.7	66.7	66.7	40.0
	Dar es Salaam	33.3	37.0	0.0	0.0	30.0
	Tanga	16.7	22.3	33.3	33.3	25.0
	Iringa	33.3	0.0	0.0	0.0	5.0
Packed Pasteurized milk	Dar es Salaam	50.0	22.3	0.0	0.0	28.8
	Iringa plants	0.0	33.3	0.0	0.0	21.4
	Imported	50.0	44.4	0.0	0.0	50.0
Sour milk	Tanga plants	0.0	100.0	0.0	0.0	50.0
	Dar plants	0.0	0.0	100.0	0.0	50.0
Packed fermented	Tanga plants	100.0	80.0	0.0	0.0	70.0
	Dar plants	0.0	0.0	100.0	0.0	20.0
	Iringa plants	0.0	20.0	0.0	0.0	10.0

4.2.3.4 Quality assessment and milk preservation methods by milk marketing agents

Results show that, most (35.9%) of the sampled milk marketing agents used visual observation to assess milk quality with Kinondoni and Ilala districts having a higher proportion of the sample marketing agents using this method (Table 37). However, many (66.7%) of the sampled milk-marketing agents in Temeke district used more advanced method of lactometer or thermometer for quality check.

Milk is a highly perishable and complex product to handle due to the fact that it is a perfect medium for microbiological contaminants (Jaffee and Morton, 1995). This makes it vulnerable especially if it is marketed some hours after milking. Majority (87.5%) of the sampled milk-marketing agents used refrigerators for milk preservation with Temeke district having all sampled marketing agents using refrigerators for milk preservation.

Table 37: Quality control and milk preservation methods by milk marketing agents

Variables	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Quality assessment methods				
Visual observation	46.2	34.8	0.0	35.9
Tasting	15.4	13.0	0.0	12.8
Lactometer/ thermometer	0.0	30.4	66.7	23.1
No quality check	38.5	21.7	33.3	28.2
Milk preservation methods				
Refrigerator	92.9	82.6	100.0	87.5
Boiling	7.1	17.4	0.0	12.5

This is similar to the findings by Mdoe and Mnenwa (2004) who found that milk preservation was mostly done by use of refrigerators. During the survey it was noted that, some milk marketing agents were supplied with refrigerators on credit by milk processing plants. Tanga Fresh and ASAS Dairies Ltd were reported providing such in kind credit in the form of refrigerators.

4.2.3.5 Milk marketing channels

Five milk marketing channels were identified in the study area (Figure 4.1) with Morogoro having fewer marketing channels compared to Tanga and Dar es Salaam. Identified marketing channels included;

(i) Milk producers selling raw milk to milk processors who then sell processed milk products to final consumers.

(ii) Milk producers selling raw milk to collection centers who then sell raw milk to milk processors, milk-marketing agents and to final consumers.

(iii) Milk producers selling raw milk directly to milk consumers.

(iv) Milk producers selling raw milk to milk marketing agents (including milk bars, kiosks and restaurants) who then sell to final consumers.

(v) Milk producer selling raw milk to milk processors who then sell processed milk to marketing agents, who then sell both raw and processed milk to final consumers.

Channel (iii), which involved direct sale to consumers is the shortest while channel (v) through which milk products pas through several intermediaries is the longest. Mdoe and Nyange (1995), in their study of milk market channels in Tanzania, observed that demand for milk is higher in larger urban areas where there are relatively longer market chains.

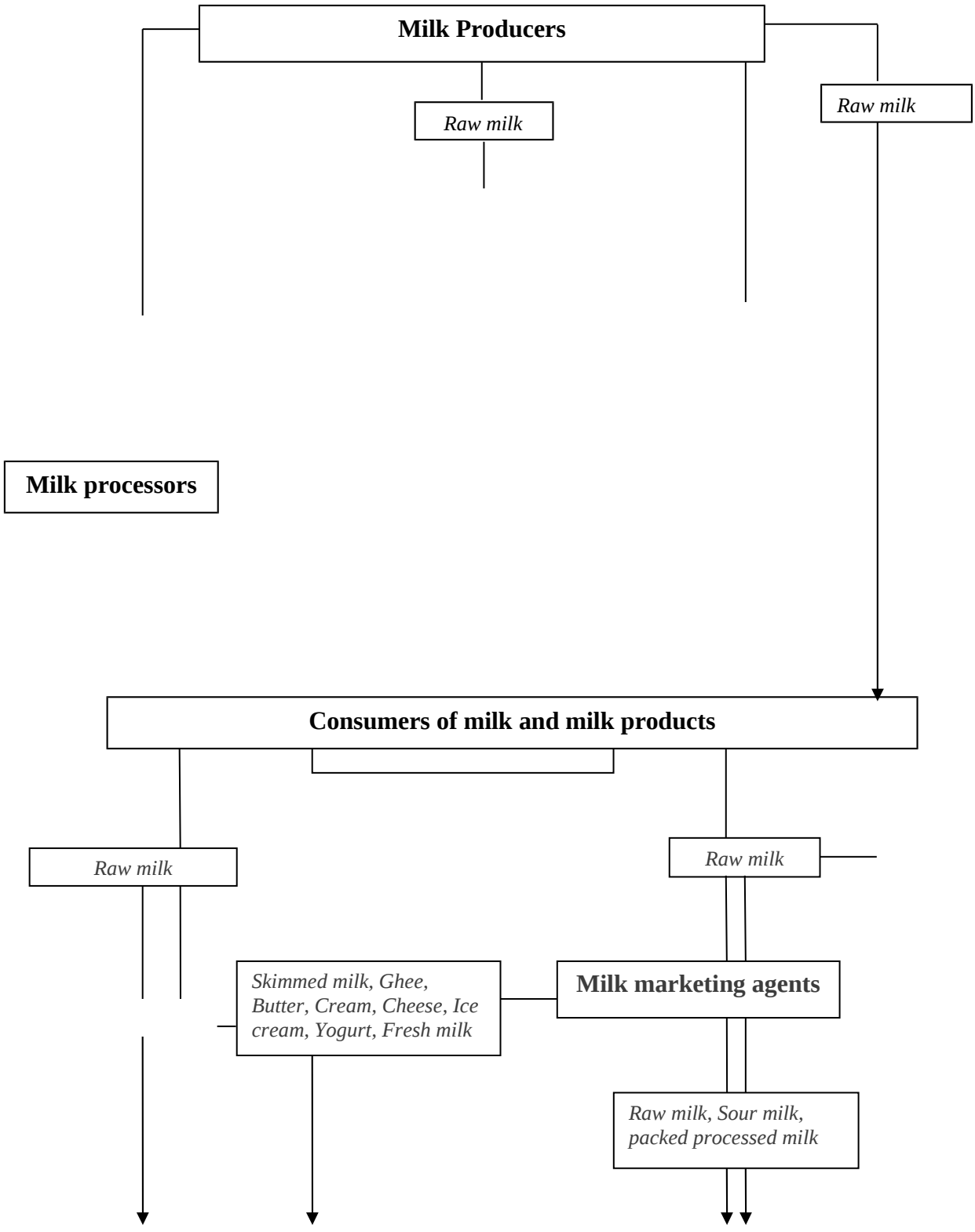
Milk Producers
Raw milk
Raw milk
Milk processors
Consumers of milk and milk products
Raw milk
Raw milk
Skimmed milk, Ghee, Butter, Cream, Cheese, Ice cream, Yogurt, Fresh milk
Milk marketing agents
Raw milk, Sour milk, packed processed milk

Figure 2: Milk marketing channels in the Dar es Salaam milk shed

4.2.3.6 Mode of transportation of milk products

In this study mode of transportation used by milk marketing agents was assessed in order to determine how the different marketing agents are linked to the other dairy value chain actors in the milk distribution process. Table 38 shows that, most (52.5%) of the sample marketing agents distributed milk by use of public transport. This is contrary to the findings by Mdoe and Mnenwa (2004) in their study on improving smallholder dairy systems in Kilimanjaro region where own and hired vehicle were found to be the commonly used transport modes among milk marketing agents. In the milk marketing node, milk marketing agent following consumer was more common than consumer following milk marketing agents.

Table 38: Mode of transport used by marketing agents

Variables	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Bicycle	10.0	10.0	32.5	12.5
Own vehicle	27.5	27.5	67.5	35.0
Public transport	62.5	62.5	0.0	52.5

4.2.3.7 Seasonality of milk sales

Figure 4.2 shows volumes of milk consumed at home and which was marketed during the wet and dry seasons. Apart from milk consumption at home which did not vary by season, milk sold varied with season. The seasonality influence was strongly noticeable for milk sold to processing plants, followed by milk sold to neighbors, and milk sold to local market, hotels, restaurants and institutions. Collection centers received a relatively stable supply of milk. Other outlets such as the neighborhood, local market, institutions and milk

processors faced variable milk supplies, with the wet season milk supplies being higher than the dry season supplies. This is partly due to higher availability of fodder in the wet than in the dry season. However, use of supplementary feeds and good husbandry in the dry season would likely increase milk production level to reduce the seasonal effect. In their study on smallholder dairying in the Kilimanjaro region, Mdoe and Wiggins, (1997) reported similar finding that, seasonality influence on milk supply is a result of variations in feeds availability.

Figure 3: Seasonality of milk sales by destination in the Dar es Salaam milk shed

According to the law of supply and demand, increased milk supply in the wet season would bring prices down. As can be seen from Table 39, milk prices are higher in the dry season than in the wet season. Notable from Table 39 milk retail prices in Tanga district are quite low compared to the other studied areas. The difference in prices is due to high supply of milk in Tanga than Morogoro and Dar es Salaam, hence more supply of milk. Dry season lasted from June to October while the wet season lasted from November to June.

Table 39: Seasonality of milk retail prices by location

Season	Average retail prices (Tshs)		
	Morogoro Urban	**Dar es Salaam**	**Tanga Urban**
Dry season	400	600	358
Wet season	350	500	280

4.2.3.8 Price determination

Table 40 shows that, majority (95.5%) of sampled milk producers in Morogoro district indicated setting their own prices for their milk. Sample milk producers and processors took into account production and processing costs in determination of price. In Morogoro district, 66.7% of processors indicated that milk prices were a product of negotiation between processors and buyers. In Tanga district, about 50% of the sample milk processors indicated that, prices were determined by market forces (supply and demand). In milk marketing, 91.3% of the sampled milk marketing agents indicated that they dictated prices of milk they sold. Similarly, majority (82.5%) of the sample milk consumers bought milk with prices determined by the sellers (Table 40). There were a few cases where by consumers negotiated with the seller in setting prices of milk. This might have occurred where the buyer was regular, reliable or bought larger volumes of milk.

Table 40: Price determination at different levels of the dairy value chain

Value chain levels	% Distribution by district					
	Price Determinant	Morogoro urban	Tanga urban	Kinondoni	Temeke	Ilala
Production	Seller	95.5	0.0	0.0	0.0	0.0
	Buyer	0.0	31.3	0.0	0.0	0.0
	Negotiated	4.5	68.8	0.0	0.0	0.0
Processing	Seller	33.3	25.0	50.0	50.0	0.0
	Negotiated	66.7	25.0	33.3	0.0	0.0
	Market forces	0.0	50.0	16.7	50.0	0.0
Marketing	Seller	0.0	0.0	100.0	100.0	91.3
	Negotiated	0.0	0.0	0.0	0.0	8.7
Consumption	Seller	0.0	0.0	65.4	100.0	82.5
	Negotiated	0.0	0.0	34.6	0.0	17.5

4.2.3.9 Forms of payment during milk buying

In any transaction, the ultimate event is to settle payment to achieve the possession utility through transfer of ownership. In doing so, transacting parties agree with each other on exchange terms. Table 41 indicates that, majority (54%), (90%), and (50%) of milk

processors, milk marketing agents and milk consumers paid cash when purchasing milk and milk products. Due to uncertainty regarding future payment, cash payment upon delivery of milk is one way of reducing risk against failure to pay.

Table 41: Forms of payment during milk buying

Payment mode	Processors, % n = 15	Traders, % n = 40	Consumers, % n = 30
Cash on delivery	54.0	90.0	50.0
Mid month payment	20.4	0.0	22.9
Monthly payment	25.6	10.0	27.1

4.2.3.10 Form of payment during milk selling

There are different forms of payment for milk, including cash payment and payments within a specified time period. Cash payment upon delivery was indicated by 95% of the sampled marketing agents (Table 42). It is also interesting to note that 24.1% of the sampled producers used credit form of payment by being paid at the end of the month. This implies the existence of mutual trust among milk producers and their customers. Most milk processors sold milk on credit and the buyers paid after a week or the middle of the month or at the end of the month. Only 20% of the milk processors were paid cash upon delivery.

Table 42: Form of payment during milk selling

Payment mode	Producers, % n = 40	Processors, % n = 15	Traders, % n = 40
Cash on delivery	62.0	20.0	95.0
Weekly payment	2.7	20.0	0.0
Mid month payment	11.2	40.0	0.0
End of Month payment	24.1	20.0	5.0

4.2.3.11 Barriers to entry into the milk market

In this study, respondents indicated that one of the barriers to entry in to the milk market especially in the milk processing node was the high level of investment costs. The findings

in Table 43 shows that, the sample milk processors' average investment costs was 50 075 000Tshs. Considering a per capita income of about 300 000 Tshs by the year 2006 for an average Tanzanian citizen (MLD, 2006), this is a high investment cost that is an indication of the need for a credit facility to producers. This large investment cost comprises costs of handling, cooling and processing facilities and most of which are imported. This finding explains the limited number of processing plants in the country. As observed by Stamer (2004), most small processors cannot afford cooling plants in milk producing areas. Low capacity to afford or purchase causes decrease in collection capacity, and as a result they concentrate on a few dairy products, which in turn affect dairy processing.

Milk marketing agents indicated that they require an average of 300 000Tshs as capital investment cost, which is the lowest, compared to the rest of value chain actors (Table 43). Relative to other potential actors, the entry to milk production and milk marketing capital requirement is not the limiting factor. With relatively low cost instruments, a small dairy producer or trader is able to enter the market. In large-scale production and marketing, however, high levels of investment are inevitable.

Table 43: Capital investment in Tshs by type of milk business

Business type	Minimum (in Tshs)	Mean (in Tshs)	Maximum (in Tshs)
(i) Producer	80 000	790 000	1 500 000
(ii) Processor	150 000	50 075 000	1 000 000 000
(iii) Marketing agent	100 000	200 000	300 000

4.2.3.12 Constraints to milk marketing

Table 44 summarizes constraints reported by sampled milk marketing agents. As can be seen from the table, the major constraints are; unreliable milk market, poor storage and

handling facilities, low quality local milk products and power rationing. Unreliable milk markets, poor milk storage facilities and milk handling facilities were identified as major constraints by 28.5% and 21.3% of respondents respectively (Table 44).

Table 44: Constraints to milk marketing

Constraints	% Distribution by district			Total (n=40)
	Kinondoni (n=14)	Ilala (n=23)	Temeke (n=3)	
Unreliable milk market	14.9	10.6	0.0	25.5
High running costs	2.1	6.4	0.0	8.5
Competition with imported milk products	2.1	0.0	0.0	2.1
Power rationing	6.4	8.5	2.1	17.0
Insufficient milk supply	2.1	4.3	0.0	6.4
Low quality of local milk products	8.5	10.6	0.0	19.1
Poor storage and handling facilities	6.4	10.6	4.3	21.3
Total	42.6	51.1	6.4	100.0

Other constraints indicated by sample milk consumers by order of importance include; high running costs, insufficient milk supply and competition with imported products. Constraints were more or less similar to those faced by the producers and processors and as reported by Mwijarubi (2007) who observed similar constraints in Dar es Salaam, Tanzania.

4.2.4 Milk consumption

4.2.4.1 Characteristics of sampled milk consumers

(i) Age distribution

Table 45 reveals that, most (36.7%) of the sampled milk consumers were young with age of below 30 years old. Kinondoni district had the highest proportion (50%) of sample consumers in that age group. The average age of the sample milk consumers

was 40 years with maximum and minimum ages of 78 and 25 years respectively (Table 45).

Table 45: Age distribution of sample milk consuming households

Variables	District			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Age (Years)				
Maximum	68	58	78	78
Minimum	25	28	26	25
Mean	38	46	40	40
Proportion % of respondent who are:				
Below 30 years old	50.0	25.0	28.6	36.7
30 to 45 years old	25.0	25.0	42.9	33.3
46 to 65 years old	16.7	50.0	21.4	23.3
Above 65 years old	8.3	0.0	7.1	6.7

(ii) Gender distribution

Table 46 shows that, most (60%) of the interviewed milk consumers were males with Kinondoni district having a high proportion of males. However the case was different for Temeke district where most (64.3%) of the sampled milk consumers were females. The dominance of males in milk consumption in Dar es Salaam region was also observed by Mdoe *et al.* (2000b).

Table 46: Gender distribution of sampled milk consuming households

Gender of respondents (%)	District			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Male	83.3	75.0	35.7	60.0
Female	16.7	25.0	64.3	40.0

(iii) Education level of sample milk consumers

Education level is one of the important pillars as far as human capital is concerned as it influences a person's ability to understand and create necessary strategies for avoiding and tackling poverty on a wider dimension (Boi, 2004). An assessment of the education level of interviewed milk consumers shows that, most (53.3%) of sample milk consumers had attained a post secondary education (Table 47). Post secondary education involved diploma to degree and above degree levels of education.

Table 47: Education level of sampled milk consumers

Education level	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Primary	0.0	0.0	42.9	20.0
Secondary	8.3	50.0	35.9	26.7
Post secondary	91.7	50.0	21.4	53.3

(iv) Household size

Table 48 shows household size distribution for sampled milk consumers. The table shows that, in the whole study area there was a minimum of five persons, an average of 6 people, and a maximum of 8 people per household respectively. It is noted that their household size is not as big compared to household sizes in rural areas where an average size may consists of 10 people. This may probably be because of the high costs of living in urban areas; hence it is not affordable to have a high size of household. Temeke and Ilala districts had the highest total average household sizes of 5 and 6 members respectively compared to Kinondoni district. It is shown in Table 48, for sampled milk consumers in Kinondoni district, the average number of people below 18 years of age in a household was 2, the minimum was 1 and maximum

number 4 while average number of people above 18 years of age were 3, the minimum was 3 and the maximum was 4 (Table 48).

Table 48: Household size and age distribution by location.

District	Age distribution	Members by age category		
		Average	Minimum	Maximum
Kinondoni, (n=12)	Below 18 years	2	1	4
	Above 18 years	3	3	4
	Total h/hold size	5	4	8
Ilala (n=4)	Below 18 years	3	2	4
	Above 18 years	3	3	3
	Total h/hold size	6	5	7
Temeke, (n=14)	Below 18 years	2	3	3
	Above 18 years	4	3	5
	Total h/hold size	6	6	8
All districts, (n=30)	Below 18 years	2	2	4
	Above 18 years	4	3	4
	Total h/hold size	6	5	8

(v) Occupational distribution

Most (56.7%) of the sampled milk consumers reported wage employment as their primary occupation (Table 49) with Kinondoni district having the highest proportion of respondents reporting wage employment as their primary occupation. On the other hand, most (53.3%) of the sampled milk consumers reported business to be their secondary occupation.

Table 49: Occupational distribution of sampled milk consumers

Occupation	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Primary occupation				
Wage employment	83.3	50.0	35.7	56.7
Business	16.7	50.0	64.3	43.3
Secondary occupation				
Wage employment	41.7	50.0	28.6	36.7
Dairy cattle keeping	8.3	0.0	17.1	6.7
Business	41.7	50.0	54.3	53.3
Crop production	8.3	0.0	0.0	3.3

4.2.4.2 Variation in household income

Income level is the bottom line of the consumer budget beyond which the consumer is limited to make any additional spending. Dairy products have high income elasticity of demand hence their consumption is generally affected by the levels of consumers' income (Mbogoh, 1995). Most (53.3%) of the interviewed milk consumers earned monthly income of between 100 000Tshs and 500 000Tshs with Kinondoni district highest proportion of sample milk consumers earning income falling in that range (Table 50).

Table 50: Income level of sampled milk consumers

Average monthly income (TAS)	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Less than 100 000TAS	8.3	25.0	35.7	23.3
Between 100 000 – 500 000TAS	58.3	50.0	50.0	53.3
More than 500 000TAS	33.3	25.0	14.3	23.3

Table 50 further shows that, most (33.3%) and (25%) of the sampled milk consumers in Kinondoni and Ilala districts respectively earned an income of more than 500 000Tshs. Overall, sample milk consumers from Kinondoni district had the highest levels of income

followed by Ilala then Temeke districts. These results suggest that, milk consumers especially in Kinondoni and Ilala districts were people of an average income level.

4.2.4.3 Consumption of milk and milk products

(i) Frequency of milk consumption

An attempt was made to assess frequency of milk consumption of interviewed respondents. Results in Table 51 show that, 46.7% of the sampled milk consumers consumed milk only three times a week, followed by 23.3% of the sampled milk consumers who drank milk once everyday. The average amount of milk consumed per day is shown in Table 53. However, as a proxy indicator of consumption pattern, respondents were requested to indicate who in the household consumed milk. The results show that, most (43.3%) of these consumers were below 18 years of age. In a few cases, milk was consumed in a household when there was a sick person or there was a guest. This may be associated with the lack of drinking milk culture among most people; as a result milk was consumed only when necessary.

Table 51: Frequency of milk consumption

Variables	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Frequency of milk consumption				
Once daily	33.3	25.0	14.3	23.3
Average of three times weekly	58.3	50.0	35.7	46.7
Average of five times monthly	8.3	25.0	14.3	13.3
Do not recall	0.0	0.0	35.7	16.7
Milk consumption pattern				
Below 18 years	55.0	40.0	30.0	43.3
Above 18 years	45.0	35.0	20.0	30.0
The sick	0.0	0.0	35.7	16.7
Guest/ special occasion	0.0	25.0	14.3	10.0

(ii) Variation in type of milk products consumed

Table 52 shows that, most (48.3%) of the sampled milk consumers consumed packed processed milk with Temeke district having a high proportion of consumers consuming these types of milk products. On the other hand, Kinondoni had most of the sampled consumers consuming raw milk while Ilala district had most of its sample consumers consuming naturally fermented milk.

Table 52: Types of milk and milk products consumed

Variables	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Type of milk products				
Raw milk	54.3	9.1	36.4	37.9
Processed unpacked milk	100.0	0.0	0.0	13.8
Packed processed milk	23.5	17.6	58.8	48.3

(iii) Variation in type and quantity of milk products consumed

As Mutagwaba (2005) observed, most people in Tanzania do not have a milk drinking habit. Table 53 shows that; consumption of milk by sampled consumers was not more than 2 liters of liquid milk equivalent per day for the different types of milk products in the study area. In every district of the study area, sampled milk consumers indicated that they consumed at least half a liter of raw milk per day.

Table 53: Type and quantity of milk and milk products consumed

District	Milk products	Average quantity of milk consumed (in liters/day)		
		Average	Minimum	Maximum
Kinondoni, (n=12)	Raw fresh milk	1.0	0.5	2.0
	Packed processed milk	0.5	0.5	0.5
	Yogurt	1.0	1.0	1.0
Ilala, (n=4)	Raw fresh milk	2.0	1.0	2.0
	Yogurt	1.0	1.0	1.0
Temeke, (n=14)	Raw fresh milk	1.0	0.5	2.0
	Packed processed milk	1.0	0.5	1.0

(iv) Variation in consumption of milk and milk products between income groups

Variation in consumption of milk products between income groups is shown in Table 54. The table shows that, consumers who obtained an income of less than 100 000Tshs per month consumed a minimum of quarter a liter, an average of 1 liter and a maximum of 2 liters of raw milk per day. Similarly, consumers who obtained an income of between 100 000Tshs and 500 000Tshs per month consumed the same levels of quantities of milk per day per household. However, the situation was slightly different for sampled consumers who obtained an income of above 500 000Tshs per month; the table shows that they consumed a minimum of half a liter of raw milk, an average of 1 liter and a maximum of 2 liters per day per household. Packed pasteurized milk, powder milk and yogurt were other milk products consumed by sample consumers who had an income of between 100 000Tshs per month and 500 000Tshs per month and above 500 000Tshs per month (Table 54).

Table 54: Variation in consumption of milk products between income groups per household

Income group (in Tshs)	Milk products	Quantity of milk consumed (in liters/day)		
		Average	Minimum	Maximum
Less than 100 000/=	Raw milk	1.00	0.25	2.00
	Packed pasteurized milk	0.50	0.50	1.00
Between 100 000/= and 500 000/=	Raw milk	1.00	0.25	2.00
	Yogurt	0.50	0.50	1.00
	Packed pasteurized milk	0.50	0.50	0.50
	Powder milk	0.25	0.25	0.50
Above 500 000/=	Raw milk	1.00	0.50	2.00
	Yogurt	1.00	1.00	1.00
	Packed pasteurized milk	0.50	0.50	0.50

From the results in the table, it is implicated that, milk consumption had a very slight dependence on income levels hence low milk consumption in some cases may not only be due to low income levels but also the lack of milk drinking habit or culture among people in Tanzania. For all income groups of the interviewed consumers, people who had income of above 500 000Tshs per month consumed a slightly higher amount of milk per day per household compared to other consumers who had an income of below that range (Table 54). From these observed patterns, it is evident that, milk consumption increases as income increases.

(v) Milk consumption and household characteristics

Table 55 shows the correlation coefficients between consumers' household characteristics including income level, household size, and number of children in a household, age, education level and quantity of milk consumption. The table shows that, household size and age of household members had negative correlation with the quantity of milk consumed. This means that, as household size and age of household members increased the quantity of milk consumed decreased. On the other hand, the table shows that, income level, number of children in a household and education level had a positive correlation with quantity of milk consumed. This implies that, as income level, number of children in a household and education level increased, the quantity of milk consumed also increased. Similarly when the later variables decreased in size or level, the quantity of milk consumed also decreased. As reported by Mdoe and Wiggins (1996), income is one of the most influential factors affecting household milk consumption.

Table 55: Milk consumption and household characteristics

Variables	Correlation coefficients, (df =18)
Income level	0.427
Household size	-0.182
Number of children	0.297
Age	-0.161
Education level	0.212

4.2.4.4 Preferred dairy products for consumption

Consumer preferences and culture shape the consumer behavior, which in turn affects the consumption decisions (Mbogoh, 1995). Table 56 shows that, most (58.6%) of the sampled milk consumers preferred consumption of imported processed milk with Ilala and Temeke district having a high proportion of sample consumers preferring imported milk products (Table 56).

The preference of imported processed milk may be associated with its quality standard, which is perceived to be higher than locally processed milk products. A study by UNDP/BCS/TetraPak (2006) observed that, consumer preferences in Tanzania are dictated by prices as a result consumers tend to avoid purchasing processed products, which are relatively expensive. About 37.9% of the sample milk consumers preferred consuming unprocessed raw milk (Table 56). A similar finding was reported by Henriksen (1996), who observed that; unprocessed raw milk is highly consumed by people of all income levels.

Table 56: Preferred dairy products for consumption

Variables	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Most preferred dairy products				
Raw milk	54.5	25.0	28.6	37.9
Locally processed milk	9.1	0.0	0.0	3.5
Imported processed milk	36.4	75.0	71.4	58.6
Preferred but unaffordable dairy products				
Canned milk	22.2	0.0	27.3	22.8
Powdered milk	33.3	75.0	18.2	34.3
Processed milk products	44.6	25.0	49.1	38.0
Ice cream	0.0	0.0	9.0	4.9
Preferred but unavailable dairy products				
Ghee	0.0	0.0	25.0	14.3
Cheese	0.0	50.0	50.0	42.9
Butter	100.0	0.0	0.0	14.3
Fermented packed milk	0.0	0.0	25.0	14.2
Yogurt	0.0	50.0	0.0	14.3

Due to low income levels of some milk consumers, other milk products are considered expensive. When asked to indicate products preferred but cannot be afforded, majority (34.3%) of respondents indicated preference of powdered milk. Processed milk products were perceived to be unaffordable by 38% of respondents, with Temeke having higher proportion (49.1%) of respondents preferring processed milk products but perceived them as unaffordable. Apart from affordability, respondents were asked to indicate dairy products, which they preferred but were not readily available. Most (43%) reported cheese as a preferred product but not available (Table 56). Despite the ongoing efforts done to improve milk drinking culture for instance the Milk promotion week done every June in Tanzania which promotes milk consumption; milk drinking culture is still very low or lacking. This is similar to findings by Ryoba (2006) who reported that, Tanzanians do not have a culture of consuming cheese.

4.2.4.5 Means of transporting dairy products by sample consumers

Table 57 shows that, most (84.2%) of the sampled milk consumers traveled on foot to go and purchase milk with all consumers in Ilala district having used this mode of transport. This was probably because milk was available at the nearby areas. Very few (15.8%) consumers transported milk by using own vehicles with Temeke district having the largest proportion of sampled consumers using this mode of transport. Means of transportation for milk consumers was done mostly through consumers following the sellers.

Table 57: Mode of transportation in milk consumption

Mod e of transport	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Own vehicle	14.3	0.0	22.2	15.8
On foot	85.7	100.0	77.8	84.2

4.2.4.6 Milk handling, preservation and quality control methods

Table 58 shows that, about 60% of the sample consumers handled milk by use of plastic utensils with Temeke district having a higher proportion of sample consumers handling milk by using this type of utensil. The table shows that, most (60%) of sample milk consumers preserved their milk in refrigerators. Apart from milk preservation methods mentioned in Table 58, shelf life of milk can also be extended by adding value to it. Half of the sample milk consumers reported to add value to purchased milk through use of starter culture and natural fermentation. Only the locally processed milk products had TBS labels; however the homemade milk products did not follow any formal standards for quality assurance.

Table 58: Handling, preservation and milk processing methods by sample milk consumers

Variables	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Milk handling equipments				
Plastic	58.3	50.0	64.3	60.0
Aluminum	25.0	50.0	21.4	26.7
Stainless steel	16.7	0.0	14.3	13.3
Milk preservation methods				
Refrigerating	80.0	75.0	42.9	60.0
Processing	0.0	0.0	28.5	13.3
Boiling	20.0	25.0	28.6	26.7
Milk value addition				
Value adding practice	50.0	100.0	35.7	50.0
No value adding practice	50.0	0.0	64.3	50.0
Milk value adding methods				
Use of culture	50.0	50.0	0.0	35.7
Natural fermentation	50.0	50.0	100.0	64.3
Boiling of milk before consumption				
Boiling	91.7	100.0	92.9	93.3
Not boiling	8.3	0.0	7.1	6.7
Quality control methods				
Visual observation/ tasting	70.0	100.0	50.0	85.0
No quality check	30.0	0.0	50.0	32.0

Although consumers reported natural fermentation as one method of adding value to milk, it is really not a safe way of adding value to milk. This method was performed by 64.3% of the sample milk consumers. Before consuming milk, it is very important to know the quality of milk so as to assure safety and hygiene. Table 58 shows that, most (85%) of the sampled milk consumers used visual method or tasting to assess milk quality. On the other hand, about 15% of the sampled consumers did not perform any quality check. Boiling of milk before consuming or preserving it is very important as it kills harmful organisms. Fortunately, most (93.3%) of the sample milk consumers reported that they boiled milk before drinking it.

4.2.4.7 Factors constraining milk consumption

In addition to the household characteristics that influence milk consumption, this section discusses factors constraining milk consumption as perceived by the respondent. Table 59 shows that, most (36.5%) of the sampled consumers' perceived low quality of milk products as the major factor constraining milk consumption. Other factors reported in their order of importance are low purchasing power, poor milk storage and handling facilities, lack of milk drinking habit and insufficient milk supply. Lack of milk drinking habit among many consumers may suggest; lack of knowledge and information about the importance of milk to human health or inability to afford milk as well as culture and attitude of a person. Sampled milk consumers in Ilala and Temeke districts were mainly constrained by low purchasing power. On the other hand, sampled milk consumers in Kinondoni and Temeke districts mostly complained about low quality of milk products.

Table 59: Factors constraining milk consumption

Constraints	% Distribution by district			Total (n=30)
	Kinondoni (n=12)	Ilala (n=4)	Temeke (n=14)	
Insufficient milk supply	4.8	0.0	0.0	1.9
Low quality of milk products	42.9	25.0	34.8	36.5
Lack of milk drinking habit	4.8	25.0	17.4	13.5
Poor storage and handling facilities	19.0	12.5	8.7	13.5
Low purchasing power	28.6	37.5	39.1	34.6

One of the most reported constraints was low quality and lack of varieties in the locally processed milk products compared to the imported milk products. As a result consumers do not have a wide variety of milk products to choose from.

4.3 Analysis of prices, margins and market power

4.3.1 Milk prices at various nodes along the dairy value chain

The prices of milk at different nodes along the chain in the wet and dry seasons are presented in Table 60. The table shows that, prices of milk varied between value chain nodes and between seasons as indicated in Table 60. Selling prices were higher at the processing level followed by marketing then production levels. However, at the production level, sampled respondents did not purchase milk because they are the ones who produced and sold milk. Irrespective of the dairy chain node the prices were higher during the dry season than during wet season.

Prices at the processing and marketing levels were higher than at the production stage as value is added to milk gradually as milk moved from initial stage of production while the higher prices of milk at the processor's node are partly due to costs associated with value addition through processing. The higher prices of milk in the dry season than in the wet season was due to scarcity of milk in the dry season.

Table 60: Milk prices obtained at different nodes along the dairy value chain by season

Season	Value chain node, n = 95	Selling prices of milk (Tshs/liter)			Buying prices of milk (Tshs/liter)		
		Aver.	Min.	Max.	Aver.	Min.	Max.
Wet season	Production	350	300	400	0	0	0
	Processing	850	700	1000	350	300	400
	Marketing	600	400	800	400	400	500
Dry season	Production	400	350	500	0	0.0	0
	Processing	900	800	1000	355	300	450
	Marketing	700	600	800	500	400	600

4.3.1.1 Marketing margins realized by value chain actors

The procedure of computing the total marketing margins and gross marketing margin is presented in section 3.4.2. The results in Table 61 show that, both total marketing margin and gross marketing margin were higher in the dry season than in the wet season except for the gross marketing margins obtained by marketing agents. This is because during the dry season, the supply of milk was low compared to the wet season when fodder was readily available than in the dry season.

Table 61: Marketing margins at different nodes along the dairy vale chain by season

Season	Value chain Actors, n = 95	Total Marketing Margin, %	Gross Marketing Margin, %
Wet season	Producer	46.2	56.4
	Processor	-	73.8
	Marketing agent	-	66.6
Dry season	Producer	50.0	62.8
	Processor	-	80.0
	Marketing agent	-	66.6

Irrespective of season, milk processors had the highest gross marketing margins of 73.8% and 80% for the wet and dry seasons respectively. Milk producers had the lowest gross marketing margin, amounting to 56.4% and 62.8% in the wet and dry seasons respectively (Table 61). The marketing margin for marketing agents of 66.6% did not vary with season. Mdoe *et al.* (2000a) reported a similar finding concerning the similarity of milk prices in the dry and wet seasons for retailers of various milk products in Dar es Salaam and Mwanza. The lack of variation for marketing margins by season is associated with the competitive nature of the milk market. Following market liberalization, varieties of milk products exist in the market, most of which are imported. As a result of this, it is rather

difficult for the market agent to raise prices depending on season since there are other milk products in the market of lower price and better quality and standard.

4.3.1.2 Profit margins realized by value chain actors

Table 62 presents annual profit margins obtained by milk producers, processors and traders. Milk processors realized the highest average profit margins of 7 579 188 Tshs per year, which is almost seven times the profit obtained by milk producers and three times the profit obtained by market agents (Table 62). The high level of profit to processors is due to packaging and increased shelf life of the milk products. Despite the additional costs the products fetched higher prices.

Table 62: Annual profit margins (in, 000 Tshs) obtained by value chain actors

Value chain actors	Per year		Profit margins per year			
	Aver. Total revenues	Aver. Total costs	Average	Min.	Max.	Per liter of liquid Milk equivalent
Producers	15 989.9	7 009.8	1 880.7	-51.3	7 574.0	0.135
Processors	74 040.0	52 240.0	7 579.2	-723.3	114 411.1	0.853
Market agents	11 268.0	9 400.0	2 626.4	-394.8	14 454.0	0.383

The high level of profits for milk marketing agents was contributed by the fact that, some of retailers in the study area; especially in Dar es Salaam region sold processed and packaged products that required little if any investment at all. Some of the investment was contributed by some of the dairy processing companies such as Tanga Fresh and Azania fresh. These companies gave them refrigerators as credit with a condition of selling their dairy products for the companies. As a result, this contributed to the amount of initial investment one had to incur. Likewise, profits obtained per liter were highest for milk processors compared to milk producers and market agents. The low profit obtained by

producers compared to other actors was largely attributed to minimum level of value addition since producers tend to sell raw milk.

4.3.2 The degree of concentration of actors at different stages of the dairy value chain

As pointed out in section 3.4.2.1, concentration ratio is the measure of market power. The greater the degree of concentration, the greater is the possibility of non-competitive behavior. Table 63 shows the concentration ratios for the actors along the dairy value chain in the study area.

Table 63: Concentration ratio of actors at different levels along the value chain

Actor	Concentration ratio %	
	Wet season	Dry season
Producers	68.27	58.82
Processors	81.32	81.32
Marketing agent	60.83	60.83

As can be seen from the table, the degree of concentration differs among value chain actors with processors having the highest concentration ratio. The concentration ratios for processors and marketing agents did not vary with season. The degree of concentration for dairy producers was higher (68.27%) in the wet season than in the dry season (58.82%). This implies that, there is high market competition for milk in the dry season compared to the wet season. This may be associated with low supply of milk in the dry season, which occurs because of low fodder availability. The degree of concentration for the processors and marketing agents did not differ with season. This is possibly because they were few in number. During the dry season they collected milk from more producers than they did in the wet season, so as to compensate the needed amount for sale. The degree of concentration for market agents was 20% less than that of processors, suggesting that,

there is more competition among market agents compared to processors. This may be a result of the quality of service the market agents offer to their customers. Another reason observed is that of adulteration of milk. For example some consumers indicated that, some market agents were adding water to milk. As a result of differences in milk quality, competition among traders arises. Even though there is more competition among traders than processors, the results show that, there is generally low competition in the milk processing and marketing sectors. This finding may be explained by the absence of product differentiation in the local market. For instance the product quality, variety of products and the kind of packaging is similar among the processing industries that exist in the country.

4.4 Organization and coordination of the Value chain

4.4.1 Milk institutions and organizations

The institutional environment as understood in New Institutional Economics (NIE) refers to the rules of the game as these affect behavior and performance of economic actors and in which organizational forms and transactions are embedded (Kherellah and Kirsten, 2001). In the dairy sub sector organizations such as Tanzania Milk Processors Association (TAMPA) and Tanzania Milk Producers Association (TAMPRODA) are private sector associations formed by actors along the chain with the aim of having collective actions. Discussions with TAMPRODA and TAMPA officials during the PRA indicate that; there is generally weak linkage between the direct and indirect actors of the value chain hence poor organization and coordination of the dairy value chain activities. With the exception of TAMPRODA and TAMPA that coordinate dairy producers and milk processors

respectively; there was a total lack of support from service providers such as the financial institutions, extension services and the government itself.

Despite the involvement of TAMPRODA and TAMPA to promote collective action, it was observed during discussions with actors in the value chain that, there is generally low knowledge of these milk organizations by the value chain actors. Furthermore, groups of actors associated with TAMPRODA and TAMPA were few or lacking in a number of regions. This was more common in Morogoro where TAMPRODA groups are only slightly active and in Dar es Salaam where only few recognized TAMPA. Table 64 shows that 35% and 73.3% of the sampled producers and sampled processors respectively were members of TAMPRODA and TAMPA respectively. In Tanga district, dairy producers have formed an organization known as UWATA, which is not related to TAMPRODA (Table 63). About 25% of the sample producers in Tanga district were members of UWATA. On the other hand, it was found that, a large proportion (86.7%) of the sample market agents were also members of TAMPA. Even though the organizations in the dairy sector have not come out strongly in terms of their contribution to the dairy value chain and dairy sector development, there are some few services, which are recognized as performed by these organizations. These services are as shown in Table 65. These services are the ones, which were common in all the visited organizations, that is TAMPA, TAMPRODA and UWATA.

Table 64: Membership to milk organizations

Membership to TAMPA, TAMPRODA and UWATA	Producers, % n= 40	Processors, % n= 15	Market agents, % n= 40
TAMPRODA	35.0	16.7	13.3
TAMPA	0.0	73.3	86.7
UWATA	25.0	10.0	0.0

Services provided to value chain actors by producers and processors associations included training, provision of information, contracting and product promotion. The contractual arrangements supervised by the organizations between milk producers in collection centers and milk processors benefited them by providing assistance in networking and access to milk markets. However, it was observed that, the value chain actors have not improved much in terms of performance as a result of formation of these milk organizations.

Table 65: Services performed by milk organizations along the value chain

Types of service by TAMPA/ TAMPRODA/ UWATA	Producers associations %	Processors associations %
Training	16.7	25.0
Information provision	4.2	37.5
Contract enforcement	66.7	0.0
Promotion	0.0	12.5
None	12.5	12.5

4.4.2 Coordination in the dairy value chain

Vertical coordination describes the different ways in which vertical stages of production, processing and marketing may be related to each other. Some of the alternative forms of coordination are market/price system, vertical integration and contracting. Contracting was the only form of coordination observed in the dairy value chain in the Dar es Salaam milk shed. Overall the contractual arrangements were weak as almost all contracts reported by the interviewed actors were verbal or written without lawyer assistance (Table 66).

Table 66: Contractual arrangements in milk buying and selling

Contractual agreements	Producers, % n = 40	Processors, % n = 15	Traders, % n = 40	Consumers, % n = 30
Verbal contract	54.1	55.6	50.0	77.8
Written without lawyer assistance	45.9	44.4	50.0	22.2

As can be seen from Table 66, most (54.1%) of sample milk producers, about 55.6% of sampled milk processors, a total 50% of sample milk marketing agents and 77.8% of sampled milk consumers, made verbal contractual arrangements. More over verbal contracts were the predominant type of contracts used by most value chain actors, during buying and selling of milk. On the other hand, Table 65 shows that, 45.9%, 44.4%, 50% and 22.2% of the milk producers, processors, market agents and consumers used written contracts without lawyer assistance. Similar observation were made by Omore *et al*. (2004) in their study on milk marketing that, most contractual arrangements by milk marketing agents in Tanzania are verbal or informally written. Such contractual arrangements are based on mutual understanding as none of the actors enter into written contract with lawyer assistance. This implies the existence of weak exchange behavior with high risk of failure. The likelihood of failure would limit the trading scope, as the value chain actors will be dealing only with people they know well and trust.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

The main objective of the study was to analyze the dairy value chain in the Dar es Salaam milk shed in order to provide information for improving linkages between actors and efficiency of the value chain. Moreover the study intended to achieve the following specific objectives; (i) to characterize the dairy value chain from production to consumption, (ii) to examine how the chain was organized, coordinated and functioning including linkages between the key actors along the value chain, (iii) to determine prices and margins obtained by actors at various nodes of the dairy value chain and, (iv) to identify the constraints facing actors along the dairy value chain and suggest interventions for the improvement of both linkages and efficiency of the dairy value chain. Both secondary and primary data were collected for the study. Secondary data were collected from Ministry of Agriculture, Food Security and Cooperatives and Ministry of Livestock while primary data were collected using PRA methods and questionnaire survey of 125 respondents including producers, processors, market agents and consumers. This chapter presents the conclusions and recommendations emerging from the major findings of the study.

5.1 Conclusions

5.1.1 Characteristics of the dairy value chain.

Overall the dairy value chain in Dar es Salaam milk shed was characterized by little value adding activities except for the milk processors who processed limited types of milk products. Specifically, the following were found to be the major characteristics of the dairy value chain in the Dar es Salaam milk shed;

(i) Small scale of operations at all stages of the value chain with dairy producers keeping small dairy herds, processors operating under capacity and marketing agents handling small quantities of dairy products.

(ii) Little value addition through processing, which was found to be largely informal and underdeveloped formal processing of milk practiced by few medium scale processors who processed a narrow range of products.

(iii) Poor quality control system, poor handling facilities and poor preservation of the milk products. With the exception of formal processing, most producers, marketing agents and informal milk processors handled milk and milk products using plastic containers, which are prone to bacterial contamination.

(iv) Seasonality of milk supply with high supply in the wet season and low supply in the dry season due to variation in fodder supply.

5.1.2 Organization and coordination of the dairy value chain

Several actors contribute to the coordination and organization of the value chain through governance, either directly or indirectly. Milk producers and processors were more strongly organized and coordinated than milk marketing agents and consumers. The strength of the these organization was recognized through establishment of local associations in Morogoro, Tanga and Dar es Salaam while the consumers and milk marketing agents did not have any organization. The established organizations for milk producers were also used as collection centers where the milk producers sold their milk. The apex organizations for producers and processors are TAMPRODA with its headquarters in Morogoro, TAMPA with headquarters in Dar es Salaam and UWATA in Tanga. By being members to these organizations, they were well informed about the dairy sector, trained by milk

organizations' officials about milk production, processing and marketing activities as well as linked to milk markets. However it should be noted that, these organizations are at the national level, the only organization at the regional level was UWATA from Tanga and there were no organizations established at the village level. On the other hand, a high rate of non-competitive behavior in milk processing resulted in more market power among the milk processors in terms of control of milk prices and quantities of milk passing along the chain. In view of this, it can be concluded that, this was a buyer driven chain since milk processors who are also milk buyers were the ones in control of the dairy value chain.

5.1.3 Prices and margins obtained by actors along the value chain

The findings of the study indicate that, prices and margins differed among value chain actors with milk processors obtaining higher prices and profit margins per liter of milk sold. Despite high costs associated with processing, prices and margins were higher in the dry season than in the wet season. Irrespective of season, milk prices increased down stream as value was being added to milk. This provides evidence that, value addition especially through processing is an effective means of generating higher profits. However, opportunities for value addition in the dairy value chain were constrained by high operating costs of processing and seasonal price hence profit margin variations. Value addition is also beneficial to milk consumers as it provides a variety of milk products. Increased choice of products among consumers or convexity in consumer behavior as termed in economic theory is a challenge to suppliers of such differentiated products. This finding emphasizes the importance of value addition through milk processing for income generation and also for provision variety of milk products for the benefit of consumers.

5.1.4 Major constraints facing actors along the dairy value chain

Overall the following were found to be the major constraints as perceived by the actors interviewed:

(i) High investment and operational costs

This constraint faced almost all the actors in dairy value chain. High investment and operational costs were associated with purchased dairy inputs such as purchased feeds and veterinary drugs, processing machines, expensiveness of storage, handling and transportation facilities. The expensiveness of the facilities limited new entrants to the dairy value chain especially milk processing; hence narrowing chances for the dairy sector growth.

(ii) Low quality standards of milk and milk products

Due to poor methods used for quality control and equipment used to handle milk and milk products, milk and milk products had very low quality. Plastic containers were the common equipment used to handle milk along the dairy value chain while visualization and testing were the commonly used methods for quality control. It is partly for this reason that most consumers preferred imported milk and milk products regardless of their high prices.

(iii) Regulatory aspects of the chain

Performance of the dairy sub sector is on the other hand constrained by aspects associated with taxation and policy regulations. Milk processors and marketing agents had a large number of taxes payment obligations that in turn increased their operating costs. Even though taxes on packaging material have been removed, these dairy value

chain actors still pay several types of other taxes such as taxes on imported dairying inputs. On the other hand, low levels of hygiene and safety in milk production, handling and distribution is much associated with none existence of clear hygiene and drug policies especially for milk producers, vendors and hawkers where poor levels of hygiene and safety was observed. Other regulatory constraints reported include few actor associations and milk collection centers. Lack of associations and milk collection centers contributed to lack of institutional support in form of extension services for the value chain actors and insufficient milk supply. This was so due to weak organization and coordination in collecting milk, which eventually limited processing capacity.

(iv) Supply and demand constraints

Due to insufficient milk supply and low consumption of milk and milk products, markets for milk and milk products were found to be unreliable. This situation became worse during the dry season when there was shortage of both processed and unprocessed milk. The shortage of locally produced and processed milk created room for the consumers to rely on imported milk products. Insufficient milk supply in turn leads to underdevelopment of local milk marketing. On the other hand, low milk consumption was highly due to the fact that, in some households, milk is not a regular diet.

(v) Low prices of milk

Due to the poor quality standards of milk and milk products sold by milk producers, processors and marketing agents, milk fetched very low prices at different nodes of the chain, but particularly more so at the production stage. The poor quality standards were

mostly contributed by several factors including lack of improved cattle breeds for milk producers, low availability of processing machinery for milk processors, and in few cases unreliable and low qualified labor power.

(vi)Low purchasing power

Low consumption of milk and milk products was to a large extent contributed by low purchasing power of consumers. Apart from other constraints such as low quality, lack of milk drinking habit, and low milk supply; income level was also a major determinant of milk consumption. Income levels had a positive correlation with the quantity of milk consumed; implying that more milk was consumed when consumers had higher levels of income. On the other hand, consumers with low levels of purchasing power could only afford to purchase raw milk and not other kinds of milk products.

5.2 Recommendations

Based on the findings of this study, the following are recommendations directed towards improving the performance of the country's dairy sub sector:

5.2.1 Strengthening and promoting groups of actors in the dairy value chain

Despite the existence of organizations such as TAMPA and TAMPRODA, the actors in the dairy value chain in the Dar es Salaam milk shed were generally poorly organized especially in rural areas where groups of actors such as dairy producers, processors and traders were weak or absent. Based on this finding therefore, there is certainly a need to strengthen dairy producers, milk processors and traders groups where they exist. Where such groups are absent, efforts should be made to promote their establishment. This can be

achieved through making sure that the different activities along the chain are integrated with one another. This integration can be realized if deliberate efforts are made to have a well coordinated information flow, targeted training of actors including consumers. The establishment of a well coordinated and organized dairy value chain will bring development in the dairy sector as well as increase income and provide employment. A variety of approaches are possible and it would be important to explore and introduce potential interventions such as formation of cooperatives and marketing groups. Such kind of associations and groups are usually influential in provision of information and influencing price formation. They will also provide a forum for training, networking, and organized marketing.

5.2.2 Improving coordination and linkages

Coordination and linkages along the dairy value chain were found to be weak. The only form of vertical coordination observed was contracting where by contracting agreements were also weak. Almost all contracts were verbal or written without legal procedures. Efforts should be made by TAMPRODA and TAMPA to link producers with processors and marketing agents especially in remote areas. This should go hand in hand with assisting producers to enter in to formal or legal contracts with the buyers of their milk.

5.2.3 Improvement of milk pricing behaviors

As anticipated, milk and milk products fetched different milk prices along the chain. For instance, at the production level milk was sold at an average price of 350Tshs per liter, at the marketing level milk fetched the average price of 600Tshs per liter while at the processing level milk was sold at an average price of 900Tshs per liter. It is evident that

after value addition, milk fetched higher prices and margins. In this respect, milk value addition, together with promotion of milk drinking habit and stability in prices would contribute to boosting up the milk market in the country hence improve the dairy sub sector.

However there was inconsistency between the milk producers who insisted that milk prices are too low to enable them to make any profit, and the milk consumers who claimed milk products were very expensive for them to afford for everyday use. This may be due to low level income of majority of people in Tanzania; hence it is hard for people to afford processed milk let alone unprocessed milk, which are of lesser price. In order to improve prices received by producers and at the same time make them affordable to consumers, better and affordable cattle management practices have to be instituted. These practices may include trainings to producers and processors on how to produce high quality milk products by using just natural and inexpensive methods as well as to organize themselves in groups so as to have more power when setting prices for their products.

5.2.4 Promoting value addition through processing and improving packaging

Although value addition was found to have a significant influence on profitability in milk business as evidenced in the milk processing stage, there was generally little value addition along the dairy value chain. This finding calls for appropriate policy interventions to promote value addition through processing and packaging of dairy products. The best strategy to achieve this is to currently promote both small scale processing and large scale processing. Small scale processing should be promoted in rural areas with few dairy cattle and where access to urban markets is limited. This requires training and dissemination of low cost methods of pasteurizing milk and processing in to other milk products, importing

knowledge and skills on how to process different dairy products. Large scale processing should be promoted in strategic locations where there is high concentration of dairy cattle. Tax reduction among potential processors to investment is the best way of promoting large scale processing. Promoting of processing should be accompanied with promoting proper presentation and packaging of various processed products so that they can compete effectively with imported dairy products in niche markets such as supermarkets and tourist hotels.

5.2.5 Establishment of milk collection and cooling centers

The study findings showed that, in places where there existed collection centers; market access was not a problem for milk producers. This suggests that milk collection centers are a reliable outlet for milk from producers, relatively easy source of raw milk for processors and traders as milk collected from farmers can be bulked, stored and cooled. However, the establishment of such centers requires high capital investment for storage, testing and handling facilities. They also require high-specialized skills for management, appropriate coordination and organization. It is recommended that the TDB should promote establishment of milk cooling centers to be managed by dairy producer groups under TAMPRODA. These should be established and operated in partnership with private milk processors. Leaders of the farmer groups as well as potential operators of the collection centers should be trained on quality and hygienic handling of milk as well as management skills.

5.2.6 Improving hygiene and quality of milk products

Results of the study have shown that most of the chain actors were using plastic containers to handle milk. In addition, milk quality control was found to be poor. This calls for efforts to improve hygiene and quality control system along the dairy value chain. This could be achieved through the following; (i) promoting use of metal containers like aluminum cans among actors in the value chain for storing and transporting milk. This should go hand in hand with supporting Small Industries Development Organization (SIDO) to fabricate the containers, (ii) Importing knowledge and skills in quality control including testing of raw milk and handling of milk and milk products. This can be achieved through training and use of brochures and leaflets and, (iii) improving milk preservation methods through dissemination of low cost cooling techniques such as charcoal coolers for milk processed by small scale processors in rural areas.

5.2.7 Improvement of infrastructure and transportation services

Value addition through processing was found to be a means of generating higher profits. Processing of milk however was partly constrained by high operating costs resulting from high transportation costs due to poor road networks and transportation systems. Improvement in infrastructure and services is an important factor for integration of value chain activities. Improved conditions of infrastructure will in one way or another enhance implementation of the strategies for the improvement of the dairy sub sector. Improvement in infrastructure and transportation services should particularly be emphasized by the government towards; improved public transport systems and good road networks. In certain cases there is a need to target improvement of infrastructure to areas of high potential for milk business.

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APPENDICES

Appendix 1: Checklist for participatory rapid appraisal.

Checklist for PRA

1. Main occupation of respondents
2. How many are registered in any association? And for how long? What benefits do you get from the association?
3. How are they connected with other actors in the chain?
4. What constraints and opportunities do they face? And what have they done so far about the constraints?
5. What are your views on value chain of milk?

PRA for Producers; Description on;

- Seasonality and level of milk marketed in production
- Their main outlet of the milk
- What kind of costs do they incur in terms of transaction, reliability, and price of milk
- Do they have any contractual arrangements with the buyers/processors/traders?

PRA for Processors/ Traders; Description on;

- Seasonality of dairy products sale and procurement, and price of the product
- Main sources of milk
- Marketing techniques
- Sources of variation in milk quality
- Do they have any contractual arrangements with the buyers and producers?

PRA for Consumers; Description on;

- Seasonal patterns of consumption, price, preferences,
- Main market sources and reason for their use,
- Constraints to availability and unmet demand.

Appendix 2: Survey Questionnaire for milk value chain actors in the Dar es Salaam milk shed in Tanzania.

SECTION A. GENERAL INFORMATION

1. Name of respondent……

2. Date of Interview……

3. Village/ Street…… 4. Ward……..

5. District……

6. Region…..……

7. Age of Respondent……..

8. Sex of Respondent, (a) Male…….. (b) Female…….

9. Marital Status of respondent (a) Single…… (b) Married……..(c) Divorced… (d) Widowed…….. (e) Others (Specify)……

10. What level of education did you attain…….

(a) Primary…….. (b) Secondary……..

(c) Post Secondary…… (d) None……..

11. What is the size of your household?

(a) Children below 10 years……... (b) Children between 11 and 17…… (c) Adults from 18 and above…… (d) Adults from 70 years and above …….

12. What is your primary occupation?

(a) Wage employed…… (b) Dairy cattle keeping…….

(c) Business…… (d) Crop production…… (e)Others……..

13. What is your secondary occupation?

(a) Wage employed…… (b) Dairy cattle keeping…….

(c) Business…… (d) Crop production…… (e)Others (Specify)…….

SECTION B: INFORMATION ON MILK PRODUCTION

2a. DAIRY ENTERPRISE INFORMATION

14. When did you start the dairy enterprise?

(a) 1-2 years ago…….(b) 3-4 years ago……. (c) More than 5 years ago……

15. How many animals did you start with…….?

- Cows……Heifers……..Bulls……steers……..…..Calves……

16. What was the source of the initial Capital for the establishment of your dairy enterprise? (a) Own Saving…… (b) Family / Friend…… (c) Formal Credit … (d) Informal credit…… (e) Others (Specify)……

17. How much did it cost you for the construction of the cows shed in Tshs……

18. How many dairy cattle do you currently keep…..?

- Cows……Heifers……..Bulls……steers……..…..Calves……

19. What type of feeding system do you practice…….?

- Zero grazing……Semi grazing……Grazing……

20. Do you purchase feed for your cattle? YES/NO,

21. If YES indicate the following

Type	Source	Quantity	Price

22. How do you treat your sick animals?

- A vet doctor visits my home……. Take animals to vet doctor……
- Buy drugs to treat animals on my own……
- Treated by a neighbor……Others (Specify)……

23. Have you had your animals vaccinated/ treated over the past year? YES/ NO

24. If YES, against what diseases were the animals vaccinated/ treated?

- Worms……ECF……..FMD……Others (Specify)……

2b. MILK PRODUCTION TREND

25. How many cows do you milk in a day…….?

26. What is the average amount of milk per cow per day during?

- Dry season……..Wet season……

27. Please estimate the amount of milk that you allocated to the different uses on daily basis;

Items	Wet season	Dry season
Consumed at home		
Sell to neighbors		
Send to local market		
Send to collection centre		
Sell to hotels/restaurants etc		
Remain unsold		
Sell to processing plant		

28. If there is unsold milk what do you do with it?

(a) Preserve cold……. (b) Process to sour milk…..….. (c) Preserve after boiling…… (d) Others (Specify)……

29. Do you have a problem of disposing unsold milk? YES/ NO……? If YES,

- When, Wet Season…… Dry season…….

30. If there is a time lag between milking time and disposal of milk, how do you preserve milk?

- Refrigerating/ Chilling……Cold water bath……..Boiling……
- Preserve using traditional means …….Other (Specify)…….

31. Please indicate the quantity of milk sold last year during wet and dry season

Season	Quantity	Price
Wet season		
Dry season		

32. What means of transport do you use in distributing milk?

- Head carrying…….Bicycle……..Public transport……
- Own vehicle……Hired vehicle…….Other,(Specify)……

33. What is the distance from home to milk market in km …….

34. What is your unit of measure for selling milk? Liter…...others (Specify)……

35. What is the price of milk in Tshs during; Wet season……Dry season……

36. Who sets the price of milk? Producer……., Buyer……. Negotiated……

37. Please indicate how much you pay for the following kind of costs of producing/ handling/selling milk per day/month.

(a) Salary…… (b) Feeds…… (c) Drugs…….(d) Payment to vet doctor…….. (e) Transport costs…… (f) Others (specify)……...

38. Do you process milk? YES/ NO…….... If YES, what milk products do you make?

(a) Sour milk……(b)Yoghurt…….(c)Ghee……(d)Butter……(e) Cheese……

2c. MILKING AND MILK HANDLING

39. How long does it take before you milk a treated animal……?

40. Hygiene at milking ……..

(a) Do you normally wash your hands before milking; YES/NO……..……

(b) What type of utensils do you use for milk preserving / storing/ transporting and selling?

- Plastic…... aluminum……., other (Specify)……..

(c) How do you get the milking utensils cleaned?

- By cold water and soap……., by warm water……
- By hot water and soap……, others (Specify)…….

(d) Is milk strained Y/ N, If Y, what method do you use?

- Sieve (mesh)……Cloth (cotton cloth)……..

2d. MEMBERSHIP TO ORGANIZATION AND RELATIONSHIP WITH OTHER ACTORS IN THE MILK CHAIN

41. Are you a member of a milk producer's organization or cooperative, YES/ NO….

42. If YES what is the name of the organization……..?

43. If YES, for how long have you been a member……?

44. What services do you get from the organization…….……,

45. What benefits do you get by being a member……..,

46. Do you have any contractual arrangements with the suppliers of dairy inputs/ service providers and milk buyers, YES/ NO……

47. If YES, Indicate the following

(a) Contract with suppliers……. (b) Contract with milk buyers……

(c) Contract with both suppliers and milk buyers…….

48. Please indicate the kind of contract you have;

(a)Verbal contract……..Written contract without lawyer assistance……Written contract with lawyer assistance……

(b) What are the terms of the contract

- Specific quantity……Specific price……Specific time……

48. If you have contractual obligations to supply given amount of milk throughout the year, what do you do to ensure constant supply of milk……,

49. Do you have access to any extension services……

2e. MARKET INFORMATION

50. How do you get the information on the demand (Quantity of milk demand)……..…

51. How do you get the information on the prices prevailing in the market……

52. What do you consider to be the main constraints facing your dairy enterprise?

……

53. What do you suggest to be done to solve or reduce the constraints……

……..

SECTION C: MILK PROCESSING INFORMATION

3a.MILK PROCESSING TREND

1. When did you start milk processing…….

2. What is the source of milk that you process……

3. What type of processed products do you produce……

- Naturally fermented milk……Yoghurt……Packed fermented milk……
- Packed pasteurized milk……..Yoghurt…… Cheese…… Ice cream…… Others (specify)……

4. What was the source of the initial Capital for the establishment of your processing enterprise…?

(a) Own saving…… (b) Family / Friend…… (c) Formal Credit…….

(d)Others (Specify)……. (d) Informal credit……

5. How much did it cost you in Tshs for?

- The construction of the processing premises ……
- Purchase of the processing machines…….

6. Indicate the following for raw material;

Type of material	Source	Quantity	Price per unit	Distance from source	Transport costs
Raw milk					
Packaging material					
Processing machines					

7. Do you get adequate supply of raw milk through out the year? YES/NO……

8. If NO, what strategies do you employ to obtain adequate raw milk for processing.....?

9. Milk handling and processing equipment……..

Item	Quantity	Cost per unit	Expected time of use

10. How much does it cost you per month/day for?

- Renting of premises……Water/Electricity…….others (specify)…….
- Labor…….Processing Machine maintenance……..Raw materials…

11. What measures do you take to ensure quality of purchased raw milk……

12. What measures do you take to ensure quality of processed product……

13. Please provide the following information for sale of processed products……

Product	Customer	Quantity per day	Price	Location of customer	Means of transport	Cost of transport

14. Which customer do you consider to be the most important……

15. Do you face any problems in disposing off your processed products……

16. How do you go about solving this problem……..,

17. How much milk do you use per unit of a processed product……..?

18. What is your scale of operation? Small……Medium…….Large……

(a) What is the Volume of production under full capacity……?

(b) Do you utilize fully you processing capacity, YES/ NO……..?

If NO, What period of the year do you operate below capacity.....? Why……

19. Do you have any kind of contractual agreement with suppliers of raw materials/ service providers and buyers of your milk products? YES/ NO.....…...

20. If YES, give the following details;

Items specified in contract	suppliers of input/ Service providers	Buyers of milk products.
quantity		
price		
terms of payment		
type of contract		
how the contract is enforced		

21. Who sets the following prices of? Inputs…….products……..

3b. MEMBERSHIP TO AN ORGANIZATION

22. Are you a member of a milk processors organization or cooperative, YES/ NO…….,

23. If YES, what is the name of the organization……

24. If YES, for how long have you been a member……?

25. How much is the membership fee…….?

26. What services do you get from the organization…….……,

27. What benefits do you get by being a member……., ……

28. What do you consider to be the main constraints in milk processing business?

(a)……..

(b)……..

29. What do you suggest to be done improve the situation

…….....

SECTION D: MILK MARKETING INFORMATION

4a. MILK MARKETING TREND

1. Business type; (a) Wholesaler/ assembler…… (b) Retailer/kiosk/shop/milk bar…… (c)Hawker…… (d)Vendor…… (e)Others (Specify)……

2. When did you start the milk business……?

3. Do you do business as?

(a) Individual…… (b) Group…… (c) Cooperative/ association……..

4. Please provide the following information for all kinds of milk products

product type	source	quantity in liters Season		buying price in Tshs Season		buyers/ customers Season		quantity in liters Season		Price in Tshs Season	
		wet	dry	wet	dry	wet	dry	wet	dry	wet	dry
Raw Fresh milk											
Fresh boiled milk											
Sour milk											
Yoghurt											
Cream											
Ghee											
Butter											
Cheese											
Packed fermented											
Packed pasteurized											

5. If you market raw fresh milk, how do you preserve it?

- Refrigerating……..Cold water bath……..Boiling…….
- Preserve using traditional means (specify)…….Process unsold milk……
- Other (Specify)…….

6. How would you describe your milk business?

(a) Buy and sell fresh milk……..Go to Qn 20

(b) Buy and process fresh milk……Go to Qn 19

7. If you process, what products do you make?

(a) Sour milk…… (b) Ghee…….

(c) Butter…… (d) Yoghurt…… (e) Cheese……

8. What do you do to ensure quality of purchased milk?

- Visual observation……Taste…….smell…….No quality check…….
- Use Lactometer……Alcohol gun……Thermometer… Other (Specify……

9. How do you get milk transported from source to the selling point?

- Head carrying…….Bicycle……..Public transport……
- Own vehicle……Hired vehicle…….Other (Specify)……

10. What type of utensils do you use for milk handling / storing/ transporting and selling?

- Plastic…... aluminum……., other (Specify)……..

11. How do you get the milking utensils cleaned?

- By cold water and soap……., by warm water……
- By hot water and soap……., others (Specify)…….

12. What costs do you incur in marketing milk per day/month?

- Transportation……Preservation……Labor…….Other (Specify)……

4b. MEMBERSHIP TO ORGANIZATION

13. Do you belong to any traders' organization? YES/ NO…….

14. If YES, for how long have you been a member……..

15. What services do you get from the organization…….....

16. What benefits do you get as a member……. ……

17. Do you have any kind of contractual agreement do you have with suppliers and buyers in terms of your milk products? YES/ NO.....….. If YES, indicate the following;

Terms of contract	Suppliers	Buyers
Quantity		
Price		
Terms of payment		
How the contract is enforced		

18. Who sets the following for your products?

- Buying price…….Selling price……..

19. What is the nature of your contract?

(a)Verbal contract…….Written contract without lawyer assistance…….Written contract with lawyer assistance…….

20. What do you consider to be the main problems in marketing milk and milk products?

(a)……..

(b)……..

21. What do you suggest to be done improve to the situation.....

SECTION E: MILK CONSUMPTION INFORMATION

1. Do you purchase any dairy/ milk products, YES/ NO…….?

2. Who consumes milk products in your household?

(a) All…… (b) Infant…….. (c) The sick…….

(d) Guest/ Special occasion……. (e) Others…….

3. How often do members of your household consume milk and milk products?

(a) After every meal…… (b) Once a day…… (c) Few times a week ……

(d) Few times a month…… (e) Can't recall…… (f) Never……..

4. In what form is milk consumed in the household?

Product	Quantity per day	Price	Distance from premise	Means of transport	Cost of transport
Raw fresh milk					
Boiled milk					
Sour milk					
Packed pasteurized					
Fermented packed					
Yoghurt					
Ghee					
Butter					
Cheese					
Powdered milk					
Canned milk					

5. Do you process the raw milk that you purchase? YES/ NO……?

6. If YES, do you use culture or do you let it ferment naturally…….?

7. Do you boil milk before drinking it? YES/ NO

8. How do you preserve raw milk……..?

- Refrigerating…….Preserve by traditional means……
- Process unsold milk…….. Boiling……...Other (Specify)……

9. What type of utensils do you use for storing/ preserving milk?

- Plastic…...aluminum……stainless steel……other (Specify)……

10. Do you usually buy as much milk as you would like to? YES/ NO……

11. If NO, why not……, ……,

12. Which dairy products you would like to consume but which the market does not offer? (List them) …...

13. Are there any products you would like to consume more but you cannot because they are too expensive? (List them) …….., ……,

14. What do you prefer most between raw, processes and packed milk? …..

Why? ……

15. Do you have any contractual arrangements with those who supply you with milk? YES/ NO,

16. If YES, give the following details……

- Type of contract, - Verbal……, Written……..

17. What are the terms of contract,-

Specific quantity……, Specific Price…….Specific time…….……..,

- Terms of payment, - Cash.....….... Credit……Other (specify)…….
- Enforcement of contract,; Law……,Trustworthiness……,others …….

18. What do you consider to be the main factors constraining you in consuming milk?

(a)……

(b)……

19. What suggestion do you give which will help improve the consumption level.....

20. What is your average income per month?

(a) High income (more than 500,000/= per month)…….

(b) Medium (100,000/= to500, 000/= per month) ……

(c) Low (Less than100, 000/= per month)……