INSTITUTIONS AND EFFICIENCY OF MILK VALUE CHAINS IN BAGAMOYO DISTRICT

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURAL AND APPLIED ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

2014

ABSTRACT

The overall objective of the study was to analyse the institutions and cost efficiency along the formal and informal milk value chains in Bagamoyo district. The specific objectives were to: (i) identify the institutional constraints in the formal and informal milk value chains, (ii) analyse the cost added efficiency in the formal milk handling and processing, (iii) analyse the producer cost efficiency in the formal and informal milk value chains and, (iv) analyse the factors that affect farm cost inefficiency in the formal and informal milk chains. The data for the study were collected from 167 milk producers, 31 traders, 4 collection centres, 3 processors and 3 regulatory bodies. Institutional constraints were analysed from Transaction Cost Economics paradigm (TCE). Cost added efficiency was identified by comparing added cost per litre of milk handled across collection centres, processor, and retailers. Translog cost frontier was used for farm level efficiency analysis. Transaction costs were attributed by incomplete contracts, milk handling and market structure. Added costs along the formal chain significantly varied among collectors, processors and retailers ($p < 0.10$). Output elasticity and cost elasticities due to feeds and labour significantly affected the total cost of milk production ($p < 0.05$). Farmers in the formal and informal chain had efficiency level high above the frontier. The inefficiency of farmers in the formal and informal chain was significantly affected by household's age, education, household size, number of cows in milk and breed type ($p < 0.05$). The study concludes that there are high transaction costs caused by spoilage and incomplete contracts and cost inefficiencies constraining dairy development in Bagamoyo. It is recommended to provide education to illiterate and young farmers on dairy best practices. Devising proper input use and formulate policies that will transform households from local to improved dairy cattle keeping.

DECLARATION

I, Stephen Aniseth Nyaki, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

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ACKNOWLEDGEMENTS

First and foremost, I thank God Almighty for his abundant grace, love, guidance and protection in my life. Psalm 23: 1-6.

I wish to express my sincere appreciation to my supervisors Prof. G. I. Mlay and Prof. L. R. Kurwijila for their invaluable generosity, professional guidance, encouragement, technical comments, advice and criticism that ensured preparation, undertaking and accomplishment of this dissertation. May the blessings of our God Almighty be with you.

Special thanks go to the East Africa Agricultural Productivity Program (EAAPP) project for their financial support that made my research work accomplished, and the Collaborative Masters of Agricultural and Applied Economics (CMAAE) programme. My sincere thanks also goes to my Uncle, Prof. N.S.Y. Mdoe for his fatherly care and support in my professional upbringing, may God provide him with more than what he gives, and fill him with his love forever and ever.

My heartfelt gratitude's are extended to the District Executive Director (DED) and the District Agricultural and Livestock Office of Bagamoyo District (DALDO) Mr. Mohammed Chamzimu for their support and guidance especially in ward and village selection. My appreciation also goes to Mr. Sadiki Lihinda for his assistance during data collection process, his competence made the survey process efficient.

I wish to express my acknowledgement to Ward and Village government leaders, farmers, traders in Bagamoyo and Dar es salaam, managers of milk collection centres, processors, TDB, TAMPA and TAMPRODA as they positively participated in the survey.

My appreciation also goes to everybody who in one way or another contributed to the success of this work.

Finally, I wish to acknowledge my parents Mr and Mrs Aniseth Nyaki, Mrs Mdoe and family, Mrs Ritha my mother, my young brothers and sisters Gabriel, Andrew, Anitha, and Jaqueline, close friend Jacqueline Sangawe and cousin Praise; and all my colleagues for their emotional and material support, encouragement and prayers. God bless you all.

DEDICATION

First and foremost, this work is dedicated to the God Almighty for he has done great things in my life. Second to my grandfather, the late Mr. Stephen N. Nyaki for his love, fatherly upbringing, and support in my life. I will always cherish your wisdom and love.

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LIST OF ABBREVIATIONS AND SYMBOLS

AE	Adult Equivalence
CE	Cow Equivalence
CMAAE	Collaborative Masters of Agricultural and Applied Economics
COGS	Cost of Goods Sold
CR	Concentration Ratio
CSR	Corporate Social Responsibility
DALDO	District Agricultural and Livestock Development Officer
DED	District Executive Director
EAAE	European Association of Agricultural Economists
EAAPP	East African Agricultural Productivity Programme
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GMM	Gross Marketing Margins
HHI	Herfindahl Hirschman Index
IAD	Institutional Analysis and Development
IDRC	International Development Research Centre
ILRI	International Livestock Research Institute
KNLN	Kopa Ng'ombe Lipa Ng'ombe
LME	Liquid Milk Equivalent
NIE	New Institutional Economics
NZARES	New Zealand Agricultural and Resource Economics Society
OECD	Organisation of Economic Cooperation and Development
TDB	Tanzania Dairy Board
TAMPA	Tanzania Milk Processors Association

TAMPRODA	Tanzania Milk Producers Association
TGMM	Total Gross Marketing Margins
Tshs.	Tanzanian shillings
TSHZ	Tanzania Short Horn Zebu
UDAFA	Upendo Dairy Farmers Association
URT	United Republic of Tanzania
VAMMS	Value Addition and Marketing of Milk for Smallholders

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Dairy is one of the most important agricultural sectors in sub-Saharan Africa with a huge potential for poverty alleviation, improvement of food security, nutrition and employment generation. For every 1000 litres of milk produced, 77 farm jobs and 13 employment opportunities in the processing sector are created (Lang'at, 2012). This also came into attention due to a continued increase in the demand of dairy products in Africa. Compared to other regions, Africa imports 15% of the world imports, this is after Asia which imports 55% of world imports (Griffin, 2013). The increasing demand for milk and milk products is associated with the growth in human population, rising incomes and urbanization, providing opportunity to poor smallholder farmers and other intermediaries in the milk value chains to realize higher incomes and escape form the poverty trap (Omore *et al.,* 2009: Lang'at, 2012). Dairy development is said to be a source of broad based economic growth as it is labour–intensive thus being able to absorb large underemployed rural labour. Dairy products are associated with relatively large income and price elasticities of demand implying that an increase in market supply of the products does not lead into large fall in prices (Brokken and Seyoum, 1990, and Omore *et al.*, 2009).

However, the potential gains from dairy cannot be achieved if constraints to market access are not addressed. Agricultural producers need to be linked to consumers by finding new markets for value added milk and milk products since most smallholder milk producers either consume milk on the farm or trade it informally. This calls for appropriate policies, institutions and public investments informed by research. In line with this broader objective, the project on improving value addition and marketing of

milk for small holder (VAMMS) funded by the East African Agricultural Productivity Program (EAAPP) is being implemented so as to improve the adoption of innovations that can contribute towards improving value addition and marketing of quality and safe milk by smallholder producers in Tanzania.

1.2 Background to the Dairy Sub-sector

The dairy sub-sector in Tanzania has a high potential for improving food security, creating employment especially for rural households and contributing to economic development. While the livestock industry accounts for 3.8% of the National Gross Product (GDP), the dairy sub-sector alone contributes 30% to the livestock GDP (URT, 2011). The sub-sector employs more than 2 million households and over 100 000 intermediaries (Njombe *et al.,* 2011). Despite its importance the dairy sub-sector remains underdeveloped in terms of production, processing and marketing.

The dairy cattle herd accounts for only 3.2% of the estimated population of about 21.3 million cattle in the country (URT, 2011; Njombe *et al.,* 2011) and 70% of total annual milk production of about 1.65 billion litres comes from the traditional Short Horn Zebu (Njombe *et al.,* 2011; Dillmann and Ijumba, 2011). According to URT (2010) milk production increased from 814 million litres in 2000/01 to 1.64 billion litres in 2009/2010 However, according to the FAO data for the period 1992 to 2011 milk production trend was slightly flatter compared to that of the number of cows in milk (FAOSTAT, 2014). This attests the fact that increase in milk production in the country was largely due to increase in herd size rather than increase in productivity per cow (URT, 2010; Kurwijila, 2010; Njombe *et al.,* 2011). The underdevelopment of the dairy sub-sector is further substantiated by the proportion of milk production that is marketed and the way it is marketed and consumed. In 2011, it was estimated that less than 10% of total milk

production was marketed and the rest was consumed at the farm level in a raw form thus potentially exposing consumers to health related risks (Kurwijila *et al.*, 1995; Kurwijila and Boki, 2003). While only 10% of milk produced by the traditional cattle was marketed, 70% of milk produced by the improved herd was marketed. About 20 % of the marketed milk from the traditional cattle herd was sold through the formal market channel and 80 % through informal market channel. On the other hand, 14.3% of the marketed milk from improved dairy cattle herd was sold through formal market channel and 85.7% was sold through the informal market channel (Dillmann and Ijumba, 2011).

Overall most of the milk marketed in the country is not formally processed. It is either consumed raw or boiled (Omore *et al*., 2004; Kurwijila, 2010). Formal processing accounts for less than 20% of the total milk marketed in Tanzania. Currently the country processes about 115 000 litres of milk per day. This amount is small when compared with Uganda and Kenya which process more than 800 000 and over one million litres per day respectively (Njombe *et al.*, 2011; Balikowa, 2011). Additionally, in 2009 processing plants in the country had the capacity of processing slightly more than 325 000 litres per day but operated at an average rate of less than 100 000 litres per day which is equivalent to 30% of capacity usage, in contrast to Kenya where 40% of installed capacity is utilized (TAMPA, 2011; URT, 2011).

Besides, domestic production of milk and milk products can not satisfy potential local demand especially in growing urban centres (Njombe *et al.*, 2011). The total demand for processed milk in Tanzania is said to be more than 61 million litres, but only 41 million litres are supplied by the local processing firms and a deficit/supply gap of more than 20 million litres being filled by imported milk and milk products from Kenya and South Africa. Currently imports cover almost 48% of the total dairy market (NIRAS, 2010).

The processing potential need efficient exploitation because large proportion of milk (about 79%) is consumed while raw which subject's consumers to health associated risks (Kurwijila *et al.,* 1995: Swai and Schoolman, 2011).

1.3 Statement of the Problem and Justification

Although dairy production potential is high in Tanzania, the development the sub-sector is curtailed by number of factors. Njombe *et al.* (2011) and Fussi (2010) documented inefficient milk collection system, weak technological capacity, unreliable milk supply, and fluctuating prices as being among those causes. However, the underlying causes of the above mentioned factors are still questionable. TAMPA (2011) argues that inefficient institutional framework and added costs within the formal chain such as import tax on milk handling machines and equipment's, uncoordinated inspections and licensing aggravate the slow response of milk marketing through the formal channel.

According to Kadigi (2012), low transactions costs and high producer prices in the informal channel attract famers to trade informally thus limiting the quantity of milk available for processing. Similarly, Wikedzi (2012) found that smallholder farmers received gross profit margins of 5.2% and 21.4% in the formal and informal channels respectively. According to TAMPA (2011), added costs which render high cost value chain actors to offer small producer prices in the formal chain are also alleged to disincentivise collection and processing. Thus the study focuses to identify the added cost inefficiencies present within the value addition process and understand its institutional arrangements which will involve the identification of institutions that constrain channel effectiveness. URT (2008) and Swai *et al.* (2014) showed that low productivity per cow combined with the large number of traditional herd and inherent inefficiencies are the central reasons for the underdevelopment. On the other hand Leng

(2013) asserts that the major criterion for improvement in production is to optimize (minimizing input costs) for efficient utilization of available resources than to maximize animal production. Therefore, with farmers being the price takers and with the varying milk prices as a result of seasonality and geography (Nyange, and Mdoe, 1995), milk production can be more beneficial if farmers produce with minimum possible costs and with an assured product/milk market which can be put in place if the subjected constraints are known and alleviated.

It is well known that formal milk marketing/handling involves the use of farm cooperatives or milk collection centres and processors/processing (Kurwijila, 2006; Quaedackers *et al.*, 2009 and Kailembo, 2013). Moreover, the potential and importance of dairy development particularly via formal chain GDP contribution and employment creation cannot be over emphasized. The achievement of these potentials as documented by Fussi, 2010) largely depend on the prudent institutional setup and support to value chain actors. However there is little supporting evidence on the actual institutional aspects and associated transaction costs in milk handling and processing which curtail achievement of these potentials. Moreover, Eaton *et al.* (2007) and Dorward *et al*. (2009) documented that institutional constraints within agricultural sub-sectors and value chains are greatly determined and explained by the underlining structure of market and/property right exchange, and performance of the whole chain, thus exemplifying these constraints in this study goes with the determination of the present structure of the market and associated margins for prudent policy judgment.

Ronald, (2012) and Wikedzi (2013) analysed the technical efficiency using the stochastic frontier method and used the profit gross margins to analyse the milk value chain performance, but they did not report on institutions, efficiency of added cost and farm

level cost efficiency as key considerations in milk value chain development. Therefore this study will consequently contribute to the body of knowledge by filling the gaps indicated above. The findings will contribute knowledge to address some of the factors constraining the development of the milk value chain in Bagamoyo District.

1.4 Study Objectives

1.4.1 The general objective

The general objective of this study is to analyse the institutions and cost efficiency along the formal and informal milk value chains in Bagamoyo District.

1.4.2 Specific objectives

i. To identify the institutional constraints in the formal and informal milk value chains.
ii. To analyse the cost added efficiency in milk handling and processing in the formal milk value chain.
iii. To analyse the cost efficiency of milk producers in formal and informal chain.
iv. To analyse the factors that influence cost inefficiency at the farm level in the formal and informal chain.

1.5 Research Hypotheses

i. Added cost efficiency does not vary along the formal milk value chain.
ii. Milk producers are not cost efficient.
iii. Farmers age, education, household size, number of milking cows, and type of breed are not associated with cost inefficiency at farm level in the formal and informal value chains.

1.6 Organisation of the Dissertation

This dissertation is organized in five chapters. The first chapter provided the background to the study and the dairy sub-sector in Tanzania, the problem statement and its justification, research objectives and the hypotheses tested. The second chapter involves the review of the relevant theoretical and empirical literature. Chapter three presents the description of the study area and the methodology employed. Chapter four presents the results and discussion while conclusion and recommendations appear in Chapter five.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Concepts and Terms

2.1.1 Value chain concept

Kaplynsky and Morris (2001) described the value chain as the full range of activities which are required to bring a product or service from conception, through different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to the final consumer and final disposal after use. Agricultural value chains are divided into five stages which include production, distribution, processing, marketing and consumption (Schipmann, 2006). In analysing or studying a value chain, there are some major elements to be considered or taken into account namely: i) actors present along the chain, their functions and how they interrelate, ii) governance mechanisms of the chains and the role of actors example such as power relations and the principal drivers of the chain functions, iii) impact of upgrading products, services and processes within the chain and iv) distribution of benefits among actors within the chain (Kaplinsky, 2000, Kaplinsky and Morris, 2001; Rich *et al.*, 2009). Thus analysing a value chain involves a number of interconnected processes which are more complex than undertaking a usual supply chain study.

Scholars interpret/understand value chain in different viewpoints. From organizational viewpoint, value chain analysis describes the activities within and around an organisation as explained by Porter (1985). It evaluates which value each particular activity adds to the organization's products and services. Within an organisation, it is also described as a system of independent activities which are connected by linkages that exist when the way in which one activity is performed affects the cost and/ effectiveness of other activities (Porter, 1985).

From a supply chain perspective, Hobbs *et al.* (2000) defined value chain as the vertical alliance between numbers of independent business organisations within a supply chain. Moreover, Stevenson and Pirog (2006) defined value chain from a food supply chain perspective, as a new leg of food product which has been converted from raw product through processing, resulting in a variety of product forms and thus an incremental value is added in the market place. Moreover supply chains are said to be synonymous with value chains, and value added describes not only products with higher market prices from processing, but also agricultural products that have certain sustainability, location, food safety, or utility attributes (Stevenson and Pirog, 2006).

2.1.2 Institutions and their role

The new institutional economics (NIE) defines institutions as the rules that govern social interaction. They are the rules of the game and include both formal (laws, contracts, political systems, organizations and market) and informal (norms, traditions, customs, value systems, religion, sociological trend) that facilitate coordination or govern relationships between individuals or groups (North, 1990). Institutions emerge to minimize transaction cost and facilitate market exchange (North and Thomas, 1973).

Efficient institutions in the agricultural sector are increasingly becoming important not only in fostering agricultural growth by reducing market failures but also in ensuring that players benefit from it (WDR, 2008). Exchange becomes efficient if prudent organisations are in place. To achieve efficiency in the production sector producer organisations are deemed important in minimizing the costs of transactions arising from the exchange process or property right transfer following the discriminating alignment hypothesis advanced by Williamson (1985). The vast ideas and discussion of the transaction cost from the NIE come from the work of williamsonian transaction cost

economics. According to Wlliamson (1975, 1985, 1996, 1998 and 2000), transaction costs provide the key to understanding alternative forms of economic organisation and contractual arrangements, where the focus is on the cost of conducting a transaction in one organisation or contractual form relative to the others. Here, the comparative ranking of transaction costs associated with different organizational/contractual choices maters more than individual quantification of these costs or their absolute amount.

From institutional economics (NIE) literature, these transaction costs arise due to search for and screening of potential buyers and suppliers, negotiating and contracting with them, and monitoring and enforcing their adherence to the contracts. These processes involve flow of information which has to be efficient for the parties to benefit in full (Dorward *et al.,* 2009). According to Coase (1937, 1961) transaction cost is the cost of using price mechanism or the cost of carrying out a transaction by means of an exchange on the open market. However, with the exception of production and exchange costs, quantification of transaction costs is quite difficult. This difficulty is due to lack of a clear definition of transaction costs which lead to variety of ways used in their measurement/estimation (Benham and Benham, 2000).

Valentinov (2007) discusses the NIE and transaction costs economics (TCE) from a firm's profit and non-profit motives. From the for-profit side, the transaction cost theory provided two strands of literature (incentive alignment approach and the Coasean approach). The incentive alignment approach places the economic role of the for-profit firm in the structuring of the economic agents' incentives in a manner that opportunistic behaviour is minimized in spite of the existence of information asymmetries. The Coasean approach assumes that economic agents are limited in their capacity to search for, process, and communicate information implying that opportunism is not given

much weight here. Despite of a rich literature in NIE and TCE, empirical measurement of costs of transactions in line with their governance structures is still challenging since "concepts that explain everything, explain nothing" (Williamson, 1993).

The analysis of transaction costs involves the use of proxies such as uncertainty, transaction frequency, asset specificity and opportunity costs for empirical measurement rather than direct measurement (Wang, 2003). Zhengchao *et al.* (2012) divided the measurement of transaction costs into micro aspect and macro aspect. The later refers to the measurement of costs of an economic system operation or institutional transformation, while the micro aspect it refers measuring the costs of an industry or field executing transaction. Allen (2006) urgues that a successful measurement of transaction cost must solve three methodological problems namely: monitoring, opportunity cost, and the insufficiency of price spreads. Wang (2003), urges that a direct measurement of transaction costs is simply the economic value of the resources used in locating trading partners and executing transactions, or taking it as a difference between the prices paid by the buyer and received by the seller.

Holloway *et al.* (1999), Vakis *et al.* (2003), and Jagwe *et al.* (2010) used choice models of market participation as a way to empirically study the transaction costs. From its theoretical underpinning, this methodology enables the researchers to just understand how particular variable accelerate or reduce the impact of transaction cost in a particular exchange process and shy away from explaining at what magnitude these variables impose a dent in an exchange process. This study used estimates obtained from frequency of transactions and opportunity costs to quantify the transaction costs. Asset specificity approach as recommended by Wallis and North's (1986) was not used due to lack of sufficient data.

Milk is subjected to number of transaction costs due to its nature. Raw milk is highly perishable and thus it requires rapid transportation to consumption centres or processed to less perishable forms. Moreover milk bulking from several/multiple suppliers increases the risk of losses due to spoilage. As a result, they limit marketing options for small and remote dairy producers and raise costs of transportation (Staal *et al.,* 1996 and Holloway *et al.,* 1999). Given the fact that milk production is year round activity, stable market search and assurance is complicated due to seasonal variation in milk production and distribution (Jaffee, 1995), thus raising a number of transactional costs in the process which this study aims to quantify.

2.1.3 Marketing margin

Marketing margin or price spread is a commonly used measure of market performance. It can be used to describe how the consumer's expenditure is apportioned among market participants at different levels of the marketing systems (Abbott and Makeham, 1990). It represents the costs for all assembling, processing, transporting, marketing and retailing added to the farm products. They entail the costs of providing a bundle of marketing services (Elitzak, 1997). It is the difference between the retail and the producers or farm gate price which represents costs of transport, storage, processing, wholesaling and retailing. Gardner (1975), Tomek and Robinson, (1990) and Wohlgenant, (2001) described marketing margin as an equilibrium entity that is a function of the difference between the equilibrium retail and farm prices, or export and farm price. Marketing margins are also considered to be the result of demand and supply factors, marketing costs and the degree of the marketing channel competition (Marsh and Gary, 2004). Gross marketing margin is the percentage of the ratio between the difference in the retail and farm gate price to the retail price. Total gross margin involve the sum of the gross marketing margin obtained at every stage in the value chain.

Theoretically, the analysis of marketing cost and margins reveal how efficient pricing in domestic markets is, and it gives an indication of the importance of transaction costs facing traders, farmers and intermediaries, and help in identifying and solving holdups thus assisting in reducing marketing costs (SIFSIA, 2011). In most cases, the correct and self-defining analysis of marketing margins also goes with the measurement of mark-up cost. Mark-up is termed as the amount added by the seller to the cost of a commodity to cover expenses and profit in fixing the selling price. Given the structure of actor's interaction in any agriculture value chain, mark-ups help to understand how each actor behave with respect to price setting behaviours.

In conversion of the theoretical understanding, marketing margins has been modelled in a number of ways. Wohlgenant (2001) attempted to model the analysis of margins from the structural specification of demand and supply. In this specification endogenous variables included the industry quantity of retail product, retail price, industry quantity of the farm product, farm price and industry quantities of the marketing inputs. The exogenous variables included the retail demand shifters, marketing input prices, other exogenous marketing sector shifters and farm product supply shifters. From this modelling and under usual regularity conditions with downward-sloping demand curves and upward-sloping supply curves, a unique equilibrium for given values of exogenous variables is established. At this equilibrium, values of the endogenous variables, and hence the marketing margin are determined.

Gardner (1975) discussed various ways of measuring price spreads/marketing margins. That is, as the difference between retail and farm value of the commodity, by the ratio of retail to farm price, by the farm value share of the total retail value, in other words is the farmers share of the retail dollar, or using percentage marketing margins (that is, marketing margin as a percentage of retail or farm price).

Moreover, Smith (1992) made an elaboration on how to present information pertaining to market performance in terms of costs, margins and mark-up. Whereby, the farm gate price can be shown as a percentage of the retail price showing farmers share of the retail value, or a difference in the retail price from the farm gate price as a percentage of the retail price which give us total gross margins, which is the interest of this study. Alternatively, the difference in the retail price from the farm gate price can also be computed as a percentage of the farm price to give the percentage mark-up.

Carambas (2005) emphasized that thorough analysis of price spread or marketing margin is only possible through an analysis of the complete set of market behaviour equations, but given the constraints attributed by the size of data, the study made an attention on gross marketing margin and total mark-up equations to estimate and draw implications on price spreads from the available data set.

Riadh, (2001) and SIFSIA (2011) urgue that the level of mark-up is related to the market structure of a particular industry. It appears to be higher in imperfect/concentrated industries than in the least concentrated. Thus mark-ups can be used as indicators of competitive pressures and an indication of innovation rents as well.

In the dairy sub-sector, milk and milk product trading involve farmers, traders, collection centres, processors and distributors/retailers for formal chain while in the informal chain producers and vendors are involved. To study the nature of margins at each node in the two chains, basic information pertaining to product price at each node is important. However, a series of cautionary instructions as advised by Smith (1992) need to be learnt before a meaningful analysis is done, like, the product involved should not change from stage to stage so as to make results meaningful. For milk, Liquid Milk Equivalence scales are used to convert products and prices to the same units for appropriate analysis.

2.1.4 Formal and informal milk markets

Milk market can be categorized into two main types which are formal and informal markets (Fussi, 2010). The formal milk market involves channels through which farmer deliver milk directly to the collection centre of a milk processing firm or through traders who buy milk from the farmer and deliver it to the milk collection centre or processor. Retailers perform a distribution function of supplying the products to the final consumers. Informal milk market involves the direct sale of raw milk by the farmer to the consumer or via vendors who later trade them to consumers. Moran, (2009) and Kadigi (2012) documented the characteristics of informal markets as being usually of small scale, localized with a few participants and milk traded in a raw form. From consumer view point these markets are at the lower cost end where price is regarded to be more important than milk quality.

The formal milk markets are of medium to large scale with more distant markets involving more participants where the milk is processed prior to sale and from the consumer perspective they are at the higher cost end where quality and food safety are important (Kadigi, 2012).

2.2 Theoretical Frameworks

Analysis of the firm's value chain rests on a number of theoretical concepts, the most important being theory of the firm. Theories which underpin this study are the neo-classical theory of the firm which explains the rational behaviour of individuals of either maximizing profits or minimizing costs subject to specific level of input/output produced, and the new institutional economics theory which alters the basics of the neoclassical theory by relaxing the assumptions of perfect information and zero transaction costs in an exchange process.

From the Neo-classical theory, a firm faces choices of what, how and how much to produce given the available scarce resources and technology, this means the producer/firm manager will try to combine the input factors so as to maximize the returns/profit or minimize the costs of producing a certain level of output, which on the other hand means operating in an efficient (cost/profit) frontier. Firm theory provides three approaches for analysing efficiency, which are technical, allocative and economic/profit efficiency. Farrel (1957) defines technical efficiency as the ability to achieve a higher level of output given same levels of inputs. Allocative efficiency indicates the extent to which firms make efficient decisions by using inputs up to the level at which their marginal contribution to production value is equal to the factor cost and profit efficiency is defined as the ability of a firm to achieve highest possible profit given the prices and levels of fixed factors and technology (Ali and Flinn, 1989). Cost efficiency is defined as the ability of the firm to produce a certain level of output at the minimum possible cost given the existing input prices and level of technology.

The theory of New Institutional Economics that was pinned by North (1991), modified the neo-classical theory of economics by relaxing the assumptions of perfect market conditions and retaining the fundamental assumption of scarcity and competition. It extends the neo-classical theory to address problems of uncertainties and incomplete information; it includes the work on transaction costs, political economy, property rights, hierarchy and organization, and public choice (Kim and Mahoney, 2005).

2.3 Review of Methodologies in Similar Studies

2.3.1 Marketing margin

Qaye and Kanda (2004) studied the Bambara marketing margins (MM) in all its distributional channels from the production centres to consumption centres in Northern, Upper East and Brong Ahafo Regions of Ghana. The total gross marketing margin of

Bambara was estimated at 41.66% with producer gross/participation margin of 58.34%. This study revealed that large share (more the half) of the marketing margin went to the producers which was encouraging despite the existence of oligopsonistic structures of the market that limit information flow and consumer awareness. The gross Marketing Margin (TGMM) for Bambara was observed to be on the high side as compared to that of sorghum which was about 30%. With low level of trade, traders were observed to obtain abnormal profits.

Ojogho *et al.* (2012) examined the marketing margin and price transmission for beef in Benin metropolis. The data were analysed using the cost-return principle, descriptive and inferential statistics. The results showed an average marketing margin of N150.75, and a unit increase in packaging and handling cost would increase marketing margin by N7.64 and N12.34 respectively. Price transmission regression showed that the long-run marketing margin elasticity was 0.976, while the short-run marketing margin elasticity of wholesalers and retailer at retail price were respectively 0.906 and 0.911. This study will use similar approach in computing and comparing actors marketing margins across the formal and informal chain.

2.3.2 Added cost efficiency

Added cost can be described as the expense that an individual or form spends in the process from material purchasing to product sale, they include material input cost and labour input cost of purchasing, packing, storing, transportation, marketing, negotiation and taxes (Qiao *et al*., 2006). Added costs are separated from production costs because they are incurred after the product has undergone primary production processes, thus the mentioned costs are incurred in the process of adding value for the product to fetch higher/distant markets. Methods of added cost efficiency estimation literary varies given

the intention/purpose, and the stage in which these costs are estimated to impact value addition process.

Qiao *et al*. (2006) used the data on pear supply in Zhejiang province in China where they compared the value added and cost added efficiency between investor owned firm with a traditional and new cooperatives using the cost ratios of total added costs to the purchasing price. The new cooperative pear supply firms were observed to be more cost added efficient with a ratio of 1.313 compared to the investor owned firms who had a cost ratio of 1.558 because the cost were all shared to the members of the cooperative.

Vitaliano and Stella (2006) employed the Data Envelopment Analysis (DEA) cost minimization model to estimate the costs added to thrift institutions of achieving a rating of 'outstanding' under the anti-redlining Community Reinvestment Act, which is viewed as an act of voluntary Corporate Social Responsibility (CSR) in New York USA. The analysis involved comparing the overall cost efficiency between outstanding and minimally compliant satisfactory thrifts where the overall efficiency did not vary significantly. However the inefficiency sources differed, and an outstanding rating involved an annual added/extra cost of $6.547 million or 1.2 percent of the total cost. The findings were consistent with the CSR as a management choice based on balancing marginal/added cost and added revenue.

Graves and Willems, (2005) using the optimization models tried to examine the optimal configuration strategies for new product supply chains. Their argument was built from the basis that there might be options to supply a raw material, to manufacture or assemble the product and to transport the product to the customer. However each of these options is differentiated by its lead time and direct cost added. With these choices along the chain,

the configuration problem is to select the options that minimize the total added supply chain costs. The study demonstrated that added costs saving can be realized when inventory cost and Cost of Goods Sold (COGS) are jointly optimized.

Mkhabela and Mndeme (2010) using the cost curve approach modelled the extra-costs of producing milk in KwaZulu-Natal Midlands of South Africa where the overtime L shape of the average total cost curves depicted that milk producing firms enjoyed the economies of size. Over a period of time, any producing firm is expected to be cost efficient where average costs will be declining as the level of investment/production is increased until a turning point where costs will begin to increase. From a correctional analysis, firms in a value chain are meant to be efficient if the added cost at each node of the chain are smooth and prices are not above the equilibrium points where marginal/added costs equal added revenue/price. The efficiency of added costs along the formal chain for this study was evaluated using similar procedure by Qiao *et al.* (2006) due to data and time limitations.

2.3.4 Farm level cost efficiency

Studies by Põldaru and Roots (2007) and Kumar and Staal (2010) analysed the cost efficiency of dairy farms/firm operations using Cobb-Douglas functional specification. However this specification proved to be weak in providing accurate cost efficiency estimates due to its restrictive assumptions like unitary elasticity for own price elasticity estimates and zero for cross price elasticity. Jiang and Sharp (2013) analysed the cost efficiency of dairy farms in New Zealand using both the simplified Cobb-Douglas and translog stochastic frontier specifications. In their results, for the North Island, the Cobb-Douglas functional form was rejected in favour of the translog based on a Likelihood Ratio test (LR) and for the South Island it was favoured for its simplicity but at the

expense of imposing unrealistic restrictive assumptions on the functional relationships. Average cost efficiency was estimated to be around 83% for dairy farms located in the north island and 80% for the South Island. Lapar *et al*. (2005) who assessed the cost efficiency of smallholder dairy farmers in Thailand using a sample of 130 dairy firms in six provinces. Trans-log cost frontier was used where costs efficiency estimates indicated that there was significant scope for improving cost efficiency in small holder dairy farms and that costs could also be reduced by 26%. Small scale firms/farms were observed to be more cost efficient than large ones.

Hidayah *et al*. (2013) from Indonesia also studied the production and cost efficiency analysis of Paddy farming systems with a sample of 120 respondents where the parameters in all stochastic frontier models showed that the average cost efficiency was 0.86 and 80% of all respondents had achieved that level of efficiency.

The functional forms that are commonly used for cost frontier estimation are Cobb-Douglas and translog. Cobb-Douglas specification is simple in the sense that it allows the focus to be on the disturbance term. However, translog specification is said to be more advantageous than Cobb-Douglas in the sense that the one-sided error component *ui* captures both input oriented technical and allocative inefficiency. Moreover, the translog specification also gives a more flexible functional form that is a second-order approximation of the true cost function which exploits some information which Cobb-Douglas specification does not (Lapar *et al*., 2005). To avoid the defects of the Cobb-Douglas specification in this study, the translog stochastic frontier specification was used.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Conceptual Framework

From a producer, milk reaches the final consumer via two types of milk value chain, which are the formal or informal value chains. As can be seen in Fig. 1, under the informal chain milk producers can either sell milk directly to consumers or via a local vendor who sells to local retailers who in turn sell to consumers. The formal chain is long as the milk goes through the milk collection centres then to the processor and then milk and milk products are distributed to whole sellers (stores) and retailers before finally reaching the consumer. In this process collection, transportation, packaging, labelling, distribution, information and handling costs are incurred. The returns or benefits are shared backwards along the chain. Basic Social-economic factors that cause cost inefficiency to the farmer need to be identified and corrective measures be undertaken, on the other hand institutions play a big role in influencing the entire value chain performance as the magnitude of transaction costs largely depend on the nature and quality of information shared, number and behaviour of actors participating in each value chain, and the surrounding general regulatory environment. Increased costs of transaction will tear down the value of the commodity traded as it is shared backwards to the producer.

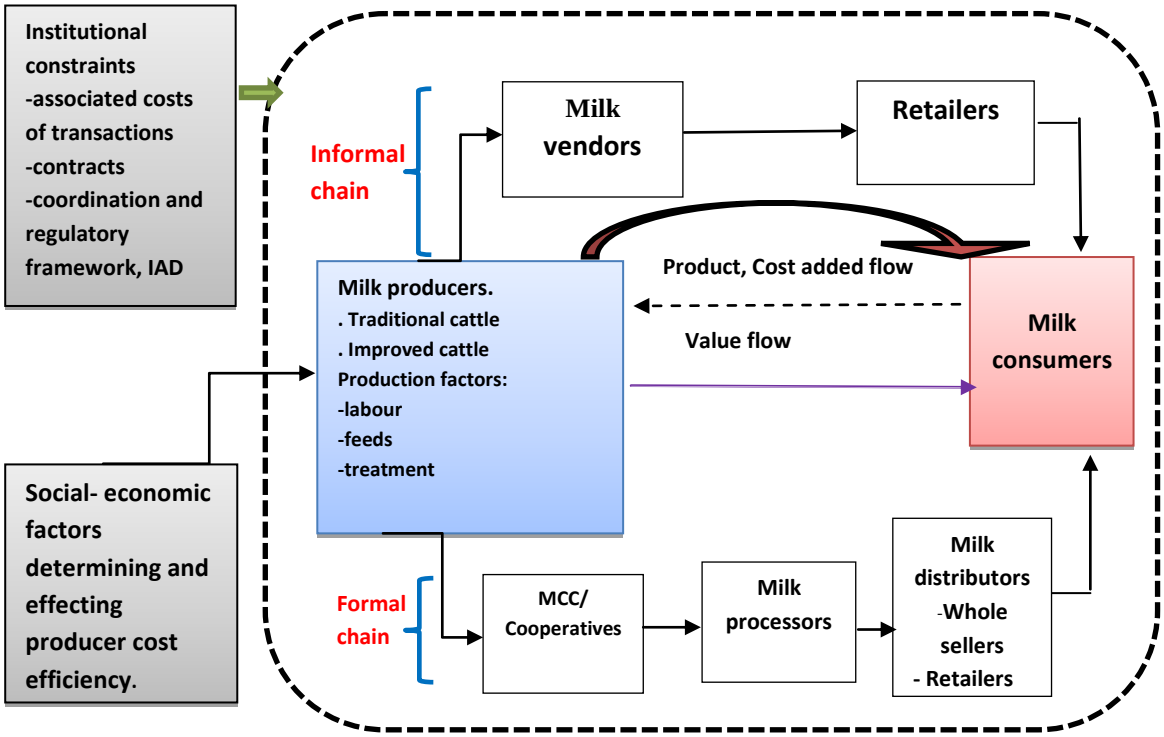

Figure 1: The conceptual framework of the study (own conceptualisation)

3.2 Analytical Framework

This will involve the detailed explanation of empirical procedures of quantifying institutional constraints in form of transaction cost, analysis of added cost efficiency and the cost efficiency of formal and informal milk producers. In-depth description is provided to address the study objectives.

3.2.1 Objective 1: Institutional constraints in the formal and informal value chains

The empirical discussion of institutional constraints cannot be well achieved without first unfolding the type of institutions present in the chains and how actors interact. The identification of these institutions will in theory employ the institutional analysis and development framework which help us understand why the observed institutions behave as they do. Moreover, other transactional costs attributed by asymmetry in information,

and search costs given their difficulty in measurement were implicitly mimicked by the structure of the market measured using the concentration ratios and Herfindahl-Hirschman Index (HHI) and market performance indicators which are gross marketing margins and mark-up costs.

3.2.1.1 The institutional analysis and development framework

The Institutional Analysis and Development Framework (IAD) was used to identify the institutions and institutional constraints present within the formal and informal milk value chains (Fig. 2). This framework was justified due to the presence of wide range of actors, organisations and drivers affecting milk value chains in Bagamoyo District. The framework was developed by unpacking and extending the basic building blocks where exogenous variables are broken down into physical/material conditions, community attributes, and rules in use; actors and action situation are set in an action arena; and the feedback of outcomes to the exogenous variables and action arena is mediated through patterns of interactions and evaluative criteria (Dorward and Omamo, 2009). Interactions among institutions, actors and activities involve actions (contracts and regulations guiding exchange) that lead to outcomes where outcomes (hidden costs of transactions) of these actions may reinforce or change the environment, institutions, activities and actors.

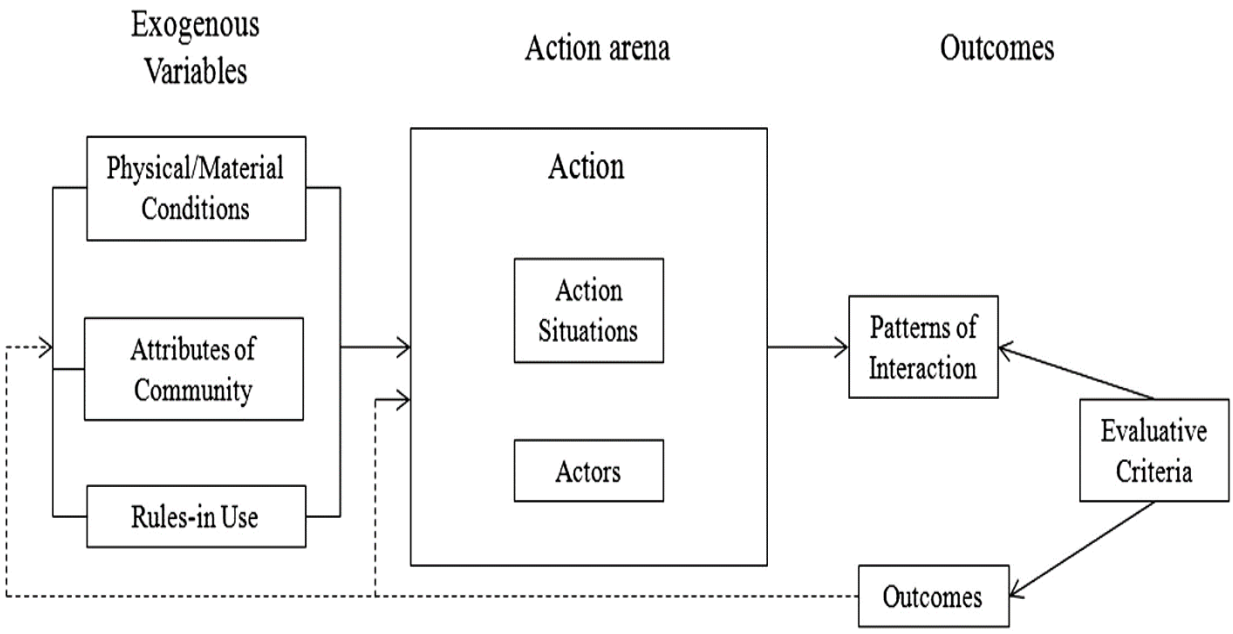

Figure 2: The Institutional Analysis and Development framework

Source: Adapted from Ostrom, Gardner, and Walker (1994)

The influence of change on elements of action domain (institutions/rules of the game, actors and activities) as theorized begins from the forces exerted by the external environment. In this study we grouped the external environment to contain three variables which are physical and infrastructural, social-economic and policy. The physical environment in our context includes the geography and climate features such as rainfall and seasonality and water availability. Socioeconomic environment covers the household characteristics, sources of labour and cultural norms. Policy environment is attached to rules governing production and related chain activities while the infrastructural environments looks on the nature of information and communication network. Interactions among these environments shape the whole structure of activities and finally the outcomes. This study identified these actions/institutions and linked their effects to actors in terms of transaction/hidden costs.

The transaction costs associated with milk value chains in Bagamoyo District emanate from costs associated with losses due to spills and spoilage in milk handling processes and costs arising from lack of contract monitoring and enforcement. Other hidden costs attributed by search for trading partner and accessing information were difficult to empirically quantify but they were signalled by the structure of the market in place.

3.2.1.2 Market structure

The behaviour of institutions or actor interactions and the effect of these interactions is highly justified by the structure of the marker exchange present, this also assist to unveil other hidden costs which hinder well-functioning of the chain which were difficult to quantify. Thus, Concentration ratios and HHI were used to determine the type of market structure present in the formal chain. The n-firm concentration ratio (CR_4) measures the market share of the n largest buyers. If the market share approaches 0 it implies a perfect competitive market structure while if the market share equals 100% it implies a strong oligopsony market structure. A CR_n greater than 50% is indicative of oligopsonist market structure. For this study, three firms concentration ration was used (CR_3) as shown in Equation 4.

$$CR_3 = \frac{\sum_{i=1}^{3} Sales\ \ from\ \ firm\ \ i}{Industry\ \ sales} \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Due to weaknesses inherent with CRn (Borenstein *et al.,* 1999) such as inability to cater for size inequality within each respective group of leading firms, Herfindahl-Hirschman Index was later proposed, where HHI is sum of squared market shares for all *n* industry competitors (Hirschey, 1985).

$$HHI = \sum_{i=1}^{N} S_i^2 \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where CR_4 is the concentration ratio of four firms, HHI is Herfindahl-Hirschman Index and S is the market share of i^{th} firm present in the industry. This study used a CR_3 standard. In a similar manner, the HHI ranges from 0 to 10 000 where a range from 0 to 1000 represent a low concentration or high competition, 1000 to 1800 representing medium concentration which also mirrors the oligopsony type of market structure and a range of 1800 to 10 000 presents high level of concentration, in this case the HHI of 10 000 means perfect monopoly which is achieved if one firm has a market share of 100%. These indexes are all used together because, concentration ratios are more useful to mirror the firm concentration in the industry while HHI squares these firm shares/concentration to obtain size distribution which CR cannot, and it is further used to serve as the benchmark for evaluation of other concentration indices (Chavas and Shi, 2012; Iveta, 2012).

3.2.1.3 Gross marketing margin

Gross marketing margins were calculated to show the magnitude of the effect of transaction costs present in the formal and informal chain. Margins in theory are said to be greatly determined by and on the other hand picture the volume of cost addition given the transactions and pricing behaviour of the player as connected to the underlying structure of the market (Goldberg, 2014). In obtaining the margins, buying and selling prices were averaged across seasons and converted to or set as per litre of Liquid Milk Equivalence (LME) .Gross marketing margin for an actor in the value chain can be obtained using the following expressions.

$$Gross\ \ marketing\ \ m\arg in\ \ = \frac{Selling\ \ \ price - Buying\ \ \ price}{Consumer\ \ \ price} \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Producer's gross marketing margin or the share of the consumer price that the producer gets is obtained by taking the difference of the total market share which is 100 less the sum of Gross marketing margins attributed to other chain actors, also called Total Gross Marketing Margin.

$$\text{Producer gross marketing margin} = 100 - TGMM \quad \text{.....(4)}$$

$$TGMM = \sum (GMM_i) \quad \text{.....(5)}$$

3.2.2 Objective 2: Cost added efficiency in milk handling and processing

In analysing the second specific objective of cost added efficiency in the process of milk handling and processing, methods by Qiao *et al.* (2006) and by Mkhabela and Mndeme, (2010) were adopted where the efficiency of the firm was measured by its ability to minimize unit cost of producing a litre of liquid milk while not curtailing output levels. The added costs were measured and the mean costs were compared across three nodes of collection centres, processors and traders with the use of ANOVA. To ease the comparison, milk and milk products and prices handled at each node were converted to liquid milk equivalents.

With milk traders, collection centres and processors

Cost added ratio (CAR) = cost added /litre of LME .....(6)

The mathematical model that describes the relationship between the response and the treatment for the one-way ANOVA is given by:

$$Y_{ij} = \mu + \tau_i + \varepsilon_{ij} \text{ where } \varepsilon_{ij} \sim iidN\left(0, \sigma^2\right) \quad \text{.....(7)}$$

Where Y*ij* represents the *j*-th observation (*j* = 1, 2… n_i) on the *i*-th actor (*i* = 1, 2, 3 groups). τi represents the *i*-th actor effect and ε_{ij} represents the random error present in the *j*-th observation in the *i*-th actor. Post Hoc test using the Hochberg multiple

comparison procedure was used to compare the mean added costs between processors and other actors.

3.2.3 Objective 3: Cost efficiency for milk producers

The estimation of the milk farms cost efficiency was carried out with the use of the stochastic frontier model by Battese and Coelli (1995). A frontier cost function defines minimum cost for given output level, input prices and the existing production technology. Equation 8 presents the stochastic frontier in implicit form.

$$c_i = c_i(w, y, \beta) + (v_i + u_i), v_i \sim N(0, \sigma_V^2), and\ u_i \sim \left|N(0, \sigma_U^2)\right| \text{……….………………}(8)$$

Where C_i is the normalised total cost of the ith producer, *w* is the vector of normalized input prices, *y* is the vector of milk produced by the ith farmer and β is a vector of the parameters to be estimated. The overall error term is decomposed into two components v_i and u_i. Deviation from the frontier due to random events is represented by v_i while u_i captures deviations from the frontier due to inefficiency.

Total cost function is a function of input prices and output produced where increase in the output produced and price of inputs used is expected to increase the total cost of production holding other factors the same. Also, from the synergistic property of factor inputs in production process, when price of two factors of production are increased proportionately, total cost is expected to increase. This conforms to the quality of a well behaved cost function which should be concave and non-decreasing in input prices where increases in an input price will not encourage its use.

The empirical specification of the model

In analysing the cost efficiency of traditional and improved cattle herd milk producers, the trans-logarithmic cost function was used.

The general form of the translog cost frontier estimated is;

$$c_{it} = \beta_0 + \beta_y y_i + \sum_{i=1}^{2} \beta_i w_i^{\cdot} + \beta_z z_i + \frac{1}{2}\sum_{i=1}^{2} \beta_{iw}(w_i)^2 + \beta_{yy}\frac{1}{2}(y_i)^2 + \beta_{zz}(z_i)^2$$

$$+ \sum_{i}^{2}\sum_{k}^{2} \beta_{ik}(w_i * w_k) + \sum_{y}^{1}\sum_{i}^{2} \beta_{yi}(y_i * w_i) + \sum_{z}^{1}\sum_{i}^{2} \beta_{zi}(z_i * w_i)$$

$$+ \beta_{yz}(y_i z_i) + v_i + u_i \quad \text{.....(9)}$$

Where: $w_i = (w_1, w_2)$, c = ln (total cost per farm/price of drugs), y = ln (annual milk production), w1= ln (price of feeds/price of drugs), w2= ln (price of labour/price of drugs), z = ln (livestock quality) this was computed as the market value of cattle reared, and $\beta_0, \beta_{ij}, \beta_y$ and β_z are parameters to be estimated. The cost efficiency frontier was estimated separately for milk producers who keep improved breeds and the milk is traded informally and for producers in the hinterland who normally keep local breed and the milk is traded in the formal channel. According to Battese and Coelli (1995) the inefficiency error component u_i is assumed to follow a truncated normal distribution with mean as a function of the explanatory variables (household social-economic attributes in our case).

Table 1: Description of cost efficiency variables

Cost efficiency variables	Definition	Expected sign
Annual milk produced (Y)	Total volume of milk produced during the agricultural season of 2012/2013	+
Normalized Price of feeds (w1)	This is the weighted price of all feeds used in the agricultural period 2012/2013	+
Normalized Price of labour (w2)	This is the average monthly wage paid for labour. Non-cash payments (in kind) were valued depending on the market price of an item exchanged	+
Livestock quality (z)	This is the market value of the milking herd present in the i^{th} farm.	+

3.2.5 Objective 4: Inefficiency model

To cater for the fourth specific objective of determining factors associated with farmer's inefficiency, the second process of simultaneous stochastic cost frontier estimation process was involved in the estimation of u_i from the cost function. The inefficiency is captured by the one sided distribution of u_i with the higher values of u_i representing greater deviations from minimum cost. This estimation method is implemented assuming the specific exponential, gamma, and half-normal distributions.

Given these specifications, it is possible to derive marginal density, mean and variance of $e_i = u_i + v_i$. Because the residual of this procedure is e_i and not u_i, the component of the error due to inefficiency is not directly observable from the estimates of the model (Lapar *et al.,* 2005). According to Jondrow *et al.,* (1982) firm specific inefficiency term can be recovered conveniently, that an expression for conditional distribution of *u* given *e* can be obtained by, $f(u|e)$. Thus an estimation of the cost function that incorporates e_i using MLE or method of moments provides estimates of the cost inefficiency term, u_i. The measure of cost inefficiency *CEi* can be expressed as.

$$CE_i = \{C_i(w, y, \beta)/e_i\} = E(\exp\{-u_i\}|e_i \quad \text{.....(10)}$$

This measure provides inefficiency estimation that is limited to producer-specific estimates of the cost inefficiency. Therefore, estimation of u_i can be followed by using the following equation:

$$u_i = \gamma_i z_i + \varepsilon_i \quad \text{.....(11)}$$

Where Z_i's are the variables that explain the inefficiency.

Empirical model of inefficiency

The empirical equation used to analyse the socio-economic factors affecting the inefficiency of milk producers was:

$$u_i = \delta_0 + \delta_1 M1 + \delta_2 M2 + \delta_3 M3 + \delta_4 M4 + \alpha_1 D_L + \alpha_C D_C + \omega \quad \text{……..……..…} \quad (12)$$

Where;

u_i = one sided half-normal error, m1= age of the farmer, m2= formal education (years of schooling), m3= household size, and m4= number of milking cows, D_L and D_C are local and cross breed dummies, (dummy for pure breed was used as an omitted category) and ω being a two sided random error. δ_n, α_l and α_c Are the parameters to be estimated (n=1, 2, 3, and 4).

Table 2: Description of cost inefficiency variables

	Cost inefficiency variables	
Independent variables	**Description**	**Expected sign**
Age of the farmer	Years of the household head/farmer	-
Education	Are number of years of schooling	-
Household size	The total number of individuals living in the particular household measured in adult equivalence	+
Number of cows in milk	Total number of cows in milk per household in 2013	+
Type of cattle Breed kept (as Dummy variables)	DL-local breed DC-cross breed	+ -

Increase in the age of the farmer is expected to decrease the inefficiency as the farmer becomes more experienced and skilful. Similarly, more years of education and training equip farmers with more skills which will reduce the farm-level inefficiency. Increase in the size of household increases the dependence which further increases the farm-level

inefficiency as more milk will be used for home use. Increase in the number of cows in milk/herd s said to increase farm cost inefficiency as more cost will be incurred in feeding and management. The inefficiency scores are also said to be explained by the type of breed kept where local breed who are low milk producing increases the mean level of inefficiency when compared to improved breed who are more productive.

3.3 Description of Study Area

Data for this study were collected from producers, processors and traders in Bagamoyo District. Bagamoyo District is one among the six districts which make up the Coastal Region (Fig. 3). Geographically, the district is located between 37^0 and 39^0 East and between 6^0 and 7^0 South of the Equator. Bagamoyo town is the district administrative centre located 65 kilometres north of Dar es Salaam. The district borders Morogoro Region from the West and Mvomero, Kilindi, and Handeni Districts from the North. According to national census of 2012 the district had a population of about 311,740. Geographically Bagamoyo District is a low lying area with an altitude of 152 meters above the sea level and covers an estimated area of 9 847 km^2 with a population density of about 31.66 inhabitants/km^2. The district has a humid tropical climate with an average temperature ranging from 13^0C – 30^0C and rainfall ranges between 800 to 1200 mm per annum, rainfall goes down to about 50 mm per month in driest months of June to September. The favourable climate, abundant water supply from the Wami and Ruvu river systems and large unused land, provide suitable conditions for livestock production attracting migration of pastoral tribes into the district (Mkama *et al*., 2013).

Agro-ecologically, the district can be divided into the coastal belt and the hinterland. Milk producers in the coastal belt practice zero grazing feeding system and about 85% of the cattle population is of improved breeds with high potential for milk production (average

of 6.5 litres per day/cow). Livestock keepers in the hinterland practice free grazing system and about 78% of the cattle are of local breeds with low potential for milk production (average of 2 litres of milk per day/cow). Some socioeconomic features of households shows that 92.6% and 55% of farmers in the hinterland depend primarily on dairy keeping and rearing of other livestock respectively. On the other hand, 60.2% of farmers in the coastal area depended on dairy keeping as the main source of their livelihood. This scenario can be explained due to the fact that most farmers in the hinterland were pastoralists thus livestock rearing was mainly a tradition.

Milk from Bagamoyo District passes through two alternative value chains namely formal chain and informal chain. The formal value chain involves milk that passes through collection centres owned by cooperative societies and processing plants. This chain was common in the Bwilingu, Msoga and Lugoba wards in the hinterland part of the district Fig. 3). The informal value chain involved milk passing through individual traders to consumers without formal processing. This chain was common in Fukayosi, Dunda and Kerege wards in the costal belt of the district. The formally traded milk goes as far as Dar es Salaam city, about 100 km from Chalinze Township in the hinterland while most of the informally traded milk is sold to consumers in Bagamoyo Township present in the coastal belt.

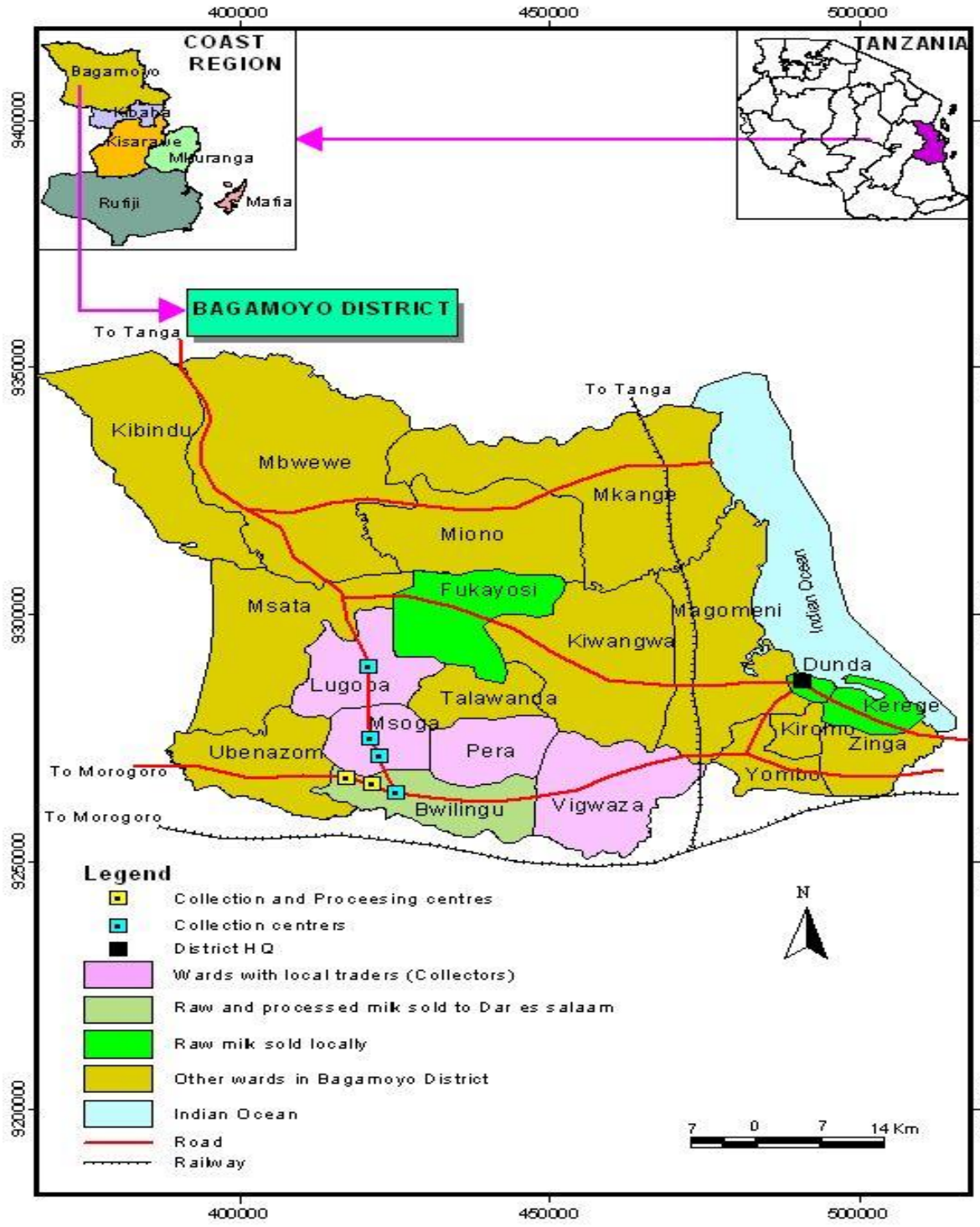

Figure 3: Map of the Bagamoyo district showing the wards with dairy activities

3.4 Survey Design

3.4.1 Sampling

The study involved three principle actors mainly producers, traders and processors. Based on the three groups of actors the following target populations are defined: Population of milk producers, population of milk traders and population of processors.

3.4.1.1 Milk producers

In selecting milk producers, all wards where livestock production is important were included. Two strata of coastal belt and the hinterland were created with respect to the distribution of the villages. Two stage sampling plan was applied in which villages were used as sampling units for stage one and whose selection was with probability proportional to size, and in stage two households producing milk were used as the sampling units where the simple random sampling procedure with equal probability of selection was used. From the two strata, 11 villages were selected from the coast and 15 from the hinterland where, four and eight households were randomly drawn from each village in the coastal belt and hinterland respectively. Thus, 50 milk producers were sampled from the coastal belt and 117 from the hinterland, making a total sample of 167 milk producers.

3.4.1.2 Other chain actors

Snowball method was used to obtain a sample of 31 downstream and upstream traders composed of 11 milk collectors, 8 raw milk traders/vendors and 12 traders in Dar es Salaam who sold processed milk from the hinterland. A census was used for milk collection centres and processors leading to 6 collection centres and 4 processors were obtained but only 4 milk collection centres and 3 processing firms were interviewed due to non-responses.

3.4.2 Data collection

Semi-structured questionnaires containing both closed and open ended questions were used to collect primary data from sample milk producers, traders, collection centres, processors, and organisations overseeing the development of the sector in the district. Data collected included households characteristics (for example age, gender, education level attained and the like), herd size, inputs used and their prices, milk production and marketing, costs of production, breed type, institutional arrangement (laws, and modes of organisation if any) and the information pertaining to dairy production and marketing problems. Questionnaires and the interviews were all translated in Swahili language so as to easily obtain accurate information in the process. Quality of interviews was maintained through daily/evening check on what has been collected to maintain consistency and accuracy of the information gathered.

Secondary data were obtained from TAMPRODA, TAMPA and TDB by consulting various relevant documents, both published and unpublished data on milk issues with a view of obtaining insights of the industry value chains.

Recruitment and training of the enumerator

The process of recruitment and training of the enumerator took place on 28th of February, 2014. One enumerator was picked based on academic qualifications (he was a degree holder in rural development) with a minimum of three years of experience in data collection, and willing to work for a long period of time basically among the pastoral households. Training took one day (1 March, 2014) covering: instrument administration, interview techniques, familiarization with the questionnaire format and recording procedures. The administration of the questionnaire was conducted within a period of 26 days from 2 to 28 March, 2014. Apart from the questionnaire, informal discussions guided

by checklist were also held with key informants such as government agricultural officers for their views and opinion on matters pertaining dairy development in the district.

Variables and their quantification

A number of analytical variables were constructed based on the collected data. These analytical variables are herd size in cow equivalents, household size in adult equivalents, weighted price of feed, weighted price of drugs, price of labour, and total cost of production. Each variable is summarised below.

Herd size: The number of cows, heifers, bulls and calves per household were converted to cow equivalents, where Alam *et al.* (2007) valued an adult cow equal to 1. A heifer and a calf equal to 0.8 and 0.4 cows respectively and a bull being equivalent to 1 cow.

Household size: Household size variable was obtained by converting the number of individuals present in one home using adult equivalence scales. The scales are used because the needs of a one person household differs with three persons living in the same household, however the economies of scale in consumption are disproportionate with the increase of every one individual. Thus, AE assigns values proportional to the need of every individual in a household. The Oxford standard/OECD Adult Equivalents (AE) standard which assigns a value of 1 to the first adult household member and 0.7 to each additional adult, 0.5 was assigned to each child with less than 18 years of age (OECD, 1982: Atkinson *et al.*, 1995).

Weighted prices of inputs: Drugs: two frequently used drugs were identified where their volumes and prices were converted into units of Tshs per litre. Given the frequency of use, weighting was done as per total volume of each drug and their respective prices.

Feeds: The price of one bushel of grass was obtained for households who practiced zero grazing, while, for free grazing households feed price was imputed from the monthly wage of an individual hired to graze, mainly amongst pastoral farmers whose payment was done in-kind (using a bull/heifer per year or 6 month of grazing). The market value of the item was imputed and allotted as the monthly cost/price of feeding.

$$Imputed\ cost\ of\ feeds = \frac{Market\ value\ of\ the\ item}{Months\ of\ grazing} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Cost of production: Costs of production were categorized into fixed and variable costs. Variable costs of production were categorized as costs from feeds, supplements, drugs, labour, breeding, water, other veterinary service cost (dipping and deworming), utensils, communication and miscellaneous (milk salve and ropes). Fixed costs were the depreciated purchase price of spraying machine (solo) and cow sheds. Straight line accounting method of depreciation was used to equally spread the asset depreciation over the years of its projected use.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter starts by presenting the structure of the milk value chains and household characteristics of milk value chain actors present in the study area. This is followed by results and discussion from empirical analysis of institutions and their constraints, market structure, marketing margins; added cost efficiency and cost efficiency.

4.1 Milk Value Chains

From the sampled farmers, about 1.25 million litres of milk were produced in the year 2013. About 814 000 litres came from the traditional cattle and 444 000 litres from the improved cattle, this is equivalent to 65% and 35% respectively. About 1.2 million litres of liquid milk, equivalent to 92.3% of the total milk produced was marketed via the formal and informal channel, while, 96 000 litres (7.7%) litres were consumed at home. Milk in raw or processed form reached final consumers through four different outlets. All sampled farmers in the coastal belt sold milk via the informal channel while in the hinterland 27.3% and 72.7% of milk was sold through the informal and formal channels respectively. Considering these proportions in general, 54.3% of the marketed milk in the district was channelled through the informal chain out of which 68.6% was sold directly to consumers and 31.4% to the vendors who sold to consumers, and 45.7% of milk marketed being captured by the formal channel out of which 93.5% was collected from the farmers by traders and sold to collection centres and the rest was sold to the collection centres by farmers themselves. Raw milk sold to collection centres was channelled to the processors for further processing into cultured milk and yoghurt by the medium scale firms[1]; and to cheese and butter by the small scale processors.

[1] Processors who handled less than 500 litres of milk per day were grouped as small scale processors while those who handled 500 to 5 000 litres per day were grouped as the medium scale processors. All the surveyed medium scale processors did not produce cheese and/butter but small ones did.

From Fig. 4, the dotted arrows show the formal channel milk flow where the milk passes via number of stages/nodes before it is finally processed. The solid arrows represent the informal chain where milk is either traded to vendors or directly to consumers by farmers themselves. The formal channel is longer than the informal one with higher risk of contamination and spoilage. Non-marketed milk was consumed at the farm in either raw or sour state as depicted by the double line filled arrows. Milk from the formal chain was largely sold to consumers in Dar es Salaam.

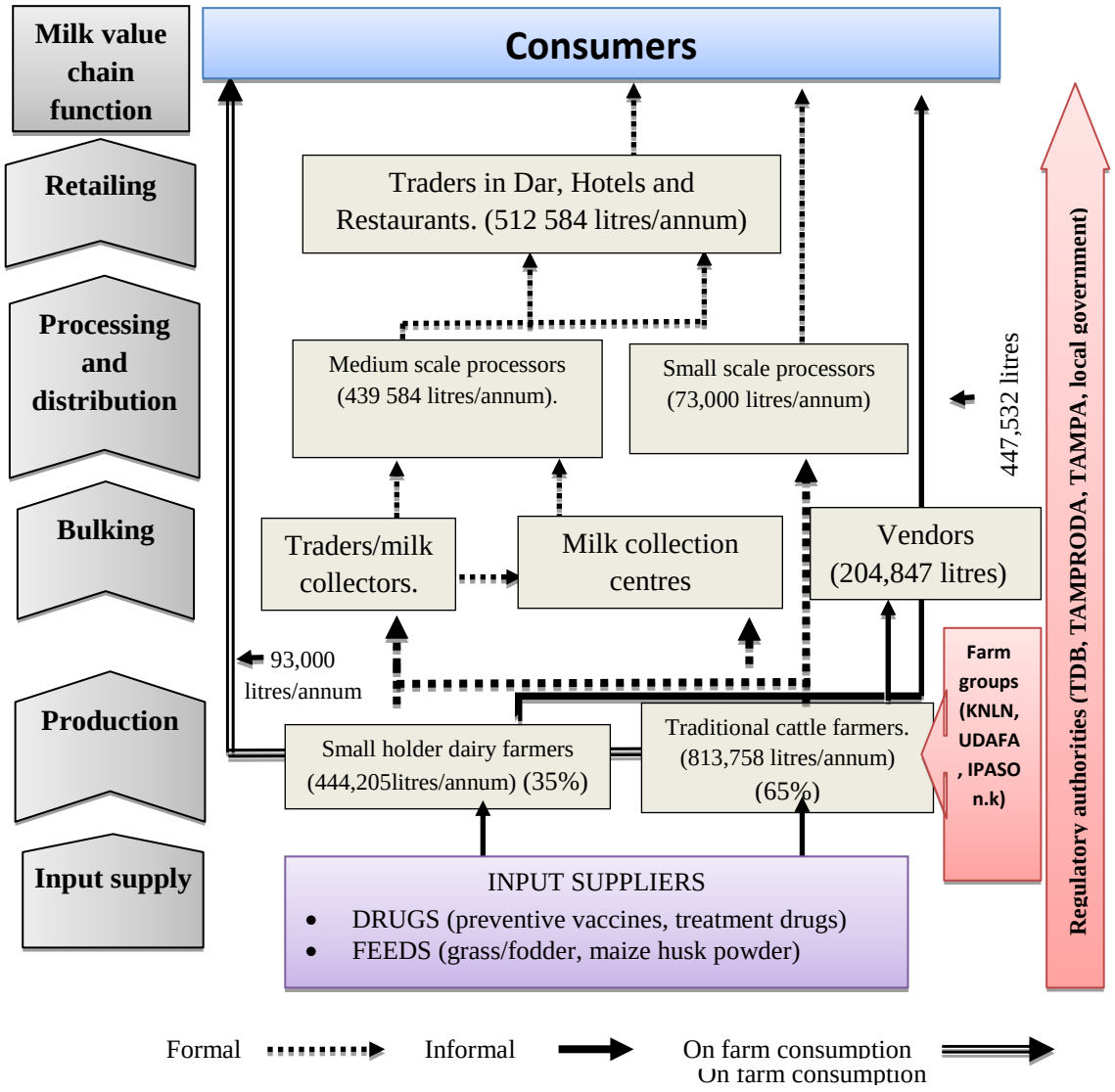

Figure 4: Milk value chain flow diagram of the Bagamoyo district

The pastoralists who were mainly the Maasai were highly scattered, and individually supplied small volumes of raw milk per cow (average of 2.4 litres per cow per day). Seasonality factor had great impact in raw milk production variation.

From Table 3, the distribution of the per day litres of milk sold in the two areas was not normally distributes/right skewed with mean's greater than median values. Thus, with the right skewed values of 6.31 and 3.5, median values best describes the results. The median quantity of milk sold per day in the wet season for households in the coastal belt was 10 litres while in the dry season the sales fell drastically to 5 litres per day. This difference was found to be significant at 10%. Similar results were observed in the hinterland area of the district where a median of 10 and 4 litres of milk were sold per day in the wet and dry season respectively.

Table 3: Seasonal milk sales in litres per day for households in the coastal belt and hinterland

	Coastal belt		Hinterland	
Season	Wet	Dry	Wet	Dry
N	50.0	50.0	117.0	117.0
Mean	15.72	9.45	18.5855	7.0855
Median	10.0	5.0	10.0	4.0
Skewness	6.31	6.211	3.587	3.454
Std. Error of Skewness	0.337	0.337	0.224	0.224

From Table 4, the volume of milk sold by households with local and improved herd in the hinterland areas did not differ significantly. In the wet and dry seasons, households with improved dairy herd on average sold at least 10 litres of milk per day. This shows that, other factors held the same, improved herds are more productive than the local breeds. These results also agree with the study by Njombe *et al.* (2011).

Table 4: Milk sold across the seasons among local and improved breed households in the coast and hinterland areas (litres per day)

Location	Season	Breed	N	Mean	Std. Deviation	Sig
Coastal belt	Wet	Local	13	9.0	5.12	
		Improved	37	18.1	32.09	
		Total	50	15.7	27.92	0.286
	Dry	Local	13	3.1	3.55	
		Improved	37	11.7	24.59	
		Total	50	9.5	21.49	0.252
Hinterland	Wet	Local	83	20.3	26.27	
		Improved	34	14.5	20.22	
		Total	117	18.6	24.72	0.191
	Dry	Local	83	7.0	12.03	
		Improved	34	7.3	10.63	
		Total	117	7.1	11.60	0.585

Some pastoral families' stopped selling milk in the dry season as the amount of milk available was only enough to feed the calves. Milk collectors perform an important function of bulking small quantities from the producers and transporting the product to collection centres or local processors in Mdaula, Chalinze and Lugoba. The mode of transport used is motorcycles which can reach areas not accessible by other types of motorized vehicles (Plate 1). A single collector is able to transport between 80 and 120 litres per trip in plastic containers. The milk collectors are either contracted by collection centres and local processors or paid between Tshs. 3000 and Tshs. 5000 per day (equivalent to 62 Tshs. /litre) or operated their own businesses. Some of collectors were provided with milk testing kits to verify milk quality on site before transferring the milk into their own plastic containers. Milk was again tested on delivery at the collection or local processing centre. It was revealed during discussion with producers that they were not paid if the milk was rejected in the second testing. Milk collected in Lugoba and Msoga wards were sold to TangaFresh milk processing firm as the collection centres entered into contract with the firm, they operated in a partnership manner as the processing firms provided them with the cooling tanks (Plate 2) while the collector was responsible for testing kit materials and containers used for milk collection.

Plate 1: Raw milk transported in plastic containers

Plate 2: Milk cooling machine at Lugoba milk collection centre

Other firms operated individually where they either sold the cooled milk to the processor or process on their own. After collection, the milk is either processed or transported to the processing industry or sold in a raw form at the Dar es Salaam milk consumption centre. Milk processors in the district marketed their product to traders in Dar es Salaam who sele the milk to customers.

4.2 Characteristics of Milk Chain Actors

The characterization of milk producers along the formal and informal chain was done by comparing their socio-economic characteristics in the formal and informal chain based on total cost per litre of milk produced. Total cost per litre of milk was divided in to three terciles corresponding to low, average and high cost per litre. Table 5, presents the ranges of these terciles in the two chains where for the formal chain producers, low cost of milk production per litre ranged from a minimum of Tshs. 22.14 to Tshs. 234 per litre. Households within this range were said to be in the low group while those with a cost of Tshs. 523 to Tshs. 1670 per litre of milk produced were said to be in the high cost tercile. In the informal chain, producers were said to be low cost producing if their cost per litre of milk produced ranged from Tshs. 55 to Tshs. 247, and high cost group if their cost per litre of milk produced was between Tshs. 516 and Tshs. 2100. Thus, the characterization of milk producers followed these ranges for a more descriptive understanding of their behaviour across the formal and informal milk chains.

Table 5: Descriptive statistics of cost of milk per litre in the formal and informal chains

Chain	Cost tercile	N	Mean	Std. Deviation	Minimum	Maximum
Formal	Low tercile	34	111.19	68.9762	22.14	234.54
	Middle tercile	17	366.01	79.8663	250.84	509.71
	High tercile	30	853.29	289.4762	523.31	1 669.53
	Total	81	439.52	380.4999	22.14	1 669.53
Informal	Low tercile	21	177.92	58.5342	55.74	247.26
	Middle tercile	39	354.28	71.7633	248.86	507.67
	High tercile	26	869.02	476.548	516.7	2 100.34
	Total	86	466.83	381.8549	55.74	2 100.34

4.2.1 Characterization of milk producing farmers

Age

According to Singh *et al.* (2003) age can be an indicator of experience, extent of wealth accumulation and capacity of decision making which affect how one works and his/her productivity. Younger farmers are said to be less productive and cost effective than the older ones despite being more energetic. Lapar *et al.* (2005) documented that age is an important factor that influence dairy farm efficiency levels. From Table 6, the percentage of farmers with low cost per litre tends to increase with age (see low tercile) for both formal and informal channels, this condition can be explained that younger farmers are less experienced than older ones, thus being less effective.

Table 6: Age distribution of milk producer by cost tercile and value chain (%)

	Formal					Informal				
Age group	N	Low tercile	Middle tercile	High tercile	Total	N	Low tercile	Middle tercile	High tercile	Total
15-40	48	35.4	20.8	43.8	100.0	34	23.5	35.3	41.2	100.0
41-60	23	47.8	17.4	34.8	100.0	42	23.8	52.4	23.8	100.0
>60+	10	60.0	30.0	10.0	100.0	10	30.0	50.0	20.0	100.0
Total	81	42.0	21.0	37.0	100.0	86	24.4	45.3	30.2	100.0

Education

According to Table 7, 56% of farmers in the formal chain were illiterate while about 81% of those in the informal chain were educated, the results show that, the percentage of households with low cost per litre increases with the level of education in the informal channel and formal channel although for formal channel the difference was small. This could be attributed by the small size of the sample. The results are supported by the fact that skilled households are also more productive and can efficiently engage in dairying by minimizing costs of production and maximize returns, where education cultivates new farming skills (Mkongo 2007; Kumar and Staal, 2010).

Table 7: Distribution of milk producer by level of education and cost tercile (%)

	Formal					Informal				
Education	N	Low tercile	Middle tercile	High tercile	Total	N	Low tercile	Middle tercile	High tercile	Total
Un-educated	46	39.1	21.7	39.1	100.0	16	25.0	43.8	31.2	100.0
Primary	30	46.7	16.7	36.7	100.0	48	22.9	45.8	31.2	100.0
Post primary	5	40.0	40.0	20.0	100.0	22	27.3	45.5	27.3	100.0
Total	81	42.0	21.0	37.0	100.0	86	24.4	45.3	30.2	100.0

Breed

Table 8 presents how breed type was associated with cost per litre of milk produced in formal and informal chain. Milk production with local breeds in the formal chain was observed to be of low cost as 56.9% of milk producers were in the low cost tercile, while 80.6% of milk producers with improved breed were high cost producers. This can be explained by the fact that most local breed kept by the pastoralists used small or not of the prepared inputs when compared to improved ones.

Table 8: Distribution of milk production by cattle breed and cost tercile (%).

	Formal					**Informal**				
Breed	N	Low tercile	Middle tercile	High tercile	Total	N	Low tercile	Middle tercile	High tercile	Total
Local	72	56.9	41.7	1.4	100.0	24	45.8	45.8	8.3	100.0
Improved	9	33.3	33.3	33.3	100.0	62	0	19.4	80.6	100.0
Total	81	54.3	40.7	4.9	100.0	86	12.8	26.7	60.5	100.0

Number of cows in milk

In Bagamoyo, cost per litre given the size of cows in milk varied with the type of the chain. From Table 9, formal chain households with a mean of 32 cows in milk (keeping in mind that 90% of these households kept local breed) were observed to be in the low cost tercile. While for informal chain households, cost per litre increased with the increase in the number of cows in milk. The size of the dairy herd / cows in milk from other studies is observed to have a varying impact on cost efficiency. This study agreed with the findings by Karanja, (2002) and Kavoi *et al.* (2010) where increase in the number of cows in milk was found to be cost effective.

Table 9: Distribution of milk producers by cows in milk and cost tercile

	Formal			Informal		
Number of cows in milk	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Low tercile	34	31.94	26.50	21	7.05	10.29
Middle tercile	17	12.47	8.80	39	3.46	3.33
High tercile	30	13.53	11.38	26	7.38	12.09
Total	81	21.04	20.96	86	5.52	8.74

4.2.2 Characterization of milk traders

Age distribution

From Table 10 Milk traders were all found to fall within the age group of 31 to 45 years. Age distribution among collectors and retailers was found to be distinct where collectors were younger than the retailers. Given the fact that the accumulation of wealth is dependent on age, these traders are also potentially active and mature to accumulate enough wealth from milk trading process (Jappelli, 1999).

Sex

Traders or milk collectors who sold milk to collection centres and or processors were all men (Table 10). This was due to the fact that they collected the milk from interior parts where pastoralists resided and used motorbikes (Bodaboda), 78% and 100% of vending or retailing of milk produced and processed was done by women who are said to have high entrepreneurial abilities of marketing compared to men (Kraft, and Weber, 2012).

Education level and experience

Unlike farmers, all the categories of milk traders had formal education. About 51% of the retailers had the experience of 6 to 10 years, this signal that milk trading has been beneficial overtime as they had not changed their occupation unlike vendors and collectors whose proportion decreased with the increase in the years of experience. More years of experience are said to equip traders with skills to increase productivity and product quality so as to capture changing consumer demands (Mbiha, 2008).

Table 10: Characterization of milk value chain traders (%)

	Traders		
	Collectors (n=11)	Vendors (n=8)	Traders in Dar (n=12)
Age			
15-30	44.4	30.0	16.7
31-45	55.6	50.3	50.0
46-60		19.7	33.3
Sex			
Male	100	22.0	
Female		78.0	100.0
Education level			
Un-educated			
Primary	66.7	65.8	100.0
Secondary	33.3	24.0	
Tertiary		10.2	
Experience			
1to5	44.4	68	48.8
6 to 10	22.2	32	51.2
11 to 20	33.3		

4.3 Institutions Present in the Formal and Formal Milk Value Chain

The analysis of institutions involved the identification of their contractual arrangements, laws and regulations guiding dairy activities and organisations coordinating efficient undertaking of these activities.

In Bagamoyo, organisation of formal and informal milk value chain differ in some ways where sport market largely dominated the exchange process in the informal chain while a seven to ten days payment structure was common in the formal chain. About 85% of all households who traded their milk in the informal channel were paid on spot/cash basis. From institutional economics literature this is the common form of exchange or gorvance where the level of coordination is non-existent due to low level of asset specificity and high risk as there were no standard quality checks. The nature of interaction among value chain actors in the study area was structured by the contractual arrangements agreed to in an exchange process, rules in use which varied greatly depending on the location with some places like Fukayosi and Chamakweza wards where pastoral tribes lived for a long

period of time being marked as pastoral areas, population distribution and ethnicity. The interaction between the external environment and other actor attributes greatly explain why the nature of institutions and its effects on the actors behave as observed. This study discussed the present institutions from the transaction cost viewpoint as constraints which limit sector development and attainment of stated potentials.

4.3.1 Contractual arrangements

The contractual arrangements among milk value chain actors in the district are presented in Table 11. It was observed that, from the sampled milk producers, 73 formal and 70 informal chain milk producers had short-term informal type of contracts based on trust or mutual understanding about specified prices and quality. The enforcement of contracts with the traders or consumers at this level was highly dependent on trust and reputation which has been built through repeated interactions. This form of involvement is said to reduce expost transactions costs in the adaptation of hybrid structures of exchange (Martino, 2010). Gabre-Madhin (2009) termed these types of contracts as relational contracts. In the informal channel, milk quality was not a key criterion as only 5 out of 81 households were reported to care for quality in the exchange process. Dorward and Omamo (2009) argued that when actors are exposed to high risks of loss from transaction failure due to significant investments in specific assets and uncertainty in prices, product and/or transaction partners, they often wish to engage in bilateral contracts or even in vertically integrated hierarchical contracts rather than spot-market transactions to reduce risks. Similar scenario was also observed in Bagamoyo, as milk moved high up in the chain, forms of contracting changed where 28 traders were observed to enter into long-term contracts with the collection centres for specified milk quality assessed in terms of alcohol and water content and price. Two out of the four collection centres had short term and formal contracts with processors. Formal contracts between collection centres and

processors are specified by large volume handled and its perishable nature which further increases risks arising from spoilage. Thus to insulate against these risks given the specificity of assets used in cooling and handling process collection centres required formal contracts with the processing firms.

Table 11: Distribution of contractual arrangements among value chain actors (frequencies)

Contract description	Criteria	Producers (n=167)		Traders (n=31)	Collection centres (n=4)
		Formal (n=81)	Informal (n=86)		
Form of contract	Short term	73	70	3	2
	Long term	8	16	28	2
Nature of contract	Informal	81	81	28	2
	Formal			3	2
Terms of agreement	Specific price		79	3	
	Specified volume		2		
	Specified quality		5	3	
	Specific price and quality	81		25	4

4.3.2 Laws and regulations guiding dairy production

The presence of formal and informal regulations and laws in particular society also influences the nature of activities that are undertaken. In the dairy sector, formal and informal regulations guiding milk production, handling, processing and marketing are all well stipulated and entrusted to the regulatory authorities overseeing the sector like Tanzania Dairy Board (TDB) for enforcement. As stipulated in the section 17 (1-2) of the Dairy Industry Act, Cap 262 of laws of Tanzania, a firm will operate dairy activities if and only if it is registered and allowed to operate by the Board given the well stipulated conditions. It cuts across all milk producers, processors, milk collectors, transporters, trader, milk or milk product importer or exporter, dairy input suppliers, manufactures, and retailers. Before registration, the stakeholder shall comply with conditions /regulations set for each category. Milk producer conditions/regulations were capacity to produce more than 10 litres per day, suitable place for milking, possess suitable milking utensils, able to

adhere to hygienic milk production and good Animal Husbandry Practices. Milk collectors are required to possess suitable milk handling equipment which should be a rigid body made of stainless steel or aluminium alloy which is easy washable, air tight and tanker able to resist corrosion and protect milk against dust and extreme temperature changes; he should also possess cooling and milk testing facilities. Milk processors and importer are required to have a valid license issued by a food regulatory authority, while traders/input suppliers are required to have a valid trading license. The results from Table 12 show that, about 58% of all sampled households were unaware of any laws and regulations governing milk production and marketing. Moreover, this proportion may mean that resources such as land used in production may be in danger of depletion due to overuse. Livestock keepers were aware that they are required to keep off from land earmarked for agriculture and 36.5% indicated that village leaders were responsible in enforcing the regulation.

Table 12: Laws guiding dairy at farm level

		Percentage
Awareness of the laws and regulations	Yes	42.3
	No	57.7
Laws (formal and informal)	Membership rules	3.6
	To practice zero grazing	15.0
	To care for environment	3.0
	Not grazing on farmers land	16.8
	No farming	5.4
	Milk adulteration	0.6
Responsible organ/individuals	Village government and farmers group leaders	36.5
	Farmers	7.8

4.3.3 Organisations

Various bodies have been established to serve the interests of the members they represent. These bodies are the Tanzania Dairy Board (TDB) which is a statutory body; Tanzania Milk Producers Association (TAMPRODA) and Tanzania Milk Processors Association

(TAMPA) which are voluntary associations. The Tanzania Dairy Board is responsible for overseeing all activities pertaining to dairy sector (regulation, development, promotion and advocacy) as stipulated in the Tanzania Dairy Industry Act No. 8 of 2004. TAMPA and TAMPRODA were formed to serve the interests of their registered members (milk processors and producer respectively) with the main aim of creating a better dairy business environment. Performance of these organisations in the district was observed to be minimal due to presence of very few farmers associations, whose ability to serve the members is also low due to among other things lack of funding.

Along the informal chain (Table 13), Upendo Dairy Farmers Association (UDAFA), IPASO and *Kopa Ng'ombe Lipa Ng'ombe* group are the identified farmers associations, while, *Umoja wa Wanawake Wafugaji Chalinze* (UWAWACHA), NABOISHU and NARETISHO were identified in the formal chain, the latter two are in the risk of ceasing to exist due to irresponsibility and inefficiencies caused by lack of common goal, recognition and supervision by regional and national regulatory bodies. Services provided to members include, credits, common purchase and sharing of inputs like drugs and breeding services, and a social system of helping each other financially in good and worse times. Only 30% of all the sample farmers belonged to these associations. At milk collection level, only one collection centre (Dairy Firm 1) was registered by the TDB, otherwise all other collection centres, traders and processors were also not organized; with this situation lack of strong and effective organisations in the milk sub-sector lock producers and others milk chain actors from accessing important dairy improving services like credit, insurance, education and training.

Table 13: Farm level organisations

		N	Location/ward	Mean entry fee	Status	Status with TDB
1	UWAWACHA	8	Bwilingu	12 750	Active	Unregistered
2	NABOISHU	2	Bwilingu and Pera	0	Ceased	Unregistered
3	NARETISHO	3	Pera	25 000	Ceased	Unregistered
4	ENYORATA	1	Bwilingu	40 000	Active	Unregistered
5	OLPARAKO	1	Pera	0	Active	Unregistered
6	KOPA NG'OMBE LIPA	12	Dunda and Kerege	16 000	Active	Unregistered
7	NG'OMBE UDAFA	11	Kerege	20 000	Active	Registered
8	IPASO	10	Bwilingu	44 000	Active	Unregistered

4.4 The Institutional Constraints

The analysis of institutional constraints is based on transaction cost economics where these costs arise due to the nature of interaction among actors. The transaction costs arise due to incomplete contracts or contract failure, and inefficient milk handling.

4.4.1 Costs due to incomplete contracts

From Table 14, milk producers in the formal chain incurred a median cost of Tshs. 52 400 per year being equivalent to Tshs. 50.8 per ton of milk produced due to incomplete contracts. These costs arose as a result of incomplete contracts that failed to insulate value chain actors from opportunism and risks attributed by the exchange process. Grossman and Hary (1986) documented that “contracts whether written or unwritten and whether linked to business or to the use of natural resources are essentially incomplete because of the bounded rationality of the contracting parties and the non-verifiability of relevant variables necessary to make the contract complete”. These were costs of milk shouldered by farmers when milk was found unfit at the collection centres, these were considered as costs due to incomplete contracts because the informal contracts that existed among farmers and traders do not state the terms and conditions of exchange and risk

management. These costs constrain sector development as farmers are discouraged to produce and participate in the formal chain. Although collection centres had written contracts with their customers (processors) milk collection centres on the other hand incurred a median cost of Tshs. 6.19 million which is equivalent to Tshs 6000 per ton of milk handled, these were losses incurred as processors paid low price than what was previously agreed in the contract. Legal action was not taken due to the lack of enforcement and fear of business shutdown.

Table 14: Costs incurred due to incomplete contracting

Actor	Value in Tshs per year (000's)	Value in Tshs per ton
Milk producer	524	50.8
Collection centres	619 000	6000

4.4.2 Transaction costs associated with inefficient milk handling

A large share of transaction costs arise due to milk spoilage and spills According to the results in Table 15, milk producers in the formal and informal channels lost a median of Tshs. 91 003 and Tshs. 36 000 per year (which is equivalent to 0.17 and 0.07 tons per year) from spills and spoilage. Costs due to spoilage were mainly incurred by producers in the formal channel. These costs were unreasonably shouldered by farmers and milk traders/collectors after finding the milk unacceptable once bulking processes is done from several other farmers.

Table 15: Transaction costs attributed by milk spoilage in 2013 (Tshs. per year)

Item	n	Mean	Standard dev	Median	Tons of milk (LME)
Informal chain					
Farmers	22	45 767	20 073	36 000	0.07
Formal Channel					
Farmers	81	95 003	79 698.9	91 003	0.17
Traders	12	280 750	152 450	262 000	0.54
Collection Centres	4	965 000	804 052	610 000	1.55
Processors	3	603 000		603 000	1.13

This study revealed that the plastic cans used by the traders in milk bulking as shown on Plate 1 made milk to be of low quality as they are difficult to thoroughly clean compare to well-designed aluminium cans. The median of Tshs. 262 000 which is equivalent to about 520 litres or 0.54 tons of raw milk were found unfit from traders hands. At the milk collection centres, losses were frequently caused by power cuts where in 2013 a median of Tshs. 610 000 (1.55 tons of milk/year) was lost. At milk processing level firms lost a median of Tshs. 603 000 which equals 1.13 tons of milk in 2013. No spoilage was recorded among the vendors because little milk left untraded was either kept for the next day or used at home. The difference in the costs between the formal and informal chain was found to be statistically significant at 5%. These costs were higher in the formal chain than the informal chain. These results are consistent with that of Staal *et al*. (1997) and Holloway *et al*. (1999) where large proportion of transactional costs in the dairy sub-sector arise due to handling problems with reference to its perishable nature.

4.4.3 Market structure

Along the formal chain six firms were engaged in milk bulking or collection. The concentration ratio (CR_3) showed that the top three firms Dairy 1, Dairy 2 and Dairy 3 dominated the milk bulking process in the district, accounting for 81% of total milk purchased in 2013 (Fig. 5). Results of Herfindahl index were also similar to those of CR_3 where an index of 2277 represented the existence of oligopsony market structure. Collusion and competition triggered by seasonal milk variation characterized the formal milk chain in the district where collectors and collection centres colluded in the wet season and competed in the dry season which resulted in decrease and increase of producer prices by 75%. Other characteristic feature of oligopsony market structure observed in the district was the limited entry caused by high initial capital required to invest in cooling and milk processing. These features of few firms controlling the demand

side of the market signal the existence high agency costs among producers due to constrained market information, leading to efficient exchange and thus high costs of transactions (Shiferaw *et al*., 2006).

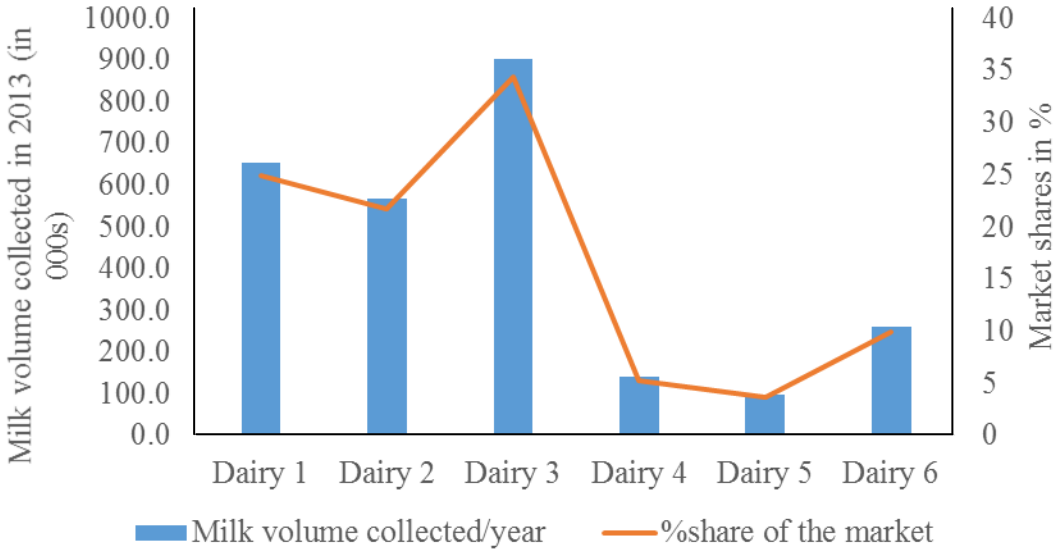

Figure 5: Quantity of milk collected and market shares for six firms in 2013

4.5 Efficiency

4.5.1 Indicators of efficiency

Following the market structure landscape which is characterized by information asymmetry and uncertainties; states of risk in the transactions will increase opportunism which will lead to an increase in marketing margins (Williamson, 1989). Thus, in the case of the dairy sub-sector this occurs when collection centres and processors are more informed about the market demand than farmers and traders, which indicate the existence of market inefficiencies. For the case of the dairy industry in Bagamoyo, marketing margins were used to assess the efficiency of formal and informal channels. In obtaining the margins, buying and selling prices were averaged across seasons and converted/set as per litres of Liquid Milk Equivalence (LME).

Results in Table 16 show that in the formal channel retailers and processors who had perfect information on the nature of market demand obtained 42.4% and 31% of the total market share respectively which was higher than what the milk producers and other traders got. When traders, processors and vendors are included, about 82% of consumer price (which is the TGMM) goes to them leaving farmers with 18% only. In the informal channel farmers obtained 76.9% of the price paid by final consumer, indicating low costs of transaction and value addition as milk was sold in the vicinity, while those in the formal chain had added costs from milk transport, bulking, cooling, and processing which made the producer margin low.

Table 16: Gross marketing margins (Tshs. per litre of LME)

	Formal chain				Informal chain		
	Buying price	Selling price	mark-up%	Gross Marketing margin %	Buying price	Selling price	Gross Marketing margin %
Producer		550		18		1000	76.9
Trader	550	650	18.2	4.43	1000	1300	23.1
Collection centres	618	712	11.3	4.17			
Processors	600	1300	106.9	31.04			
Vendor/retailer	1300	2255	173.6	42.35			
Total gross marketing margin in %				82			23.1

4.5.2 Added cost efficiency

Given the nature of the margins where producers obtained a small share of the final price, added costs present along the chain were assumed to be the cause of farmers trading milk informally where they obtain higher margins. Tables 17 and 18 present the added cost per litre at milk collection and processing levels where dairy1 and Processor3 had the highest added costs of Tshs. 123.5 and 283.4 per litre of milk handled. Processing firms were less efficient in cost addition compared to collectors as they had high cost ratios per litre of milk.

Table 17: Annual added costs at milk collection level (n=4)

	Dairy1	Dairy2	Dairy3	Dairy4
Total costs of milk handling	69 088 000	16 850 000	8 279 667	5 680 000
Litres of milk handled	559 600	413 800	316 800	280 000
Added cost in Tshs. per litre	123.5	40.7	26.1	20.3

Table 18: Annual added cost at milk processing level (n=3)

	Processor 1	Processor 2	Processor 3
Total cost of processing (Tshs)	8 756 879	47 313 250	35 540 000
Volume of milk handled	132 000	245 100	125 400
Added cost in Tshs. per litre	66.3	193.0	283.4

Retailers were observed to have a mean cost per litre of Tshs. 56 which was much lower compared to processors who had a mean cost per litre of Tshs. 180. With minimum cost added per litre of liquid milk handled, retailers obtained 42% of the gross marketing margins and 173.6% as mark-up cost which are higher than any other player in the milk value chain (refer Table 16). From Appendix 2, the mean added cost per litre across collection centres, processors and traders was significant different ($P < 0.05$) with an F ratio of 7.9 (2, 16). Thus we failed to accept the hypothesis that the added costs along the formal chain did not vary. The added costs taken into account were costs due to, investment, labour, transport, additives, utilities, communication, packaging and fuel. The composition of these costs varied from firm to firm depending on its capacity and ability to cut back.

Results from the Post Hoc test using the Hochberg multiple comparison procedure (Table 19), revealed that the mean added costs between processors and other actors was significant different at 5%. Collection centres to retailers mean added cost per litre of milk handled was not significantly different.

Table 19: Results of Hochberg GT2 Post Hoc test

(I) actor	(J) actor	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Processor	Collection centre	128.28*	38.49	0.01	26.29	230.27
	Retailer	125.34*	32.53	0.00	39.14	211.54
Collection centre	Processor	-128.28*	38.49	0.01	-230.27	-26.29
	Retailer	-2.94	29.09	0.99	-80.04	74.16
Retailer	Processor	-125.34*	32.53	0.00	-211.54	-39.14
	Collection centre	2.94	29.09	0.99	-74.16	80.04

*. The mean difference is significant at the 5% level.

Moreover, 65% and 57% of the added cost in milk collection and processing were mainly from services and utilities cost (like cost of water, transport, communication, administration, packaging. lactometers, and reagents). Key input cost consisted of labour, rent and power costs (Table 20).

Table 20: The proportion of average input costs incurred in milk collection and processing

	Collector (n = 4)		Processors (n = 3)	
Cost type	Costs in Tshs	Proportion (%)	Cost in Tshs.	Proportion (%)
Key Input costs	5 401 000	21.62	11574667	37.90
Service and Utilities costs	16246750	65.05	17402067	56.99
Fixed Cost	3326667	13.32	1559976	5.11

4.5.3 Cost efficiency of milk producers

The stochastic cost frontier estimation based on equation 9, shows the effect of input prices and output produced on the total cost of the dairy farms in the formal and informal chain. It was hypothesized that although producers fetch low prices in the formal channel, they can increase the benefits from dairy production by being cost efficient. The maximum likelihood estimates of the translog cost frontier for milk producers in the formal and informal chain are shown in Table 21.

The results show that most of the producers cost elasticities with respect to output and normalized input prices in the formal and informal chain were positive as per theoretical expectation. The results also shows that cost elasticities were statistically significant at five and ten percent probability level. In the formal chain, output elasticity was 2.38 which implies that a percentage increase in milk production leads to a 2.38 percentage increase in the total cost of milk production. Similar results were also observed with respect to normalized feed price and labour prices where, a percentage increase in the fees price for producers in the formal chain led to 11.81 percentage increase in the costs of production, however, this increase could be less as they just grazed the cattle. Also a percentage increase of labour price led to 8.44 percentage increase in the costs of production. The coefficient of output (y^2) in the informal chain was observed to be negative and significant at 5% level.

Table 21: Maximum likelihood estimates of the translog stochastic cost frontier for milk producers in formal and informal

	Formal		Informal	
	Coefficient	t-ratio	Coefficient	t-ratio
	-34.71**	-38.64	10.27*	1.94
y	2.59**	3.52	-1.72*	-1.87
w1	10.80**	13.65	0.43	0.80
w2	11.48**	27.63	1.16	1.24
z	1.32**	2.63	0.04	0.05
y^2	0.28	1.51	0.07	0.47
$w1^2$	-1.76**	-5.19	0.16*	1.64
$w2^2$	-2.12**	-7.25	0.11	0.98
z^2	-0.03	-0.22	-0.01	-0.19
w1w2	1.98**	7.74	-0.10	-1.05
yw1	0.83**	2.56	-0.03	-0.35
yw2	-1.20**	-2.84	0.23	1.62
w1z	-0.04	-0.26	0.01	0.17
w2z	0.28	1.51	-0.16	-1.50
yz	-0.12	-0.72	0.05	0.57
Sigma-squared	0.7369	0.0783	1.3512	0.3602
Gamma	1.0000	0.0001	0.9937	0.0043

** Significant at 5% probability level, * significant at 10% probability level

However, the combined output elasticity was positive which meant that a percentage increase in output produced led to a 0.19% increase in the total cost of production. Karanja (2002) and Kavoi *et al*. (2010) reported similar results in a cost efficiency study of coffee and dairy farmers in Kenya where output coefficient had a negative sign with a significant effect on the costs of production. This was said to be attributed by increase in cost of production while yield remain stagnant or decreasing. There was no sufficient evidence for economies of scale as the coefficient of y^2 was insignificant.

In the formal chain, cost elasticity with respect to feed and labour price appears to indicate economies of scale, given a statistically significant coefficient of $w1^2$ and $w2^2$. There is potential of decreasing cost if an increase in output goes with an increase in wages and not feed price. From the translog cost frontier model, γ is estimated at 0.98 which can be interpreted that over 98 % of random variation in the model is explained by inefficiencies; implying a high level of inefficiency exists in dairy farming. From Table 22, cost efficiency estimates of milk producers in the formal chain ranged from a low of 1 to a high of about 11.42, and 1 to about 10.96 for those in the informal chain. Mean efficiency was 2.6 for producers in the formal chain while it was 1.91 for producers in the informal chain.

Table 22: Descriptive statistics of cost efficiency estimates and the distribution above and below mean efficiency estimates

Chain	Formal	Informal
Minimum	1.00	1.03
Maximum	11.42	10.97
Mean	2.56	1.91
Sandard deviation	2.11	1.72
Distribution of efficiency estimates (number of respondents)		
Below mean	58(71.6)	62(72.1)
Above mean	23(28.4)	24(27.9)

The study found that informal chain milk producers were more cost efficient, with an average efficiency estimate of 1.91 or 91% above the frontier efficiency level. Formal chain milk producers had an average efficiency of 2.56 or 156% above the frontier efficiency level. This also means that, on average, 91 and 156% of the costs incurred in the formal and informal chain can be avoided without any decrease in total output. Moreover, 71.6 and 72.1% of formal and informal milk chain producers were below the mean efficiency level of 2.56 and 1.91, implying that more than half of the formal and informal milk producers surveyed were more cost efficient than the average farmers in the sample.

4.5.4 Determinants of inefficiency

Variables that were hypothesized to affect the cost inefficiency of the milk farms in the formal and informal chain are household age as a proxy for experience, years of education, household size, number of cows in milk, and breed type used. The results in Table 21 show that in the informal value chain household-head age had significant effect in reducing cost inefficiency of the dairy farms where experienced producers are less cost inefficient than their younger ones. Similarly, education was observed to be cost inefficiency reducing. Household size (HHS) was observed to be inefficiency increasing given a significant positive coefficient of HHS. This turned opposite to the theory where we expected an increase in the size of a household could add man power thus reducing dairy operational costs on a farm. However, an increase in a household size could add dependence to the household head and thus drawing (reinvest) resources from the dairy farm to a secondary employment. Likewise, increase in the number of cows in milk was inefficiency increasing. This implies that households with fewer number of cows in milk were more cost efficient than those who had large number of cows in milk.

Table 23: Parameter estimates of the inefficiency model

Independent variables	Formal chain		Informal chain	
	Coefficient	T-ratio	Coefficient	T-ratio
Constant	0.465	0.579	-0.658	-0.382
Age (m1)	-0.007	-0.396	-0.157**	-3.403
Edu (m2)	-0.017	-0.295	-0.291**	-2.399
Hhs (m3)	-0.089	-0.538	0.862**	4.236
Nmc (m4)	0.003	0.326	0.112**	3.930
Dl (local breed dummy)	0.152	0.213	-0.963	-1.041
Dc (cross breed dummy)	-2.034**	-1.787	-3.393**	-2.427

These results are also similar to those by Lapar *et al.* (2005) who found that households with large number of cows in milk/herd size were less cost efficient. With respect to breed type, it was observed that, the mean inefficiency of dairy farmers who kept cross breeds in the informal and formal chain was – 4.051 and -1.57. This implies that cross breed type of cows are more cost managing and productive, than rearing local and pure breeds. Rearing cross breed cow for farmers in the formal chain was observed to be the significant and the only remedy of inefficiencies observed in dairy production. Discussed variables affecting cost inefficiency were all observed to be significant at 5 % level. We thus have enough evidence to reject the third hypothesis which stated that household socio-economic characteristics were not associated with cost inefficiency at farm level.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The general objective of this study was to analyse institutions and cost efficiency along the formal and informal milk value chains in Bagamoyo District. The specific objectives were (i) to identify the institutional constraints in the formal and informal milk value chains (ii) to analyse the cost added efficiency in milk handling process in the formal chain (iii) to analyse the cost efficiency of milk producers and (iv) to analyse factors that influence cost inefficiency in Bagamoyo District. Hypotheses of the study were tested basing on the respective techniques and analytical methods employed in the study.

The characterization of actors with respect to age and education distribution and their cost per litre of milk produced showed that, older and educated milk producing households with at least primary education and more than 40 years of age were more cost effective than the younger and uneducated ones. Large proportion of households who kept local breeds in the formal and informal chain were observed to be high cost producing when compared to those with improved breeds.

From the first specific objective, the study findings indicate that, milk marketing was highly characterized by spot market transactions and informal contracts. The formal chain is more constrained by high transaction costs due to incomplete contracting and milk spoilage than the informal channel. At farm level, these costs were attributed to the existence of informal contracts which were non-binding in terms of risk leading to opportunistic behaviours by traders. At the level of milk collection centres, these costs were attributed to failure to enforce seasonal contracts entered between the milk

collection centres and processors. Other constraints like asymmetry in information and agency costs were attributed by oligopsony market structure which was found to exist but were not empirically measured. The effect of the imperfect market structures was also reflected by high gross marketing margins among retailers and processors who knew the nature of market demand than farmers. Farmers in the informal chain who traded raw milk to vendors obtained very large proportion of the gross marketing margin as the chain was short and little value was added.

With regard to the second specific objective, cost addition process across collectors, processors and retailers was shown to be inefficient as milk processors were observed to have high cost added ratios than the rest of the actors (mean added costs were Tsh. 52, 180 and 56 for collectors, processors and retailers respectively), where, 65% and 57% of collectors and processor added costs were incurred for services and utilities payment. This difference was found to be statistically significant at 10% level. The component of added costs varied among and across actors, large proportion of these costs were attributed by investment, communication, transport, packaging and utilities.

To cater for the third objective, output and cost elasticity factors significantly affected the costs of milk production in both chains. Results from cost efficiency estimates showed that, milk producers in the formal and informal chain had a cost efficiency level of 156% twice above the frontier level and 91% above the frontier level respectively.

Pertaining to the fourth specific objective, informal chain household experience in livestock production, education, and improved cattle breeds were observed to be inefficiency reducing factors, while increase in number of cows in milk and size of the household increased the inefficiency. In the formal chain holding other factors constant, improved dairy breeds were observed to be inefficiency reducing.

Thus, the hypothesis that added costs did not vary across the actors in the formal chain was rejected at five percent level of significance. Furthermore, some milk producers were observed to be cost efficient thus rejecting the second hypothesis; and with regards to the third hypothesis, household age, education, size, number of cows in milk and breed type had significant association with farm level inefficiency.

5.2 Recommendations

Based on the major findings of this study, the following recommendations are made in order to promote dairy production, marketing and value chain upgrading in the study area:

i. Training of farmers so as to impart appropriate knowledge on efficient dairy keeping practices, storage, marketing, and consumption to value chain actors which will contribute in improving cost efficiency along the value chain. This can be achieved through organised trainings and frequent extension visits, and ensuring that formal and informal legal procedures of undertaking dairy activities as stated by the Dairy Industry Act, cap 262 are observed.

ii. To cater for high added costs in milk processing and collection proper milk handling procedures should be adopted. Also the government, through its policies, ensure constant and assured availability of power since it's more costly to use generators and charcoal as alternative energy source.

iii. Given the existence of oligopsonistic structures of the market, the study recommends facilitation of market competition via the integration of collection and processing firms through facilitation of an increase in milk collection and processing plant material. This will support smooth cost and benefit distribution and wear down information asymmetries since most farmers are uninformed of the retail market situation. Also, policies on how to vertically and horizontally

integrate farmers should be devised to enable farmers obtain large shares of the margins.

iv. From the estimates of the stochastic cost frontier, the government should devise possible means of reducing the costs of production and increase milk produced. This can be done through a synergistic utilization of input factors like the use of alternative feeds type. Observing proper and timely medication or vaccination which will help to increase livestock quality specifically for milk production purposes.

v. The government should also devise possible ways to support and transform pastoral farmers who kept large number of low producing local breed cattle to a more improved specifically cross breeds cattle capable of diseases and harsh climate which proved to reduce farm inefficiencies. In collaboration with other interested parties like the private sectors, this can be approached by using few pastoral farmers as an aid for productive cattle keeping. Also informal chain milk producers should be advised to keep few number of dairy cattle given the capacity to have an efficient management of the herds.

vi. Limited in the sense that it utilizes cross sectional data that represents only one year of milk production only. Milk production level and milk price varies from season to season which could change the findings of a similar study in the future. Thus, conclusions drawn from the study cannot be generalised for the whole country as they only applies to Bagamoyo. This is because, the situation in Bagamoyo District may be different from the rest of Tanzania and hence, findings and recommendations revealed may not apply to other areas. However, the study gives some insight into the institutional constraints and efficiency of milk value chain actors in Tanzania.

vii. Majority of the milk producers (mainly the pastoralists) in the study area, do not keep records of the cost items. This posed a challenge during data collection process where collection depended greatly on the memory recall which was tough to manage.

viii. Some milk producers, mostly the Pastoralists (the Maasai) in the study area declined or gave false information fearing that the data collected might be handled to the government which will later propose to displace them. However, after discussion most of them were convinced to cooperate after being assured that the information was meant for research purposes and privacy would be respected.

ix. This study dwelt on analysing institutional constraints and efficiency of milk value chains from the farm level to retail level, but it did not discuss the consumption side of it due to resource limitations. To improve the operation of the milk value chain, the demand side of the milk products should also be improved as it was earlier noted that still dairy consumption in Tanzania are below recommended levels. Thus more studies should dwell on analysing what to be done to improve dairy consumption or what limit its development regarding the demand options. Similarly, an institutional analysis of organisation in this study lacked depth and breadth. Thus this study provide a window for further study of institutions of organisations of the Bagamoyo dairy sector given their importance in reduction of transactional costs.

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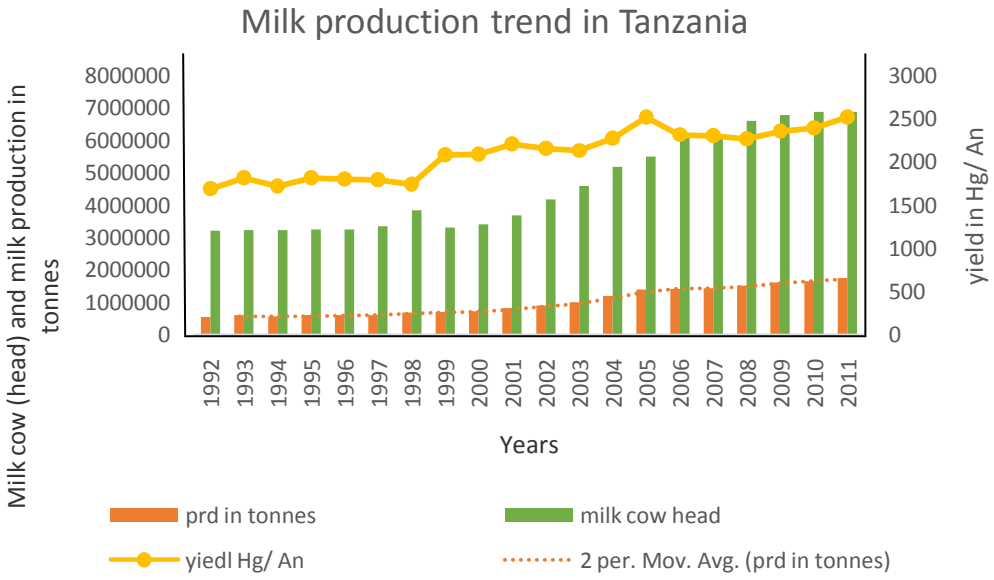
APPENDICES

Appendix 1: A Milk production trend in Tanzania

1.1 Milk production trend in Tanzania



Appendix 2: Results of one way ANOVA comparing mean added costs per litre across collectors, processors and traders

Added cost per litre	Sum of squares	Df	Mean square	F	Sig.
Between groups	40180.51	2	20090.26	7.912	0.004
Within groups	40629.07	16	2539.317		
Total	80809.58	18			

Appendix 3: Questionnaire for Milk Producers in Bagamoyo district in 2013

Name of Enumerator……Date of interview…….

SECTION A. GENERAL INFORMATION

A. 1: Name of respondent……..

A. 2: Name of household head……

A. 3: Village/Street……..

A. 4: Ward……..

A. 5: Age of household head (years)……..

A. 6: Sex of household head 1= Male and 2= Female [ ]

A. 7: House hold size, males [ ] female [ ]

A. 8: Level of education attained by the household head (Enter years of schooling) 0= none, 1= standard one, ….., 7= standard seven, 8= training after primary, 9=form one…..12=form four, 13= form five, 14=form six, 15=training after secondary education, 16= university & tertiary education, 17= adult education [ ]

A. 9: Years of experience in milk production. State the actual years [ ]

A. 8: What is your primary occupation? [ ]

1= Wage employment……. 2= Dairy cattle keeping…… 3= Business…….. 4= Crop production……. 5= others (specify)……

A.9: other type of employment/ sources of Income sources

	Type of employment/activity	Description	Units	Price per unit	Estimated income
1	wage employment (specify)				
2	dairy keeping				
3	business/entrepreneur				
4	crop production				
5	non-dairy livestock				

Section B: Information on Milk Production

B.1 which types of cattle do you keep? [ ] [ ] [ ]

1 =Local breed 2= Pure exotic breed, 3 = Cross breed

B.2: what is their number?

	Category				
Type	cows	heifer	Bulls	steers	calves
local breed					
pure exotic breed					
cross breed					

B.3: What would you think these cattle type worth in the market? (Amounts in Tshs)

Type		Breed market prices		
	Number	Local breed	Pure exotic breed	Cross breed
Adult cows (3 and over)				
Cows in milk				
Cows (dry and in calf)				
Adult cows (3> yrs not in calf)				
Heifers (2-3) years				
Heifers (1-2) years				
Female calves (6-12 months)				
Female calves (0-6 months)				
Bulls (above 3 years of age)				
Steers (2-3 yrs)				
Steers (1-2 yrs)				
Male calves (6-12 months)				
Male calves (0-6 months)				

B.4: What type of feeding system do you practice? [ ] [ ] [ ]

1= Zero grazing 2=Semi grazing 3= Grazing 4= Others (specify)……

B.5: How many cows do you milk per day [ ]

B.6: what is the volume of milk produced per day? (volume in litres)

	morning				evening			
	no of cows in milk	Volume in litres/cow			no of cows in milk	Volume in litres/cow		
		Minimum	maximum	average		minimum	maximum	average
Wet season								
Dry season								

A. 7. What is the lactation period of cows (last lactation in months)

Local breeds [ ]	Pure exotic [ ]	Cross breed [ ]

Section C: Production Costs Incurred In 2013

C 1. Production costs incurred in a dairy enterprise

Item		**Unit of measurements(eg Kg, litre, bundle etc)**	**Quantity**	**Frequency of purchase .(eg once per week)**	**price/unit (TShs.)**	**Total Costs per year (TShs.)**
Forages/grass						
Transport cost for feeds						
Milking vessels						
House/fortress (boma)						
Milking salve						
Disinfectant						
Detergents						
Minerals						
Concentrates.						
Veterinary treatments/drugs						
Labor charge(Hired)	Casual					
Cost of breeding	Hired bull					
	Bull Transport cost					
	AI					
Water usage	Wet season					
	Dry season					
Deworming						
Rope						
Dipping						

C2: Additional costs apart from production.

Items	**Unit of measurement**	**price**	**Frequency of occurrence(eg 2 times per month)**	**Total cost per year**
Transport cost for milk.				
communication cost(to extension officer/trader)				
Milk spoilage				
Energy(Fuel, electricity)				
Cost of finding market. (Time spent)				
Cost of finding labour (Time spent)				
Fees				
Other food supplements used				

Section D: Handling and Milk Marketing In 2013

D1. Where do you sell your milk during	1. Wet season [ ] [ ] [ ] 2. Dry season? [ ] [ ] [ ]

1 = Neighbours 2= local market/retailer 3= Farmers' cooperative 4= Processing plants 5= Hotels/restaurant 6= Wholesaler, 8 =Others (specify)……..

D2. Milk sells by seasons

Market	**Wet season**				**Dry season**			
	Quantity (litres)	Frequency of occurrence(eg 2 times per week)	Lowest Price per litre)	highest Price per litre)	Quantity (litres)	Frequency of occurrence(2 times per week)	Lowest Price per litre)	highest Price per litre)
Neighbors								
local market/retailer								
Farmers cooperative								
Processing plant								
Hotels/restaurants								
Wholesale buyer								
Others								
Remain unsold								

D. 3: Which payment method do you prefer most?
1= On spot cash payment, 2= weekly payment, 3= monthly payment

D.4.Do you own any means of transport? 1=Yes, 0=No [ ]

D.5. If Yes of what kind (1=bicycle, 2=motorcycle, 3=cart, 4=van) ( ) ( )

D. 6.Do you seyou milk to the market/buyer or the buyer comes to fetch them? 1=I send, 0=they come [ ]

D.7.What do you do with unsold milk? [ ]
1=consume at home 2= make yogurt 3= others (specify)

D.8. which market outlets do you prefer most? [ ]

1=farmers' cooperative, 2 local trader .3 =Neighbour, 4=Processor…..5=Wholesaler….

6.=Local trader, 7=Others(specify)……

D.9. why do you prefer this outlet? [ ]

1=they offer good price 2= they buy at any volume 3= They pay in cash 4=Trustworthy 4=Others (specify)…….

D10. Do you have any contractual agreements with any buyer of your milk? [ ]

1 = Yes 2 =No

D.11: If Yes, of what kind?

Buyer	Type Of Contract	Nature Of Agreement	Terms of agreement
Neighbor			
Local Market/Retailer			
Farmers' Cooperative			
Processing Plant			
Hotels/Restaurant			
Whole buyer/ Seller			
Others…..			

Code

Type Of Contract	Nature Of Agreement	Terms of agreement
1. Short term contract (<2 years)	Informal agreement based on mutual understanding	Specified milk price
2. Long term contract	Formal written agreement with legal implications	Specified volume of milk
3. Others	Formal written agreement without legal implications	Quality of milk
4.		Fine/penalty in case of failure

D12.How much input do you have in making decision about the business contract [ ]

1=No input, 2=.Input into very few decision 3= Input into some decisions 4=.Input into most decision 5= Input into all decisions.

D.13. what are the internal and external environments that affect milk production and marketing?

(a) Internal, 1=culture, 2= poor road condition, 3= diseases, 4= limited market/buyers

(b) External, 2= prolonged drought, 2= limited pastures/land 3= government policy

D14: What is the average distance from home to the milk market? …… (Walking hours)
D15: Who sets the price of milk? [ ]

1 = Producer, 2= Buyer, 3= Negotiated,4 =Others(specify)

D. 16: Where do you get the information on the demand (quantity and price of milk)

1=Neighbor farmer 2=trader 3 =Farmers' cooperative 4=newspaper /notice board

5=Processor 6= Others (specify)

D. 17: What challenges do you face during marketing? [ ]

1=Seasonal Supplies, 2=Unreliable Buyers, 3=Price uncertainty 4=High competition, 5=Un trust customers, 6=Product deterioration,7=Others (specify)

Section E: Membership to Organization and Relationship with Other Actors in the Milk Chain

E1: Is there any dairy farmers' organization in your ward/village [ ]

,1= YES 2=NO

E.2: Are you a member of milk producer's organization or cooperative [ ]

1 =YES 2=NO…… (If no=skip up to question no E.7)

E. 3: what is the name of the organization……....?

E. 4: How long have you been a member [ ]

E5.What is the membership fee per year? .....

E. 6: As a member, what services and/or benefits do you get from the organization?

1=Input supply2=Provision of extension, Training, veterinary and breeding services, 3=To sell my products, 4 =Provision of Credit/ loan,5= Others (specify

E.7.How much input do you have in making decision in your organization?

1= No input , 2.= Input into very few decision, 3=Input into some decisions ,4=Input into most decision ,5=Input into all decisions.

Section F: Institutional Environment. (Legal and Policy Setting)

F1. Are there any regulations governing dairying in Bagamoyo district?

1= Yes, 0 =No

1= Restriction to a maximum number of cattle per household number

2=Special permit from government official on purchase of cattle 3= To practice zero grazing 4= To care for environment (noise, bad smell, diseases etc) 5= boiling the milk before sale, 6=others

F3. Who is responsible on making sure that laws and regulations are enforced? …..

F4. Are there any fine/penalty when you breach any of the mention laws? [ ]

1 =yes, 2=No

F5: If Yes, How much per cow…….

F6. Are the laws enforced as required?

F7.Which law is affecting your dairy production? ……

Section G: Additional Questions

G.1: What do you consider to be the main problems (internal and external) facing your dairy enterprises? Geographical, organizational ect

……

11= Thefts, 2= diseases, 3= others, mention

……

G. 2: Farmer proposed solution to named problems

……..

……

G.3: What is your future prospects regarding your business?

1=Maintain the same level of production, 2=Abandon Production,3=Expand Production

4=Others(specify)

G. 4: What do you think should be done to improve production and marketing of milk and milk products?

.....

……..

"THANK YOU FOR YOUR COOPERATION"

Appendix 4: Questionnaire for Dairy farmers co-operative in Bagamoyo district (2013)

Name of Respondent……Date of interview……

Position in the cooperative/association……..

SECTION A. GENERAL INFORMATION

B. 1: Name of farmers' group/cooperative……

A. 2: Ward……..

B. 3: Village/Street……..

B. 4: Year of establishment……

A. 5: Number of members……Male [ ] and Female [ ]

A. 6: Number of employees……Male [ ] and Female [ ]

Section B: Information on Milk Collection in 2013

B.1: What volume of milk do you buy per day

	Flush season	Dry season
Minimum		
Maximum		
Average		

B2: Where do you buy the milk? [ ] [ ] [

1=producers 2=wholesaler 3= Retailer 4 =Other milk collection centres 5=Others(specify)

B.3 Milk procurement during flush season(2013)

Product/ Source	Volume (litres)	Frequency of purchase (eg 2 times per week)	price per litre		Types of milk 1.Raw fresh milk 2.Fresh boiled 3.Both	Criteria set	Mode of payment	contractual arrangement	Total income per month
			minimum	maximum					
Members									
Non members									

B.4 Milk procurement during dry season

Product/ Source	Volume (litres)	Frequency of purchase (eg 2 times per week)	price per litre		Types of milk 1.Raw fresh milk 2.Fresh boiled 3.Both	Criteria set	Mode of payment	contractual arrangement	Total income per month
			minimum	maximum					
Members									
Non members									

Codes

Criteria	**Mode of payments**	**Business arrangement**
1.Quality 2.Volume 3.Others (specify)…..	1.Cash upon delivery 2.Twice per month 3.Once per week 4.Others(specify)	1.Written contract 2.Verbal agreement 3.Spot market 4.Others(specify)….

B 5: How did you arrive to the final price per unit with buyer? [ ]

1= Negotiations, 2= Meetings between members and suppliers ,3 = Based on operational and marketing cost , 4 = Meeting with members only 5= Others (specify)……..

B 6: Where do you sell your milk per day? [ ] [ ] [ ]

1= To individual buyers 2=kiosk/retailer 3= Hotel/restaurant 4= Processors 5=wholesaler

B.7 Milk sells during flush season in the period of 2012/2013

Category	**Volume (litre)**	**Price per litre**		**Frequency of sells(2 times per week)**	**Mode of payment**	**Contractual arrangement**	**Total revenue per month**
		min	**max**				
1= Individual buyer							
2 = Kiosk/retailer							
3=Hotels/Restaurants							
4=Processor							
5=Own consumption							
6=Unsold milk							
7= Others (specify							

B.8 Milk sells during dry season in 2013

Category	Volume (litres)	Price per litre	Frequency of sells(times per week)	Mode of payment	contractual arrangement	Total revenue per month
1= individual buyer						
2 = Kiosk/retailer shops						
3=Hotels/Restaurants						
4=Processor						
5=Own consumption						
6=Unsold milk						
7= Others						

Criteria	Mode of payment	Business arrangement
1.Quality	1.Cash upon delivery	1.Written contract
2.Volume	2.Twice per month	2.Verbal agreement
3.Others(specify)…..	3.Once per week	3.Spot market
	4.Others(specify)	4.Others(specify)….

B9.What do you do with unsold milk? .....

B10. Do you have fine/incentive based on the quality of milk brought to the collection centre? [ ]

1= Yes , 2= No

B11. If Yes for B12 above, what are they?

For good quality milk; ……

For poor quality milk……..

B 12 Apart from purchasing cost, what are the other costs did you incur in the last year 2013

Item		Quantity	Expected life	Cost/unit (TShs.)	Frequency of occurrence (1 times per month)	Total Costs (TShs.)
Fixed and investment costs						
Housing /rent			*			
Repair						
License						
working equipments			*			
Variable and overhead costs						
Quality check ups						
Labor	permanent					
	Temporary					
Fuel						

Communication cost						
Administrative costs						
Handling cost						
Milk spoilage						
Transport						
Water						
Electricity						
Taxes						
Fees deduction.						
Others						

B13.Do you deduct any fee from members? [ ]

1=Yes or 2=No

B14. If yes how much per month?.....

B15. Is there any difference between prevailing price in the markets and the one you are offering? [ ]

1 = Yes 2= No

B16. If yes, what are the differences per litre of milk?.....

Section D: Relationship with Other Actors in the Milk Chain

D1: Are you are member of any apex organization? [ ]

1 = Yes ,2 =No

D. 2: If YES, what is the name of the organization…….?

D. 3: How long have you been a member…….?

D. 4: What services do you get from the organization….....?

……..

D 5: What is the membership fee……?

D 6: Are there any supporting service you receive from any organization for the purpose of improving your business?

1= Yes ,2 = No

D7: If YES, can you mention the organization [ ]

1. NGOs/Private,2. Research Institute. 3. Processor 5 Others (specify) …….

D8.What are the supporting services do you receive? [ ]

1 = Extension services 2 = business training 3 = financial support 4 = Others (specify)

If No, give reasons……..

Section C: Institutional Arrangements

C. 1: Are you aware of any regulations/by-laws regarding collection and distribution of dairy products? ? [ ]

1 = YES 2 = NO

C. 2: If yes, what are these regulations?

1=ensure cleanliness of premises 2 = Business location 4= Others (Specify)……..

…….

C3.Who is responsible on enforcing above mentioned law/by-laws?

……..

C4.Which by-law or regulation is hindering your day to day business operation?.....

C.5.Do you have your own by laws governing your day to day peration in relation with other chain actors? [ ]

1 = YES 2 =NO

C.7.Do the association/cooperative own any means of transport? 1=Yes, 0=No

C6. If Yes of what kind (1=bicycle, 2=motorcycle, 3=cart, 4=van) ( ) ( )

Section E: Additional Questions

E1: What do you consider to be the main problems facing your dairy enterprises? (Internal and external, i.e. geographical, environmental, infrastructural, policy failures, competitions and the like),

……

……

E. 2: what are the proposed solutions to named problems?

……

……..……..

E. 3: What do you think should be done to improve production and marketing of milk ?

…….

“THANK YOU FOR YOUR COOPERATION”

Appendix 5: Survey Questionnaires for Milk Traders

Name of Enumerator…… Date……

SECTION A: GENERAL INFORMATION

A. 1: Name of respondent……
A. 2: Village/Street……..
A. 3: Ward…….
A. 4: Division……
A. 5: Region…….
A. 6: Age of respondent (years)……..
A. 7: Sex of respondent…..…… 1= Male and 2= Female.
A. 8: level of education attained (Enter years of schooling)
0= none, 1= standard one, ….., 7= standard seven, 8= training after primary, 9=form one…..12=form four, 13= form five, 14=form six, 15=training after secondary education, 16= university & tertiary education, 17= adult education [ ]

Section B: Information on Milk Procurement and Marketing

B1.What is your business type? [ ]

1= Wholesaler/assembler, 2= Retailer/kiosk/shop/milk bar, 3= Hawke, 4= Vendor,5= Others (Specify)…….

B 2: When did you start the dairy business? State the actual year [ ]

B. 3: Which main source(s) do you rely on for your milk procurement? [ ] [ ] [ ]

1= Producer, 2 = local processor 3= Small trader 4= Farmers' cooperatives 5=Imported 6=Others(specify)

B4.Milk procurements.

Product/ Source	Volume (litres),		Types of milk	Frequency of purchase (eg 2 times per week)	price per litre		Preference	Mode of payments	Business arrangement	Total income per month
	lowest	highest			min	max				
1.Producers										
2.Local processor										
3.Small trader										
4.Farmers cooperatives										
5.Imported										
6.Others										

Preference	**Mode of payments**	**Business arrangement**	**Types of milk**
1.High Quality 2.Constant supplies 3.Cheap product 4.Others (specify)…..	1.Cash upon delivery 2.Later payments(1-4 weeks) 3.Once per week 4.Credit 5.Others(specify)	1.Written contract 2.Verbal agreement 3.Spot market 4. Others (specify)….	1.Raw fresh milk 2.Fresh boiled milk 3.Sour milk 4.Packed fermented 5.Yoghurt 6.Ice-cream 7.Others(specify)

B6.Who set the purchasing price? [ ]

1=Self 2=supplier 3 =Negotiation 4= based on the prevailing price in the market 5= Others (specify)….

B.7 where do you mainly sell your milk? [ ] [ ] [ ]

1= At home, 2= Kiosk/retailer 3=Processor 4= Hotel/restaurant 5 = Others (specify)

B.8. Milk sells for the period 2013

Category	**Volume (litres)**	**Price per litre**		**Frequency of sells (2 times per week)**	**Types of milk**	**Mode of payment**	**Business arrangement**	**Total revenue Per month**
		min	**max**					
1.At home								
2.Kiosk/retailer shops								
3.Hotels/Restaurants								
4.Processor								
5.Own consumption								
6.Unsold milk								
7.Others (specify)…								

Codes

Mode of payments	Business arrangements	Types of milk
1.Cash upon delivery 2.Later payments(1-4 weeks) 3.Once per week 4.Credit 5.Others(specify)	1.Written contract 2.Verbal agreement 3.Spot market 4. Others (specify)….	1.Raw fresh milk 2.Fresh boiled milk 3.Sour milk 4.Packed fermented 5.Yoghurt 6.Ice-cream 7.Others(specify)

B9. Apart from purchasing cost, what are the other marketing costs?

Items.	Expected life (year bought-year of disposal)	Unit of measurement	Frequency of occurrence(eg 2 times per week)	price	Total cost per year
Electricity					
House rent					
Communication cost					
Milk spoilage					
Transport					
Water					
Taxes					
Market Fees.					
Labor					
Cost of visiting supplier(Time spent)					
Utensils					
Business license fees					
Fuel					
Fines .					
Other costs					

Section C: Institutional Arrangements

C. 1: Are you aware of any regulations/by-laws regarding marketing of dairy products? [ ]

1 = YES 2 = NO

C. 2: If yes, what are these regulations?

1= paying fees and levies 2=ensure cleanliness of premises 3 = Business location 4= Others (Specify)……..

C3.Who is responsible on enforcing above mentioned law/by-laws?

……..

C4.Which by-law or regulation is hindering your day to day business operation? .....

……..

1 = YES 2 =NO

C6.If yes what are those……

C.7.Do you own any means of transport? 1=Yes, 0=No

C.8. If Yes of what kind (1=bicycle, 2=motorcycle, 3=cart, 4=van) ( ) ( )

Section D: Membership to Organization

D. 1: Do you belong to any traders' organization? [ ]

D. 2: If YES, for how long have you been a member…….

D. 3: What services do you get from the organization……

D. 4: Is there any price differentials over seasons to different customers? [ ]

1 = YES 2 =NO

D. 7: If Yes, What are the prices?

Category	**Price during wet season**	**Price during dry season**
At home		
Milk collection centre		
Supermarkets		
Kiosk/retailer shops		
Hotels/Restaurants		
Processor		
Others (specify)		

Section E: Other/Additional Questions

E. 1: What are the challenges facing your business?

E. 2; What do you think should be done to improve production and marketing of milk and milk by products?

"THANK YOU FOR YOUR COOPERATION"

Appendix 6: Questionnaire for Milk Processors in Bagamoyo

Name of Enumerator……..Date…….……

Section A: Background Information

A. 1: Respondent's Name……..

A. 2: Location Ward/Street……...

A. 3: Business Name…….

A. 4: When was the business started (year)……..……

A. 5: Are you a registered processor? [ ]

1 =Yes and 2 =No

Section B: Information on Milk Procurement and Marketing

B. 1: What are the main sources of milk that you process? [ ] [ ]

1= producer, 2 =small trader 3=wholesaler 4=Farmers' cooperatives 5= others (specify)

B2.Milk procurement during flush season

Product/ Source	Volume (litres)	Types of milk	Frequency of purchase (eg 2 times per week)	price per litre	Preference	Mode of payment	Business arrangem	Total income per month
1.Producers								
2.Local processor								
3.Small trader								
4.Farmers' cooperatives								
5.Imported								
6.Others(specify)……								

Codes

Preference	Mode of payments	Business arrangement	Type of milk
1.High Quality 2.Constant supplies 3.Cheap product 4.Others (specify)…..	1.Cash upon delivery 2.Later payments(1-4 weeks) 3.Once per week 4.Credit 5.Others(specify)	1.Written contract 2.Verbal agreement 3.Spot market 4. Others (specify)….	1.Raw fresh milk 2.Fresh boiled milk 3.Sour milk 4.Packed fermented 5.Yoghurt 6.Ice-cream 7.Others(specify)

B3.Milk procurement during dry season

Product/ Source	Volume (litres)	Types Of milk	Frequency of purchase (eg 2 times per week)	Average price per litre	Preference	Mode of payment	Contractual arrangements	Total income per month
1.Producers								
2.Local processor								
3.Small trader								
4.Farmers' cooperatives								
5.Imported								
6.Others (specify)……								

Codes

Preference	Mode of payments	Contractual arrangement	Type of milk
1.High Quality 2.Constant supplies 3.Cheap product 4.Others (specify)…..	1.Cash upon delivery 2.Later payments(1-4 weeks) 3.Once per week 4.Credit 5.Others(specify)	1.Written contract 2.Verbal agreement 3.Spot market 4. Others (specify)	1.Raw fresh milk 2.Fresh boiled milk 3.Sour milk 4.Packed fermented 5.Yoghurt 6.Ice-cream 7.Others(specify)

B.4 where do you sell processed milk/milk product?

1= At home, 2= Kiosk/retailer shops, 3= Hotel/Restaurant 4= Exporting 5=Distribution points 6= Open market , 7 =whole sale stores

B5. Milk selling

Category		Type of milk	Volume (litres)	Price per litre	Frequency of sells	Mode of payment	contractual arrangement	Total revenue Per month
1.At home								
2.Kiosk/retailer shops								
3.Hotels/Restaurants								
4.Exporting								
5.Distribution points	1							
	2							
	3							
6. Open market.								
7. Others (specify)……..								

Codes

Preference	**Mode of payments**	**Contractual arrangement**	**Type of milk**
1.High Quality 2.Constant supplies 3.Cheap product 4.Others (specify)…..	1.Cash upon delivery 2.Later payments(1-4 weeks) 3.Once per week 4.Credit 5.Others(specify)	1.Written contract 2.Verbal agreement 3.Spot market 4. Others (specify)….	1.Raw fresh milk 2.Fresh boiled milk 3.Sour milk 4.Packed fermented 5.Yoghurt 6.Ice-cream 7.Others(specify)

B. 6: What is your milk processing capacity? (Litres/day) minimum…….
Maximum……..

B. 7: Do you get adequate supply of raw milk throughout the year? [ ]

1= YES 2 = NO

B. 8: What strategies do you employ to obtain adequate raw milk for processing…..?

B. 9: Months of the year with under/over supply? Under…..... Over……,

Section C: Processing and Marketing Cost

C. 1: Indicate the cost outlay for the products you process

COST ITEM		**TYPE OF PRODUCT**			
		Fresh milk	**Yoghurt**	**Ice cream**	**Butter**
Variable costs:					
Milk procurement					
Transport					
labor	Casual				
	Permanent				
Milk additives					
Other ingredients(eg sugar,salt)					
Packaging materials					
Sanitary costs					
Quality assessment equipment, reagents					
Overhead costs:					
Fuel					
electricity bills					
Transportation costs					
Water bills					
Stationery					
Communication cost.					
Contingency costs					

Premise inspection fees				
Other marketing cost				
Fixed costs:				
Salary				
Premise rent				
Municipal fees				
License				
Depreciation				
Income tax				
Membership fees				
Other taxes				
Conversion ratio(From fresh milk)				
Other costs				
Total				

C. 2: Who are the largest competitors where you supply your products?

1= local small processors 2= local large processors 3= Imported products 4=others(specify)

Section D: Processors Organization and Institutional Support

D. 1: Is there any dairy processor's organization in your ward/street? [ ]

1 = YES 2= NO

D. 2: If yes, what is the name of the organization …

D. 3: Are you a member of the organization? [ ]

1= YES 2= NO

D. 4: If yes, for how long have you been a member……

D. 5: How much is a membership fee……

D. 6: Do you get any support in developing your business? [ ]

1=Yes and 2 = No

If yes, tell us the type of support service you receive

…….

……..……..

…….....

Section E: Institutional Arrangement (Legal and policy setting)

E1.Is there any law or by law that hinder development of your business? [ ]

1= YES, 2= NO

If yes, what are those laws/by laws [ ] [ ] [ ] [ ]

1= Charges for business license 2= Taxes for starting business 3= Construction of appropriate business buildings and infrastructures. 4= others (specify)……

E2.Who is responsible on enforcing the above by laws? .....

E3.In case you happen to breach any of the above regulation/laws what action can be

E4.Is there any institution available on making sure you improve the performance of your business? If yes what are they? .....

E5.Do you have your own set of by-laws/regulations governing day to day operation of your business in relation with other actors? [ ]

1= YES 2= NO

E6 If yes, what are those by laws/regulations (Mention)

E7.What do you do when it happen one of your business partner violated one the regulations?

E8. Are you aware of any national policy governing milk processing in Tanzania?
1=yes 2=No

E9. If yes, what are they?

E10. What policies do you think are discriminatory? Eg, 1=machinery import duties, 2=low tariffs on imported milk, 3= others……..……..

Section F: Others

F. 1: What problems do you face during processing/production and marketing of your products? [ ] [ ] [ ] [ ]

1=Lack of access to fresh milk supply 2= Insufficient market 3= Variability in demand 4 =High input cost 5 Price uncertainly 6 =others (specify)

F.2: What do you consider to be the main internal and external constraints in milk processing businesses? i.e. grought, infrastructural, policy failures, high charges etc.

……

E. 3: What do you suggest to be done to improve the situation?

……

"THANK YOU FOR YOUR COOPERATION"

Appendix 7: Checklist for key informants

For milk stakeholders/organizations/government officials

A. BACKGROUND

A.1. Name of organization.....

A.2. Name of respondent..... cell ……

A.3. Job title of respondent ……

A.4. District/Ward……and village……..

A.5. Year of establishment…….

B. General Questions

B.1. how would you describe the current status of milk value chain in the district? .....

B.2. what issues/challenges do farmers, input suppliers, extension workers, traders and processors face?

B.3. In your option who is most powerful actor in the milk value chain? (Processor, producer, farmer cooperatives, trader).

Give the reasons……..

B.4. what kind of support do you provide to milk value chain actors?

……

……

……

B.5. what criteria do you consider? .....

B.6. Do you provide market information to the milk chain actors? 1= yes 0= no ( )

B.7. Are there any by laws and regulations governing milk industry on production, processing, transporting and marketing in Bagamoyo district?

……

……

B.8. If yes, who are responsible on enforcing the mentioned laws/by laws above?.....

.....

..

B.9. What is the impact of the mentioned by law in terms of sustainability of milk value chain?.....

B.10. Are there any contractual agreements between the organization and other farmers cooperatives? 1= Yes, 2= No

B.11. If yes show

Kind of contractual agreement present	Farm group/cooperative		

1=Verbal agreement based on trust, 2=formal written contract with legal implications, 3=formal written with no legal implication.

B.12. what are the internal and external environments that affect the well-functioning of the chain?

(a) Internal, 1=culture, 2= poor road condition, 3= diseases, 4= limited market/buyers

(b) External, 2= prolonged drought, 2= limited pastures/land 3= government policy

“THANK YOU FOR YOUR COOPERATION”