FACTORS INFLUENCING CHOICE OF MILK OUTLETS AMONG SMALLHOLDER DAIRY FARMERS IN IRINGA MUNICIPALITY AND TANGA CITY

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ABSTRACT

The global markets are increasingly being integrated due to globalization and liberalisation. Drastic changes prompted by technological change are daily transpiring in the agricultural produce marketing which put smallholder farmers'market survival at stake. The notable changes are manifested in terms of value addition and product differentiation. This study was undertaken to identify factors that determine milk value chain choice amongst smallholder dairy in Iringa and Tanga urban. The specific objectives were: to assess and compare profitability between informal and formal milk value chain participants; examining factors that influence choice of milk marketing channels/outlets among smallholder dairy farmers. Purposive and random sampling techniques were employed in selecting 160 smallholder dairy farmers and 62 middlemen. Both descriptive and quantitave techniques (Gross Margin and Multinomial Logistic Regression) were used in data analysis. The enterprises' profitability between dairy farmers selling milk through the informal and formal milk channels was statistically different ($P< 0.05$), implying thatinformal milk channel is shown significantly being more profitable than the formal channel, with a mean difference of 385.00 TZSper litre. The Multinomial Logistic results show that, the highly statistically significant variables at 1% ($P<0.01$) level of significance are the price offered per litre of milk, family size of household, education level of household head, sex of household head, volume of milk produced, and access to credits. These findings suggest that an adjustment in each one of the significant variables can significantly influence the probability of participation in either formal or informal marketing channels. In view of research findings, several policy proposals are suggested. These include offering reasonable prices price per litre of milk, propelling collective actions, provision of non-price incentives, re-structuring existing dairy institutional arrangements,establishing milk collection centers,encouraging value addition (adoption of best upgrading practices) and investment in dairy processing (empowering SMEs).

DECLARATION

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

Michael Lucas Kadigi — Date

(M.Sc. Candidate)

The above declaration is confirmed by:

Dr. F.T.M. Kilima — Date

(Supervisor)

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DEDICATION

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

AEZ III	Agro Ecological Zone three
AIDS	Acquire Immune Deficiency Syndrome
AGM	Average Gross Margin
AVC	Average Variable Costs
BCR or B/C	Benefit Cost Ratio
DADP	District Agricultural Development Plan
DALDO	District Agricultural and Livestock Development Officer
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GM	Gross Margin
GMA	Gross Margin Analysis
HIV	Human Immune Virus
IDRC	International Development Research Centre
IFPRI	International Food Policy Research Institute
IRR	Internal Rate of Return
MAFC	Ministry of Agriculture, Food security and Co-operatives
MCC	Milk Collection Centre
MLFD	Ministry of Livestock Development and Fisheries
MMA	Match Maker Associates
MM	Marketing Margin
MNLR/MNL	Multinomial Logistic Regression
MVCP	Milk Value Chain Project
NBS	National Bureau of Statistics
OLSR	Ordinary Least Squares Regression

RLDC	Rural Livelihood Development Company
ROI	Return On Investment
SADC	South African Development Community
SMEs	Small and Medium Enterprises
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
TDL	Tanzania Dairies Limited
TC	Total Cost
TCC	Tanga City Council
TDDP	Tanga Dairy Development Programme
TDCU	Tanga Dairies Co-operative Union
TSZ	Tanzania Shorthorn Zebu
TZS	Tanzania Shillings
UHT	Ultra High Temperature
UNDP	United Nations Development Programme
URT	United Republic of Tanzania
USA	United States of America

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Dairy farming represents one of the livelihood options for livestock keepers in the developing world that provides cash todairy farmers, especially smallholder (FAO, 2011). Dairying is one the main economic activities within the livestock sector in Tanzania. The dairy industry has the potential to improve the living standards of people through improved nutrition arising from milk consumption and increased incomes from sale of milk and milk products (Urasa and Raphael,2001; Mulangila*et al.,* 1997; Mlozi, 2005). Specifically, market-oriented development of smallholder dairying can spur economic growth and alleviate poverty (Bennett *et al.,* 2006). According to Quaedackers(2009) the livestock sector in Tanzania is estimated to contribute 5% to7% of national gross domestic product (GDP), and the dairy sector makes up 30% of that percentage.

It is estimated that, out of the 21 million cattle in Tanzania, about 680 000 are dairy cattle mainly crosses of Friesian, Jersey, and Ayrshire breeds with the Tanzania Shorthorn Zebu (TSZ) (RLDC, 2009). The rest are indigenous cattle raised as dual purpose animals to provide milk and meat. Dairy goats are also gaining popularity as a source of milk particularly to the poor as most of the milk produced is normally consumed at the household level (Msanga and Njombe, 2009).

Statistics show that total annual milk productionhas increased from 814 million litres in 2000/01 to 1.65 billion litres in 2009/10 (Figure 1)(Ministry of Livestock and Fisheries Development (2011), cited by Njombe*et al.,* (2011)).However, it has been established that the increase in milk production both for indigenous and improved dairy cattle is due to increase in herd size rather than productivity of cows (Njombe*et al.,* 2011). About 70% of

the milk produced comes from the traditional sector *i.e.* indigenous cattle kept in rural areas, and the remaining 30% is from improved cattle that are mainly kept by smallholder producers (Mbwambo*et al.*, 2012; Charlse and Mchau, 2010 and Kurwijila, 2010).

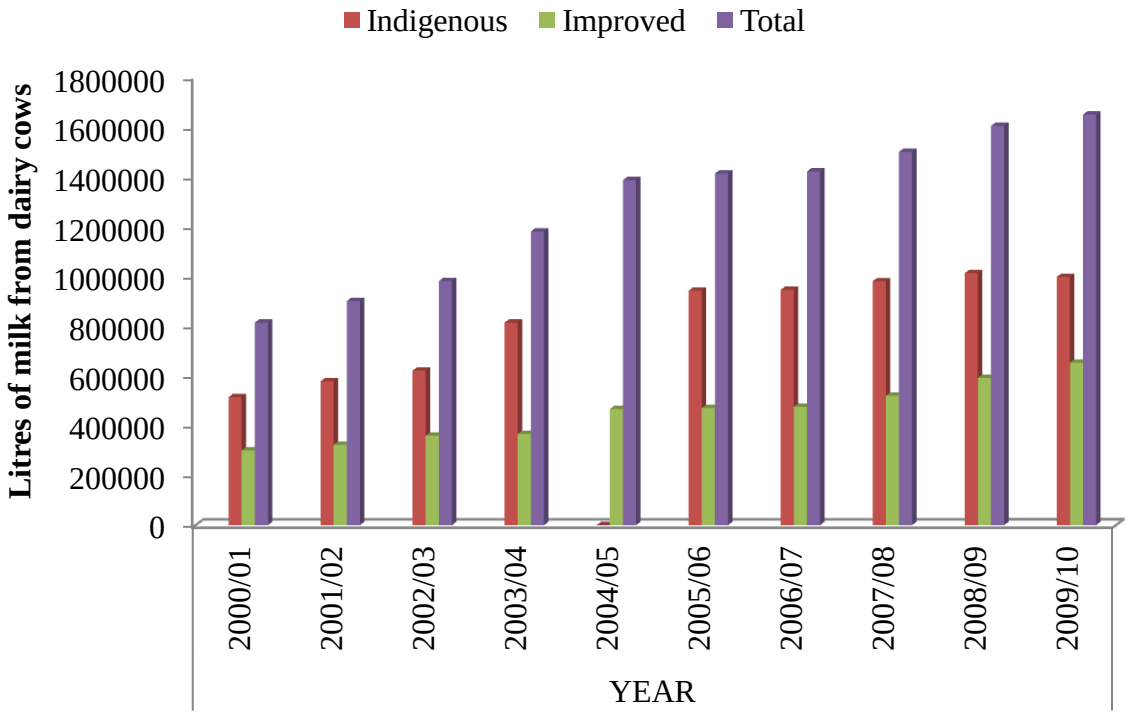

Figure 1:Production of milk ('000') 2000/01 - 2009/10
Source: MLFD 2011

Most of the milk produced is not processed and many milk processing plants operate below their installed capacity. There is evidence showing that by May 2011 the national milk processing capacity was 410 500 litres per day whereas the capacity utilization was only 123 150 litres/day, which is only 30% capacity utilization (Njombe*et al.*, 2011). This under utilization is caused by among others things, underdeveloped milk collection systems, weak technological capacity to manage the machineries, unreliable milk supply, seasonality of supply, weak institutional support as well as fluctuations in milk demand (Charles and Mchau., 2011 and Fussi, 2010). It is estimated that in 2011 per capita consumption of processed and unprocessed milk in Tanzania was about 45 litres per

annum. This consumption is relatively low compared to the FAO recommended milk per capita consumption of 200 litres for Africa(Quaedackers, 2010).

According to a study on dairy value chain by UNDP/BCS/Tetrapak (2006), milk production; processing and consumption decisions are not integrated. As a result quality and quantity demands at various nodes are not well known. This situation has limited value chain development and most of the milk produced is consumed at the farm level or sold to neighbours, and milk that cannot be disposed of, is often spoiled especially during the rainy season. Although investment in milk processing by private firms has increased after market liberalization, value addition through processing is still very low in Tanzania. Consequently, most of the processed dairy products are imported from Kenya, Netherlands and South Africa (Kurwijila*et al.,* 1997; Mbiha, 2008; FAO, 2011). The government's strategy is however, to channel surplus milk to dairy plants for commercial processing, with a view to supplyurban markets with hygienic milk and milk products(UNDP/BCS/Tetrapark, 2006 and Alexopoulou, 2011).

Despite the Government Livestock (dairy) Policy prohibiting sales of raw milk, the reality is that most of the milk is sold in the traditional informal markets which offer cheaper price due to low transaction costs. However, there are health risks since the milk is not checked for quality and safety. This is due to ignorance on the side of the vendors on such risks. The informal market creates competition with the formal market and is neither regulated nor taxed as attempts to formalize it have failed (RLDC, 2009).

1.2 Problem Statement and Justification

The basic structure of food production and food marketing has experienced a paradigm shift all over the world and the emergence of integrated food supply chains is one of the

fast growing and most visible market phenomena (Delgado *et al.,* 1999 and Lundvall, 2009). These changes mean that participants in various chains should adopt strategies to cope with the ongoing production and market changes. Dairying is one of the food subsector in which notable changes have occurred in terms of value addition, product differentiation and market competition (Bennett *et al.,*2006 and Moran, 2009).

Despite the tremendous changes occurring in the dairy subsector, there is still poor integration within the dairy subsector, the informal market in Tanzania is far greater than the formal market. Dairy studies conducted by Kurwijila (2010), UNDP/BCS/Tetrapak (2006) and Fussi (2010) have revealed that only 10% of raw milk produced reaches both formal and informal markets, of this only 2% is traded in the formal market. In the commercial sector in which 30% of milk is produced, the milk market share is apportioned as: neighbours (86.1%), local market (5.3%), traders at the farm (4.6%) and processing factories (1.4%). The low percentages of milk sold through the formal chain are an indication of fierce competition which the formal dairy sector faces in Tanzania.

Meanwhile, research findings in Africa reveal that urban dwellers consume more milk products than rural consumers in the same income band(Jansen, 1992; Staal and Mullins, 1996). According to UNDP/BCS/Tetrapark, (2006) the main markets for dairy products so far are the big cities, especially Dar es Salaam, the biggest city in Tanzania. Since very little milk is processed and packed, no milk from distant milk producing areas reaches the many potential customers in Dar es Salaam, where there is a shortage of dairy products. Despite this potential many small dairy farmers in both urban and rural areas in Tanzania have neither been able to market their milk through formal value chain nor compete favourably with imported milk (Chimilila, 2006). Where formal market chains are established, they frequently handle more products. Most population growth in developing

countries will be amongst urban, rather than rural dwellers, and they are better served by formal milk markets, particularly as consumers become more affluent (Moran, 2009).

Notwithstanding the dominance of informal milk channel, formal milk channel is seen as an important and more income generating market channel for many rural and urbandairy value chain actorsin Tanzania (Mdoe and Mnenwa, 2004; Maron, 2009; RLDC, 2009 and Fussi, 2010). Conversely, a wide range of views on whether "informality or formality" have been expressed from time to time. Some scholars see the informal channel as a constraint to development (Farrell, 2004) and others see itas a potential source of economic growth and poverty alleviation(Schneider and Ernste, 2000).Over the last decades a theory and policy shift has taken place, from banning the informal economic activities and businesses to integrating them to formal economy. However, there is little information on whether the benefits from participating in the formal milk channel exceed those from the informal market.

The proposed research is therefore an endeavour to address this gap based on factors that determine milk value chain choice between informal and formal channels among smallholder dairy farmers as well on evidences from profit margin analysis of dairy farmers in Iringa and Tanga urban. Findings from this study are intended to furnish information that will assist policy makers, NGOs and other stakeholders in designing appropriate programmes for smallholder dairy farmers and improving performance of the urban dairy farming and generally the dairy sub sector in Tanzania.

Besides filling the existing research gap, the findings of the proposed study will be useful for planners to understand the economic impacts of urban dairy farming and policy governing this activity.

1.3 Objective of the Study

1.3.1 General objective

The overall objective of this study was to evaluate factors that determine milk value chain choice between informal and formal channels among smallholder dairy farmers with a view of drawing lessons for pro-poor growth and poverty reduction among participants in the study areas.

1.3.2 Specific objectives

i) To compare profitability between informal and formal milk value chain participants, and

ii) To examine factors that influence choice of milk marketing channels/outlets.

1.4 Research Hypotheses

i) The formal and informal milk value chains are equally rewarding to dairy farmers.

ii)Household socio-economic characteristics do not influence choices of milk market channels among smallholder dairy farmers.

1.5 Organization of the Study

This study is organized into five chapters. The first chapter furnishes a general background to the study, involving discussions on the problem statement, study objectives and hypotheses. The second chapter gives a critical review of literature relevant to the study while the third chapter presents a detailed description of the study area and methodology employed. The fourth chapter presents results and discussion while the last chapter gives conclusions and recommendations drawn from the study findings.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition of Terms and Concepts

2.1.1 Value chain concept

The concept of value chain is defined differently by different authors. One of the most widely adopteddefinition of value chain is the one that defines it as a full range of activities which are required to bring a product or service from conception, through the intermediary phases of design, production, delivery to final consumers, and final disposal after use (Kaplinsky, 2000). Thus, elements to be considered in the analysis of any value chain for a commodity include; actors along the chain, their functions and interrelations; governance mechanisms for the chain, rolesof actors e.g. power relations and principal drivers of the chain functions; impact of upgrading products, services and processes within the chain; and distribution of benefits among actors within the chain (Kaplinsky, 2000; Kaplinsky and Morris, 2001; Schmitz , 2005; Rich *et al.*, 2009: Bolo *et al.*, 2011). Thus analysis of a value chain encompassesmore issues than supply chain which deals only withthe physical flow of goods or services from production to consumption through intermediate stages of value addition.

Other authors (e.g. Stevenson and Pirog, 2008) define the term ‘value chain’ from a food supply chain’s perspective (i.e. value added) as a new point of a food product which has been converted from raw products, through processing resulting in a different product form and hence the incremental value in the market place. Furthermore, ‘the word value and values’ are used to characterize the nature of business relationships among interacting food business enterprises and these values-based relationships are then called value chains.

2.1.2 Marketing channels or chains

Marketing chains can be defined as the series of steps a commodity moves from one point to the next. Formally, a marketing channel is a business structure of interdependent organizations that startsfrom the point of the product originand finds its end to the consumer (Kotler and Armstrong, 2003). This channel may be short or long depending on the kind and quality of the product marketed, available marketing services, and prevailing social and physical environment (Islam *et al.,* 2001). Marketing chain analysis can reveal the connection between price and other marketing services performed by actors. It also provides information on transport and storage destinations and who is the ultimate consumer/user.

According to Islam *et al.* (2001), marketing channel defines the flow of commodities from producers to consumers that brings into place economic agents who perform complementary functions with the aim of satisfying both producers and consumers. A marketing chain may link both formal and informal market agents, also it may connect one or more milk or dairy sheds.

Marketing chains are important in understanding which firms/dealers are involvedin business. It can be used to illustrate and clarify the movement of commodities, financial, credit and information flows, and the strategic location of storage and processing facilities in the system. The patterns revealed through such illustration may shed light on opportunities and constraints faced by traders, consumer and/or producers.

2.1.3 Formal and informal milk markets

Milk marketing through the dairy value chain takes place in many ways. According to Moran (2009) milk markets are often categorized into two main types, informal and

formal. Fussi (2010) differentiates the two terms: On one hand formal milk marketing is described as a process involving all the channels through which farmer delivers milk directly to the milk processing plant or to a Milk Collection Centre (MCC) or to traders who buys milk from the farmer and sell it to the MCC or processor. In this process retailers have the role of supplying the products that are mainly demanded and can influence what the processors produce. On the other hand informal milk marketing involves the direct delivery of fresh milk by the farmer to the consumer or milk that may pass through two or more milk vendors before reaching the consumer; this is a typical example of traditional markets in developing countries. Despite being informal, during the transaction consumers develop relationships with traders and through these relationships suppliers are able to identify and supply products according to consumers' taste and preferences.

2.1.4 Characteristics of formal and informal dairy commodity marketing systems

According to Moran (2009) the following are some of the key features of the informal and formal markets:

Informal markets are usually small scale, local markets involving few participants and milk is often sold as raw product (unprocessed). Consumers in these markets are at the lower cost end where price is considered to be more important than milk quality. Most people think of informal milk marketing as the direct sale of raw milk by a middle man, who collects it from farmersfor direct sale to the consumer.

Formal markets are usually medium to large scale, more distant markets involving more participants where milk is processed prior to sale. Consumers in these markets are at the higher cost end where quality and food safety are important. Most people think of formal

milk marketing as a process by which raw milk is bulked and chilled after collection from many farmers prior to transport to the milk factory where it is processed, packaged and distributed to small and large scale retailers.

Mano (2010) has characterized the formal and informal using theSouthern African Development Community (SADC) countries. According to Mano (2010), most SADC countries (Tanzania being among) have a dualistic dairy industry. The large traditional cattle rearing subsector involves the subsistence dairy production and informal local marketing in a low value underdeveloped market chain serving the dairy needs of the low-income, malnourished rural population.

According to Mano, the formal dairy market concentrated in high to middle income segments of the urban areas, is well-served by a small but highly productive and sophisticated commercial dairy industry that enjoys complete access to input markets, support services and quality assurance institutions. A formal comparison of the formal (high value dairy market chain) and informal (low value dairy market chain) dairy commodity value chains is summarized in the (Figure 2) below.

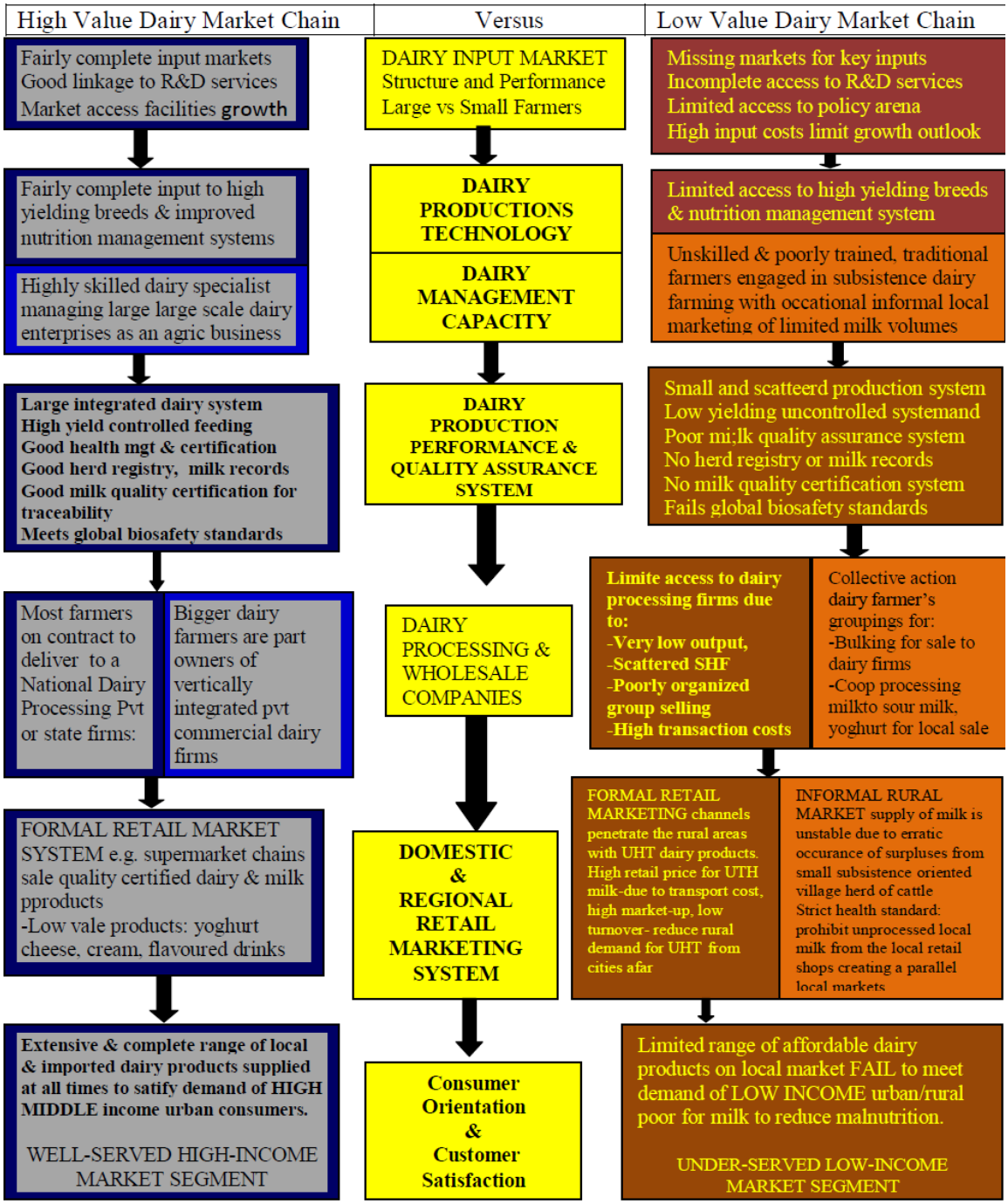

Figure 2: Comparison of formal high value and informal low value dairy marketing chains

Source: Mano, 2010

2.1.5 Marketing margin

A marketing margin is the percentage of average selling price over the average buying price at each stage of the marketing chain. The total marketing margin is the difference between what the consumer pays and what the producer/farmer receives for his product. Alternatively, it is the percentage difference between retail price and farm gate price (Cramers and Jensen, 1982). A wide margin means high prices to consumers and lower prices to producers. The total marketing margin is subdivided into two components: all the costs of marketing services and the profit margins or net returns. The marketing margin in an imperfect market is likely to be higher than that in a competitive market because of the expected abnormal profit. Marketing margins is also likely to be high, even in competitive market due to high real market cost (Wolday, 1994).

2.2 The Dairy Industry Sub sector in Tanzania

The dairy industry is among the important components of the livestock sector. In Tanzania dairy farming systems, which is mainly under smallhoder producers, may be classified as urban landless and per-urban and rural dairy farming (Kurwijira*et al.,* 2002). The Urban landless farming system is characterized by zero grazing while peri-urban and rural dairy farming encompass both zero and semi-zero grazing.

Dairy production among the stallholder farmers has contributed significantly to poverty alleviation and reduction of malnutrition particularly in rural areas (Kayunze*et al.,* 2001, Kurwijila, *et al.,* 2002).As observed by Quaedackers*et al.* (2009) the dairy sector makes up 30% of the 5 to 7% of the livestock sector contribution to the national Gross Domestic Product(GDP). The industry has even greater potential to improve the living standards of people through improved nutrition arising from milk consumption and incomes from sales of milk and milk products (Njombe*et al.,* 2011).

2.2.1 Milk production

Milk production in Tanzania is mainly from cattle. It is estimated that, out of the 21.3 million cattle in the country, about 680 000 are dairy cattle which consist of Friesian, Jersey, Ayrshire breeds and their crosses to the East African Zebu (RLDC, 2009).The rest are indigenous cattle raised as dual purpose animals for milk and meat production. Dairy goats are also gaining popularity as a source of milk particularity among the poor and their milk is normally consumed at household level (Msanga and Njombe, 2009).

Total annual milk production is currently estimated at 1.65 billion litres. About 70% of the milk produced comes from the traditional sector (indigenous cattle) kept in rural areas, while the remaining 30% comes from improved cattle mainly kept by smallholder producers (Kurwijira, 2010). The increase in milk production from both indigenous and improved dairy cattle is due to increase in herd size rather than in productivity per head (milking cow). Between 2009 and 2011, only a small proportion (10%) of marketable surplus of milk produced was sold through the urban markets and processing plants (Njombe*et al.,* 2011). Big proportion of milk was consumed at home or wasted in the rural, milk producing areas.

According to RLDC (2009) the average milk production is low and this is due to the low genetic potential of the Tanzania shorthorn Zebu estimated to produce around 0.5 litre/lactating cow/day in the dry season and 1.2during the wet season. Milk production also fluctuates greatly with seasonality; the wet season production roughly doubles that of the dry season. The reduced production during the dry season emanatesfrom shortages of pasture and water which in turn involves long distant streaking (UNDP/BCS/Tetrapark,2006). The fluctuations in production create uncertainty amongmilk producers and processors as it reverses sharply the demand and supply curves.

This pattern puts a strain on both sides as producers are looking for continuous sales of milk and processors are not supplied with enough milk during dry seasons (RLDC, 2009).

2.2.2 Milk collection and handling

Since raw milk is highly perishable, efficient means of collection and processing are crucial. Milk collection centres operate in areas with milk above the local market requirement and this surplus is sold in peri-urban and urban areas (RLDC, 2009; Ashimogo and Greenhalgh, 2007). Existing milk collection centres are operated by farmers' groups, processors or few traders who collect and sell milk to processors or consumers (Quaedackers*et al.,* 2009). The uncertain of milk supply in the traditional sector discouragesthe establishment of collection centers and processing plants (Omore*et al.,* 2009).

Milk collection for processing is feasible when there is surplus production and a well established collection system which entails bulking and transportation. As established earlier in this study, milk is mainly produced by indigenous cattle which are widely distributed in different areas including remote villages with problems like poor road infrastructure and inadequate utility services (Njombe and Msanga, 2009; and Njombe*et al.,*2011). These problems blend inefficiency in milk collection and increase the cost of collection and processing.

A few dairy producer societies that exist in Tanzania are mainly found in Tanga region (where 13 societies with 3 004 members exist). Non existence of producer societies not only makes collection and marketing of raw milk difficult but also discouragesthe introductionand adoption of innovations (Njombe*et al.,* 2011). All these challenges result into limited domestic and export marketing of milk and milk products.

2.2.3 Milk processing

Milk being a highly perishable product; marketing of surplus milk is indispensable and can only be tackled by processing raw milk into long-life dairy products. According to Njombe, *et al.* (2011) milk processing in the country is mainly undertaken by small and medium scale plants of capacities ranging between 500 and 30000 litres per day. The current national milk processing capacity is 410 500 litres per day, but, the capacity utilization is about 30%.

Fussi (2010) reports the low capacity utilization which is partly due to inadequate raw milk production as a result of seasonality in milk production which is attributed to inadequate feeding; low milk production and milk producers being widely spread in remote areas thus increasing milk collection and transportation costs; high cost of milk processing due to the high cost of equipment, machinery, packaging materials and utilities. In addition to the poor infrastructure, high cost of doing business and low milk consumption levels also constrain milk processing (Quaedackers*et al.,* 2010; Quaedackers*et al.,* 2009; Njombe*et al.,* 2011).

The privatization of TDL in 1990 -1997has caused milk collection, processing and marketing function to be left to the private sector (Njombe and Msanga, 2009; and Fussi, 2010). The RLDC (2009) estimates the quantity of milk processed at 30 Million litres per year (9.5 %) of the marketed milk. The RLDC further reveals that, the entire country has only 47 milk cooling centers installed with a total capacity of handling 88450 litres of milk per day. It is estimated that the total daily processing of milk is only 60 000 – 80 000 litres. Out of these operating processing plants, most of them are micro or small plants with a turnover of less than 1000 litres a day.

It is estimated that there are only 10 medium sized processing plants operating in the country with production higher than 1 000 liters daily. Out of them there are 5 or 6 clear leaders in processing and marketing: ASAS, Tanga Fresh Tandairies, International Dairies, and Musoma and Mara Dairies; operating in Iringa, Tanga,Dar es Salaam/Coast region, Arusha, Lake zone respectively. Musoma Dairy is the only plant in the country with capacity to produce Ultra High Temperature(UHT) milk (Quaedackers*et al.,* 2009; RLDC, 2009).

Several dairy studies (Fussi, 2010; Njombe and Msanga, 2009; UNDP/BCS/Tetrapark, 2006; Kurwijira, 2010; Valk and Tassema, 2010 and Njombe*et al.,* 2011) indicate that products processed from milk processing plants include pasteurised milk, fermented milk, cheese, yoghurt, ghee and butter. Njombe*et al.* (2011) report that among the efforts that have been made to generate a favourable environment for development of the dairy industry include the government decision to uplift import duties for milk packaging materials and some equipments used in the collection, transportation and processing of milk products. Moreover, the Local Government Authorities (LGA) are sensitizing the stakeholders to form groups, associations and cooperative societies in order to enhance milk collection, handling and processing (Fussi, 2010).

2.2.4 Milk marketing systems and consumption

Milk and milk products in Tanzania and many African countries are channeled to consumers through both formal and informal dairy marketing systems (RLDC, 2009; Quaedackers, 2010 and Mohammed *et al.,* 2004).

Milk is mainly marketed in urban and peri- urban areas where consumption is relatively higher. A study conducted by the Austro Project Association, "Assessment of Fresh Milk

and Milk Products Market and Consumption in Dar es Salaam"Kurwijila*et al.*(1995) shows that 79.2% of milk customers purchase raw milk where 40% of consumers prefer fermented milk. Only a small (3.3%) proportion of consumers buy pasteurised milk.). This is caused bythe unwillingness of many consumers to pay for the extra costs of pasteurization in the formal marketing channel as well as theirtaste and preferences for traditional dairy products (Omore*et al.,* 2009).In the informal channel, milk marketing is mainly practiced by vendors/hawkers who collect milk from their own herds and other household to sell directly to retailers (kiosks, restaurants) consumers (RLDC, 2009).

The formal market is dominated by processors who distribute and sell their produce through their own distribution networks using trucks, tricycles and bicycles, the major outlets being self operated depots, supermarkets and retailers (MMA, 2008; RLDC, 2009 and Quaedackers, 2010). The formal market faces competition from the informal marketwhich is neither regulated nor taxed and most of the attempts made to formalize it have failed.Figure 3 below illustrates the formal and informal dairy market channels in Tanzania.

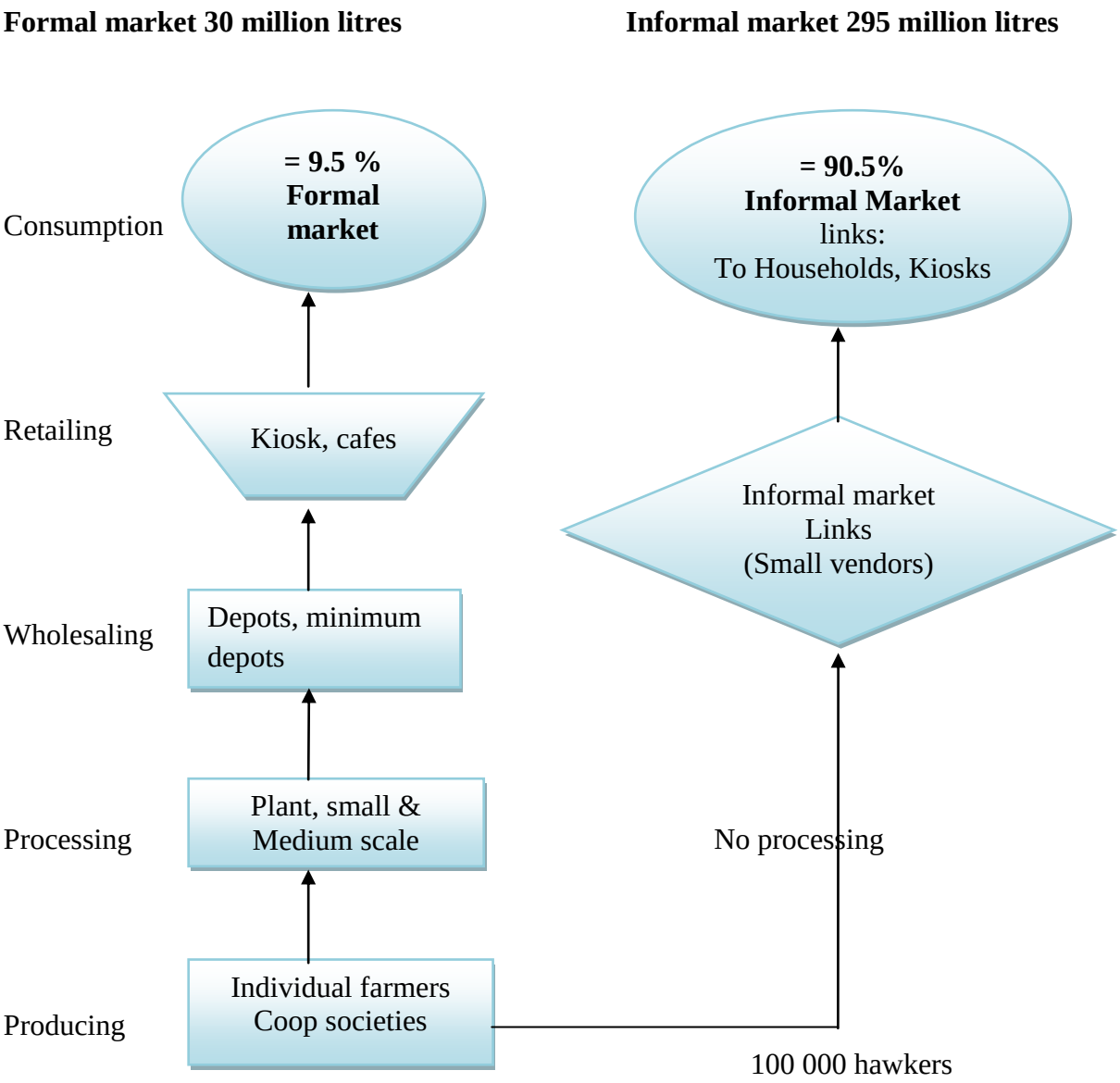

Figure 3: Formal and informal markets: source RLDC, 2009

2.3 Theoretical Framework and Empirical Methods

2.3.1 Profit maximization

Mendola (2005) stressed that farmers have the objective of maximizing profit. Since the process of decision making of a peasant family involves both production and consumption aspects, other economists have argued that the profit maximizing theory tends to ignore the consumption side. As small-scale producers often operate in a household economy, consumption and production decisions are assumed to be separable. Doing so enables producers' focus to be placed on market channel with more impact on farm output/crop profits. A small-scale producer is assumed to choose the level of output for each distribution channel in a manner that maximizes profits (Blandon *et al.,* 2007). Odhiambo (1998), Schultz hypothesized that farm households in developing countries are poor but efficient in the use of agricultural inputs. The study by Rawlins (2000) supported Schultz's hypothesis by performing Cobb-Douglas production function tests for efficiency, and these tests have shown that small scale farmers may be efficient in production decision.

A major problem that that limits the overall acceptance of efficiency hypothesis among peasant farmers is the application of the profit maximization concept as a measure of allocative efficiency. Janssen (2005) points out that most studies that have modeled farmer decision-making and have assumed that farmers maximize profit and thereby ignored the fact that decisions of farmers are normally motivated by multiple, often conflicting, objectives including profit maximization (Wallance and Moss, 2002). Instead of maximizing profit farmers may want to minimize borrowing or maximize borrowing or maximize net-worth of or maximize cash accumulation or sustain family consumption.

2.3.2 Gross margin of milk marketing enterprises

The main motivating factor to guarantee that milk traders generate sufficient earnings is the level of profit from their invested capital (Karuga, 2009). The most profitable segment along the milk value chain will attract more capital relative to the less profitable segments.

There are various measures of profitability of the enterprises including Gross Margin (GM), Return on Investment (ROI), Benefit-Cost Ratio (BCR or B/C), Internal rate of Return (IRR), and Marketing Margin (MM) (Turuka, 2000). However, Kotler and Armstrong (2006) revealed that to date there is no adequate measurement of profitability available in the marketing sector. A survey conducted by Kotler and Armstrong (2006) for marketing exclusives and professionals revealed that 68% of marketing executives have difficulties in measuring profitability of investment and 73% of them reported that there is an adequate profitability measurement tool.

However, the GM is an important measure of resource efficiency in Small and Medium Enterprises (SMEs). The GM is a gross return minus the total variable expenses, which can be expressed in normal value, ratios or as a percentage of return (Debertin, 1993).The size of GM under a competitive market condition is the outcome of supply and demand for marketing functions, and should therefore be equal to the minimum cost of service provided plus normal profit (Scarborough and Kydd, 1992). The normal profit is the least payment a trader or the owner of the enterprise would be willing to accept for performing the entrepreneurial functions. Therefore, receiving normal profit is important in order to keep the trader or proprietor from withdrawing the capital and managerial effort and putting it into another alternative business (Kotler and Armstrong, 2006).

Therefore, the calculation of GM for different enterprises in different segments along the value chain of milk marketing requires a detailed analysis of the accounts of enterprises, noting precisely the cost incurred and the value added at each stage along the value chain (Debertin, 1993). GM analysis is useful to identify returns (profit) obtained by traders at each stage along the value chain of milk marketing.

GM can be expressed as a ratio or in percentages in order to compare the profitability of enterprises at different stages along the milk (Mendoza, 1995). Thus, the GM, when expressed as ratio or percentages is given by;

$$\text{Percentage/ratio GM} = \frac{\text{Total Revenue (TR)} - \text{Total Variable Cost (TVC)}}{\text{Total Revenue (TR)}}$$

The expression above cannot be used to show the normal value of the earnings of the enterprise and cannot be used to measure profitability of non production enterprises. However, the expression is useful for comparing profit across different enterprises and different segments along the value chain (Mendoza, 1995).

The GM as ameasure of enterprises' profitability was used by Eskola (2005) for rice/milk in two different markets which are Ifakara and Dar es Salaamreported the profit obtained by different traders in the rice market along the rice national value chain.

The limitation of the methodology used by Eskola (2005) is that it entailed the use of different units of profit (values, ratios and percentages). Also, traders were not grouped into homogeneous groups performing similar functions therebymaking it difficult to interpret results and making policy recommendations.

Furthermore, Debertin (1993) identified some problems of using GM as a measure of profitability, which are failure to deduct the opportunity costs for the money invested in the enterprises. Ponte (2002) noted that the technique has several disadvantages including failure to account for the variation of fixed costs, and failure to make allowances of costs for depreciation and obsolescence of fixed assets.

However, Phiri (1991) reported that GM is still the most satisfactory measure of resource efficiency for Small and Medium Enterprises (SME). It gives a good indication of the financial health of enterprises and deep insight into traders' management efficiency of the enterprises (Hammod, 2001). Thus, without adequate GM for traders, their ability to pay operating costs and hence their business sustainability is jeopardized (Hammod, 2001).

An understanding GM across different enterprises is vital because traders tend to shift tied capital to more highly profitable enterprises or segments in the milk/dairy marketing systems (Rweyemamu, 2001).Despite the weaknesses of GM as a measurement of profitability, it remains the most satisfactory measure of resource efficiency. The GM is useful in comparingenterprises operated by small dairy farmers and middlemen performing different marketing functions.

2.4 The Theory of Choice

Dairy producers' decisions to choose one or a set of milk marketing channels is a matter of choice that can be scrutinized under the theoretical framework of economics, often called the science of choice (Parkin, 1997). Economics is a behavioural science. It is a social science as it is also central to some of modern political science and is used by some scholars in other disciplines such as sociology and philosophy Rahelizatovo (2002).

Guided by the principles of rationality this science involves seeking the most cost-effective means to achieve a specific goal without reflecting on the worthiness of that goal.

2.4.1 Rational choice theory

Rational choice theory generally referred to by economists (Lehtinen and Kuorikoski, 2007; Binmore and Shaked, 2010;McCloskey, 1996 and Rabin, 1998)as the economic approach or rational optimization approach has been widely used in social sciences. Like many theories, it uses abstract deductive reasoning by drawing conclusions and predictions from sets of assumptions, and provides guidance of "what ought to be", though the description of a situation is far from complete. Proponents of the rational choice approach claim that it provides a unified and rigorous framework to understand human behaviours and actions, an analytical tool for relating aggregate events to real environment under which individuals make decisions (Friedman and Hechter, 1988; Rule, 1997; Chai, 2001).

On the other hand, critics(absence accurate knowledge of what would happen from such decisions "bounded rationality", decision under static environment, failure to explain instants where people act altruistically "altruism", absence of a monotonic relation or 'parallelism' between overall utility and monetary payoffs) have revealed the shortcomings of the theory, including the unrealistic assumptions about preferences and the failure to incorporate such factors as altruism and cultural diversity (Hodgson, 2012; Binmore, 1999; Green and Shapiro, 1994; Binmore and Shaked, 2010;Gintis, 2006 and Herfeld, 2012). Such limitations, however, have confirmed the fact that a tractable representation of the complex world would only capture limited features of such complexity.Therefore, details are stripped to expose only specific aspects of behavior relevant to the question being analyzed.

Rational choice theory assumes that individuals are purposive and intentional (Friedman and Hechter, 1988). Individual decisions and actions are shaped by rational preferences (likes and dislikes) and constrained by resource scarcity, opportunity costs, institutional norms and quality of information.

2.4.1.1 Rational preferences

Rationality of preferences constitutes a key assumption in the neoclassical economic analysis of behaviour. Individuals are assumed to have explicit, complete, reflexive, and transitive rank ordered preferences over the possible outcomes of their actions (Bicchieri, 2004). Preferences should also assume non-satiation, strict convexity, and continuity properties. In other words, individuals should consistently prefer "more of something to less" and "average outcomes to extremes" (Rahelizatovo, 2002).

Usually, preferences are described by means of the graphical representation of an indifference curve (Figure 4). Such a curve consists of a locus of pair-wise combinations of outcomes that would provide the same level of satisfaction to the decision maker. Each indifference curve represents a different level of utility. The continuity and completeness of a preference ranking would lead to a dense map of indifference curves. Curves positioned further to the north-east of the map are assumed to provide decision makers with higher satisfaction. In addition, the convexity of preferences ensures that the indifference curve exhibits the diminishing marginal rate of substitution. In other words, the more an individual has of a good, the less satisfaction he perceives from an additional unit of the same good and the more he is willing to exchange it for a given amount of the other goods (Case and Fair, 1992; Varian, 1999; Parkin, 1997).

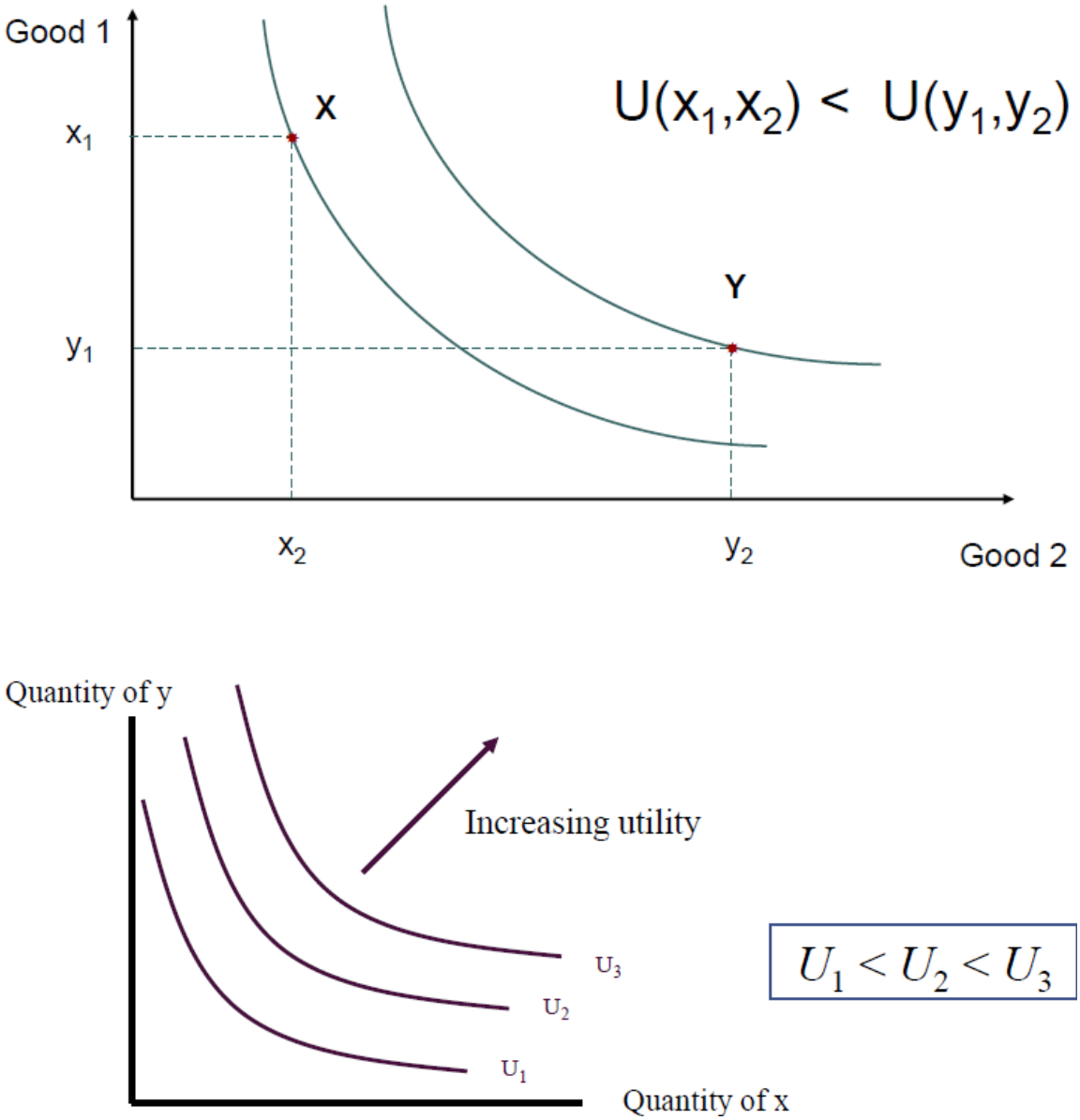

Figure 4: Illustration of preferences using indifference curve

2.4.1.2 Optimization behaviour

The fundamental economic problem has been attributed to the limited resources available to satisfy human beings' unlimited wants and needs (Parkin, 1997). Resource scarcity drives individuals to make choices to attain satisfactory ends consistent with their preference hierarchy.Differential access to resources affects the individual's ability to attain the alternative end results, making some easy to achieve, and others more difficult or even impossible to reach (Friedman and Hechter, 1988). However, decision makers are

assumed to conduct rational calculation and subsequently select the course of action likely to be associated with the highest outcome values.

Utility theory offers an understanding of individuals' choice through utility maximizationbehaviour (Varian, 1993; Parkin, 1997). Individuals' preferences are associatedwith a real-value indexed utility. Consequently, individuals'choice is assumed to favour thecourse of action that provides the highest utility, or maximum satisfaction. Yet, individuals'choices often fail to agree with such an ideal proposition.

There are other factors that affect individuals' decisions. One factor is what economists term as opportunity costs, which arise with making a specific choice. These implicit costs are associated with the act of foregoing the next best alternative available to decision makers. Individuals must consider these implicit costs in their pursuit of maximum benefits and satisfaction (Rahelizatovo, 2002). High opportunity costs can affect the attractiveness of the most preferred action and may urge decision makers to act accordingly, by choosing a lower level of satisfaction attainment instead. Thus, individuals' choices favour the course of action that would provide the highest expected net benefits.

Similarly, institutional norms and rules, as well as access to better quality information at the time a choice has to be made, also influence individuals' decision outcomes. Individuals may also reduce the risk and uncertainty surrounding their choices by acquiring more information. Perception of rewards and costs are shaped by social institution rules (Rahelizatovo, 2002).

2.4.2 Discrete choice modeling

Discrete choice models are econometric modeling techniques that focus on the analysis of the behaviour of decision makers who face a finite set of alternative choices. Such models attempt to relate the conditional probability of a particular choice to various attributes of the alternatives, which are specific to each individual, as well as the characteristics of the decision makers (Judge *et al.*, 1985). The choice behaviour of individuals with only two alternatives can be examined using a dichotomous dependent variable as in the case of binary choice models. There are different ways to approach such models. Models relying on the linear random utility assumption are based on an individual decision maker maximizing his/her expected utility derived from the choice.

2.4.3 Empiricalmodels and determinants of market choice for smallholder farmers

Staal*et al.* (2006) in their study on smallholder Dairy Farmer Access to Alternative Milk Market Channels in Gujarat; employed the conditional (fixed effects) logit analysis to evaluate farmers' choice of milk marketing channel among those that were available in the area: direct sales to individual customers, sales to generally informal private traders/venders and sales to cooperatives/private dairy processors. The latter two milk channels were included explicitly, thus the comparator variable was direct sales to customers. The results indicated that farmers are less likely to select the private traders marketchannel when there is option of selling to individual customers. Similarly, though notstatistically significant, households may be less likely to select the coop/private processorschannel than the individual customer channel. As expected, households that kept the higher number of livestock were more likely to select both the private traders and dairy coop/processor channel as opposed to selecting the individual customer channel. The interpretation here was that farmers producing more milk sought out channels that can more easily accept larger, and possibly more variable, quantities of milk.

Interestingly, the results presented by Staal*et al*indicated that households were less likely to select channels that paid cash, or that took milk on informal credit. Conversely, channels that offered monthly payment or provided formalized credit terms (written contract) were more likely to be selected (the base comparator in the analysis). Finally authors concluded that, there was no evidence in the results that informal markets would diminishas the scale of production increased or that processed milk markets were more attractive to large scale producers than informal traders.

Sharma *et al.* (2009) examined determinants of market channel choices of milk producers in India. A two-stage multinomial logit model was employed to investigate determinants and effects of market channel choices of milk producers. The paper also attempted to investigate what impacts these market channel choices may have on farmers' income and technology adoption.Results indicate that small dairy farmers and the poor were likely to be excluded from modern private sector channels. Household's socio-economic variables (farm size, age and education) were important determinants of marketing channel choice in the case of the modern private sector. Large farmers had better opportunity to participate in modern private channels. Market infrastructure such as road, provision of veterinary services, and distance from the milk collection centres, markets, milk collection centres and price risks hadsignificant effect on farmers' choices of market channels. The second stage results of the Heckman model showed that education, membership of the producers' association/cooperatives, provision of veterinary services, and farm size had significant impact on cooperative marketing channel and farmers' income while in the case of modern private sector, education and price risk had significant impact on income.

Fertő and Szabó (2002) investigatedfactors that influenced farmers' choice of supply chain in Hungarian fruit and vegetable sector using a multinomial logit model. In this study

farmers had three possible choices; wholesale chain, marketing cooperative chain and producer organization chain. The results indicated that, the farmer's decisions with respects to supply channels were influenced differently by transaction costs. Decisions among producers selling to wholesale market were negatively affected by the farmer's age, information costsas well as bargaining power and monitoring costs. Producers' choices to sell to marketing cooperative or producer organization were different. Moreover, the probability that farmers would sell their products to marketing cooperative was found to be positively influenced by the age and information costs, whereas asset specificity and bargaining power affected it negatively. The results indicated a similar picture for producer organizations without significance, except for asset specificity though unexpected with opposite sign.

Sayin*et al.* (2011)used the logit model to evaluate factors affecting milk marketing decisions. Results show that milk selling decisions were significantly affected by income and demographic characteristics. Empirical findings also showed that milk producers who received milk incentive premiums received higher price than others. Results also show that decisions whether to sell to cooperatives or individuals were significantly affected by income and demographic characteristics. In particular, income had positive effecton the sell to cooperatives, while participation in cooperatives and the probability of selling milk to street sellers declined with age. Empirical findings also show that price primia and market scarcity were important factors in influencing these choices.

Bhuyan (2009) used a binomial logistic model to determine factors that influence a dairy farmer's choice of cooperatives as market channel. The covariates included various farm and farm operator characteristics and farm management efficiencies. The study hypothesized that some of the factors that were likely to influence dairy farmers' decisions

to participate in cooperatives were price of milk, farm size, the farm operator's age and his/her level of education. The following were variables that were statistically significant: average price received for raw milk; level of education of a dairy farmer; whether a dairy farmer received government payment; whether a dairy farmer had a written contract with handlers and processors; whether a dairy farmer was financed by a buyer to acquire inputsand had a nutrition plan for his cows; and how solvent the dairy farm was.

Moreover,Bhuyan (2009) reported that, dairy farmer's decision to sell his/her raw milk to cooperatives was found to be influenced by the price of milk as dairy farmers were more likely to sell their milk to non-cooperative buyers when they offered better prices. Similarly, dairy farmers who received additional payments from the government were less likely to participate in cooperatives. Likewise, other factors that significantly increased the likelihood of a dairy farmer to sell his/her raw milk to cooperatives included the educational level of the farmer, whether there was a written contract for marketing milk, and the degree of solvency of the dairy farm. More specifically, it was found that the higher the education level of the dairy farmer, the higher the likelihood of participation, ceteris paribus. In terms of farm operator characteristics, a dairy farmer's level of education impacted his decision to sell to cooperatives. It was established that the likelihood of such a dairy farmer selling his raw milk to a cooperative increased with the level of education. Finally, there was no relationship between farm size and dairy farmers' decisions to participate in cooperatives, or between farm size and dairy farmers' cooperative membership.

Kyeyamwa*et al.* (2008) used a multinomial logistic regression to assess factors that influence market choice among livestock farmers in rural Uganda. According to this study, market categories were dichotomized as the informal market (farm gate sales) and the

formal market (primary, secondary, and tertiary market outlets). Factors such as age of livestock keeper, experience and education of farmers were important characteristics for a livestock to choose either formal or informal market. Regarding age, it was established that younger farmers (less than 35 years of age) were more likely to sell through the formal market channel. This expected, as young farmers may find it easier to overcome transaction costs related to accessing formal channels such as handling costs, distance and time and market information search.More experienced farmers were also likely to choose informal markets than those who were less experienced. Highereducation levels also increase the possibility to choose formal markets as higher level of education is expected to lower transaction costs associated with the participation in formal markets.

Lefevre (2011) in his paper that aimed at evaluating Senegalese consumers' willingness-to-pay (WTP) for local fresh milk-based products, in opposition to the ones produced with imported powder used an Ordered Probit Model (OPM). The results showed evidence for a positive WTP for fresh raw material, which may be seen as a strong indication of preference for local products.

Jariand Fraser (2009) also used the multinomial logistic model to identify institutional and technical factors that influence market participation choices amongst smallholders.The model was used to assess the odds of: informal market participation versus not participating; and formal market participation versus not participating. The results of the logistic regression model revealed that market participation choices were influenced by technical and institutional variables. The statistically significant variableswere access to market information, expertise on grades and standards, availability of contractual agreements, existence of extensive social capital, availability of good market infrastructure, group participation and reliance on traditions. Jari and Fraser (2009)

concluded that the significant predictor variables that had a higher probability of shifting households from non-market participation to informal marketing were access to market information, availability of good market infrastructure, existence of extensive social capital, group participation and guidance from tradition.

Jari and Fraser (2009) further reports the variables that were likely to shift households from non-market participation to formal market participation to be group participation, access to market information, expertise on grades and standards, availability of contractual agreements and existence of extensive social capital. These variables had positive influence on formal marketing, implying that, an increase in each of the variables resulted in a higher probability of households changing from not participating in product marketing to formal market participation.

Uzunoz and Akcay (2012)using the probit model analyzed the socioeconomic factors affecting milk consumption of households in Turkey. Four estimators (household size, income, milk preferences reason, and milk price) in the probit model were found statistically significant. According to empirical results, consumers with lower household size and higher income levels tend to consume packed milk consumption. The study findings further revealed that consumers who were sensitive to price were less likely to consume packed milk and believed that packed milk price was expensive compared to unpacked milk price. Also, milk price was an effective factor concerning packing and unpacked milk consumption behavior. The majority of consumers read the contents of packed fluid milk and was affected by safety food in their shopping preferences.

Somano (2008) used the Heckman two-stage econometric estimation procedure (Probit model analysis) to identify factors that determine milk market participation decision and

milk sale volume of the farm household in the area. The first step of the Heckman two stageprocedure's results showed that dairy household milk market entry decision was strongly and significantly affected by age of the household head, family size, education level, experience in dairy production, number of cross breed milking cows owned and distance from milk market center. In addition, the second stage estimation results revealed that marketable milk volume was found to be strong and significantly affected by the number of cross breed milking cows owned, family size, age squared and annual non-dairy income source of sampled dairy households. More specific, the probit model analysis results revealed that dairy household milk market participation decision was positive and significantly affected by formal education level of the dairy household head. This result confirms that education improves the readiness of the dairy household to accept new idea and innovations, and get updated demand and supply price information which in turn enhances their willingness to produce more, and thus increase their market participation level.

Sinja*et al.* (2006) analysed factors that determine participation in milk marketing groups in Kenya using the Logit model (Probit) accommodated.Results showed that most of the variables used in the regression (age of trader, education level of leader, region where the group is found, gender of trader, type of business, and contact with regulatory authority) did not significantly affect participation in a milk marketing group. The probability of joining a group was found to be the same in all regions and there were no differences with respect to sex, education and age of milk trader.The type of business the trader operated had significant influence on their probability of joining a group. Traders with milk bars were significantly less likely to join a group than those with other type of business.

The situation might be so because traders with milk bars were likely to be able to access the market as individual milk bars without using group as their clients were always likely to find them in their location. The probability for traders were was not significantly different from traders produced own milk or were employed as transporters. Finally the study concludes that belonging to a group increases the probability of a trader being established in informal milk marketing since he/she incurs less losses in the business, is able to handle bigger volumes of milk and fetch higher prices for the milk. Hence group operations in milk marketing were argued to be beneficial to producers, middlemenas well as consumers who stand a better chance to get quality milk.

Lie *et al.* (2012) in their paper assessed the potential of local dairy value chains as an approach for smallholder farmers to improve their livelihood. Authors looked at smallholders' capability to establish and sustainably manage a competitive and economically viable local dairy value chain through the case of Twawose, a small dairy goat co-operative in Tanzania. The analysis used a value chain approach as a framework to identify the possibilities for upgrading and the determinants of competitiveness in value chains in which smallholder farmers can participate.

Mburu*et al.* (2007) seeking to understand factors affecting smallholder dairy farmers' adoption of various milk marketing channels used econometric logit models to evaluate the rationale underlying smallholders' milk marketing channel choice. Eleven explanatory variables were significant in explaining farmers' adoption of milk marketing through the dairy cooperative channel. These variables were: leases land, average milk price, total number of cow milked and farm acreage negatively influenced farmers' adoption of milk marketing through the dairy cooperative channel. Upper midlands, lower highlands, hired permanent labour, household head worked off-farm, average milk production per cow

(kg/day), dairy cooperative as a source of animal production information, and availability of credit services had positive influence.

Woldie and Nuppenau (2009) analysed factors affecting the selection of marketing channels among banana farmers. The main channels included sales to wholesale traders, sales through cooperative marketing groups and sell through village retailers to local consumers. The study hypothesized that transaction costs affect channel choice decision as they were different in alternative channels. The study used a Transaction Cost Economics (TCE) to explain the use of wholesale traders and marketing cooperatives by farmers. By using a tobit model an attempt was made to demonstrate the empirical application of TCE and measure transaction costs that influence smallholder markets.

Bardhan *et al.* (2012) analyzed the factors that determine dairy farmers' choice of marketing channel and degree to which their market choice influence the level of commercialization or market participation. The study used multinomial logit (MNL) model to ascertain major factors influencing producers' choice of marketing channels and a multivariate regression model to assess the level of market participation. The study revealed that given the right institutional incentives and market infrastructure, marginal and small landholders were capable of scaling-up milk production and hence commercializes their dairy enterprises. The results of MNL analysis indicated that increase in the scale of milk production would lead a shift away from cooperatives to market as point of first sale. Milk production and extension contact emerged as the two most important policy variables favourably influencing intensity of market participation. Distance to market has negatively influenced likelihood of producers' market participation, irrespective of hills or plains.

Yayar (2012) when attempting to investigate packed and unpacked fluid milk consumption and preferences among Turkish households used multinomial logit procedure to investigate the selected socioeconomic and demographic characteristics of consumers that determined households' fluid milk consumption choices among packed, unpacked and both packed-unpacked milk consumption choices. Results indicated that better educated household heads, higher income and larger households, and households with children under seven years of age consumed more packed milk than others. A similar result was found for unpacked milk consumption, except for a negative effect of education, working wife and income.

Alwis*et al.* (2009) in their study focused on analysing the consumer attitudes, demographic and economic factors that affect fresh milk consumption among the mid-country consumers of Sri Lanka. Factor analysis was carried out in order to weigh up the consumer attitudes and factor scores were introduced to the final model as independent variables which can be categorized as cost and usage, nutrition, sensory factors and availability. An ordered logistic regression was carried out to find out the relationships between number of demographic and socio-economic characteristics of consumers such as age, gender, level of education, income, size and composition of the household, ethnic group and presence of diseases that affect fresh milk consumption. Results from estimation of a ordered logistic regression model of consumption showed age of the respondent, cost and usage related attitudinal factor and Nutrition related attitudinal factors were the key determinants of milk consumption levels; however, household monthly income, health problems affected on fresh milk consumption and level of education played a more important role in consumption.

Mzyece (2011) employed the probit model to identify the factors that influence cowpea producers' market participation decisions as well as their choice of marketing channels in Zambia. The results showed that cowpea producers sold to a particular channel as long as it presented a ready market to the seller. The factors that influenced the producers' market participation decisions included price, inventory, transport, level of mechanization and marital status.

While considering the dynamic changes in agri-food systems in developing countries, Blandon *et al.* (2009) used a stated choice model to explore the marketing preferences of small-scale producers of fresh fruits and vegetables in Honduras. The results suggest that farmers have strong marketing preferences associated with new supply chains, such as prearranging prices and quantities with buyers, but have remaining preferences for some attributes of traditional spot markets, such as the lack of grading produce, receiving cash payments, lack of delivery schedules, ability to sell at the farm gate, and ability to sell individually. Further, farmers preferred market channels that did not require major upfront investments.

Chalwe(2011) aiming at understanding Zambian smallholder bean producers and the factors that influence their choice of marketing channels used a probit. Results from the probit model indicated that the choice of marketing channel was directly influenced by the price of beans, scale of operation (as measured by the quantity of beans harvested, and quantity sold), distance to the market, farming mechanization used and livestock ownership. On the other hand probit results for decision to sell indicated that price, mechanization and farmers age significantly affected farmers' decision to sell. Meaning that price was very important in stimulating both selling decisions and channel selection.

Vergara*et al.* (2004) used a multinomial logit model to analysefarmers' preferences of marketcontracts. The findings show that farm size can favourpooling than cash sales. Producers willing to incur higher transaction costs tend to choose futures/options contracts and forward pricing. It was also found that risk-averse producers did not prefer pooling contracts. On the other hand, producers who aimed at abnormal gains through speculation tend to choose pooling contracts. Finally, producers who perceive markets as being price-efficient prefer cash sales.

A logit model was used by Kumar (2010) to identify drivers that could induce the milk market agents' participation in the milk processing. The results of the logit model show that age, education, household size, experience and occupation have been found to influence the traders' decision to participate in the milk value chain. A person with a higher education level is expected to have a better access to information and understanding of emerging marketing opportunities in the milk value chain. The more experienced milk traders seemed to participate more eagerly in the milk value chain, as the experience helps the traders to understand the nitty-gritty of the business and thus facilitates their entry into more lucrative marketing opportunity. The study found further that, traders who depended on milk marketing have a higher propensity to choosethe milk value addition to maximize their income. Age and household size did influence the traders' decision to participate in milk value addition activities negatively. With increase in age, the traders' risk bearing abilities as well as the quest for exploring new business entity are reduced.

Hatirli*et al.* (2003) investigated factors affecting choices of milk sources using a multinomial logit model Results indicated that number of children, household size, educational level and income were among the important household characteristics that influence fluid milk purchasing behaviors. In particular, processed fluid milk purchases

were made by households with high-income levels, higher educated and small households in comparison to unpacked fluid milk purchases. On the other hand, results revealed that response of households to price difference and other usages of fluid milk significantly stimulated households to choose unpacked and processedalternatives over the processed fluid milk choice.

Ogunleye and Oladeji (2007) in their study entitled "Choice of Cocoa Market Channels among Cocoa Farmers in ILA Local Government Area of Osun State, Nigeria" used logit model and found that the cocoa farmers in the study area made their choice of market channels for their produce based on time of payment, mode of payment, price of product, distance from farm, transportation cost and grading of product. Majority of the farmers involved in the study patronized itinerant buyers, cocoa merchant, other farmers and cooperative society store in that decreasing order. They conclude that the delay between when produce are sold and when payment are made is an important negotiation cost that influences the choice of an outlet for cocoa farmers. Delay in payment discouraged farmers from the choice of an outlet. Transportation cost increases with increased distance from farm and also related to the condition of road. Bad road tends to increase the transportation cost and so farmers will prefer a very low transportation cost if they cannot completely avoid it. Uncertainties are attached to grading of produce because farmers stand the chance of their produce being rejected or the price being brought down and so farmers will tend to prefer a situation of not facing either of the two consequences attached to grading of produce.

A study by Wojciech, Timothy and Abdulbaki (2003) "Marketing portfolio Choices by Independent Peach Growers: An Application of the "Polychotomous Selection Model (PSM)" showed that In selecting a marketing channel for fresh peach sales, Georgia

commercial peach growers choose the channel after accounting for buyers' preferences for quality attributes. Using the PSM and survey data it was identified that both external and internal quality attributes were essential factors influencing the choice of a marketing channel and the share of the crop marketed. Other factors that influenced the choice and the volume sold through each marketing channel included orchard characteristics and the variety-determined fruit maturity**.**

Gbetibouo (2009) used aHeckman probit model and a multinomial logit (MNL) model to examine the determinants of adaptation to climate change and variability.Initially, the MNL was specified with 10 adaptation options of which failed to produce satisfactory results in terms of the significance level of the parameters estimates and also in terms of the validity of the Independence of Irrelevant Alternatives (IIA) assumption. The model was thus restructured by grouping three closely related choices together in the same category which finally yielded seven adaptation options. Based on the review of literature on adoption of new technologies and adaptation studies, a range of household and farm characteristics, institutional factors, and other factors that describe local conditions were identified and included in the model.The results of the multinomial logit and Heckman probit models revealed that household size, farming experience, wealth, access to credit, access to water, tenure rights, off-farm activities, and access to extension were the main factors that enhanced adaptive capacity.

2.4.4 Synthesis of the literature review

Literature review was done by comprehensively collecting the existing literature on the overall marketing channels along milk supply and/or value chain. The review revealed thatthere is a growing recognition of the relevance of value chain analysis concepts and

their application in agriculture for market-led development. The concepts are applicable across a wide range of products in the primary sector and therefore have great potential to help in developing both rural and urban enterprises and economy as whole.

The value chain was defined focusing on activities as well as actors involved from production through delivery to ultimate consumer. The assessment of value chain has substantial merit in highlighting the constraints and opportunities at and between stages/nodes of the chain and thus can be used to develop integrative policy recommendations that target chain inefficiencies and address distributional issues. Also value chain is useful in analyzing the role of policy in enhancing the competitiveness of a firm and analysis of returns to different activities in the chain. It is argued that the competitiveness of enterprises or industry depends on the business environment viewed from the policy and institutional point and the company operations such as inter-firm cooperation.

Similarly, methodological approaches were reviewed with a corresponding discussion of each approach. Gross margin (GM) as one of the key measures of profitability/returns from business was discussed giving weight to the advantages, disadvantages and its applicability in measuring business performance citing empirical studies employed the technique. GM may be used as an initial indicator of potential competition concern of the market. Furthermore, marketing margin technique was used to indicate how much has been paid for processing and marketing services applied to the product (s) at a particular stage in the marketing process. Also it was learnt that in spite of the shortcoming of the approach still it still a good measure of market performance.

The theory of choice was reviewed. Rational choice theory (rational preference and optimization behavior) was linked with the utility that individual derive from the choices they make. Rational choice theory is relevant for agricultural market channel analysis in developing countries as well as in agricultural sector. This is due to the fact that not all market outlets or channels guarantee the desired returns/margins to farmers hence farmers utilize the in selecting market outlet for their output.

Discrete choice models (logit such binary, multinomial, tobit and probit) as econometric modeling techniques that focus on the analysis of the behaviour of decision makers who face a finite set of alternative choices were involved in the review. It was learnt that such models (logistic regression) attempt to relate the conditional probability of a particular choice to various attributes of the alternatives, which are specific to each individual, as well as the characteristics of the decision makers. Additionally, empirical studies under different market settings were cited and thoroughly discussed with the aim of getting a clear applicability of the choice models among farmers with respect to agricultural (milk) marketing channels.

A review on marketing channels that milk value chain actors use to supply their milk to the market has indicated principally two milk channels (informal and formal channels) that govern the milk value chain in Tanzania. A characterization of these two imperative milk market channels was conducted with the target of setting the prevailing difference in terms of efficiency as well as the dominant user of the each channel within the Tanzania context. Based on the literature reviewed the majority of supplies/producers prefer using the informal channel despite the weaknesses pointed out by former researches.

Empirical findings have indicated that informal milk channel is vital and more income generating market channel for many rural and urbandairy value chain actorsin Tanzania, while other hold against it attaching due credence to formal and modernized channel. Conversely, a wide range of views on whether “informality or formality” have been expressed from time to time. Some scholars see the informal channel as a constraint to development (Farrell, 2004) and others see itas a potential source of economic growth and poverty alleviation. Over the last decades a theory and policy shift has taken place, from banning the informal economic activities and businesses to integrating them to formal economy. These antagonistic views pose questions that need to be unanswered. However, there is diminutive information on whether the benefits from participating in the formal milk channel exceed those from the informal market.

The proposed research was therefore an endeavour to address this information gap based on factors that determine milk value chain choice between informal and formal channels among smallholder dairy farmers as well on evidences from profit margin analysis of dairy farmers in study areas.

2.5 Conceptual Framework

The conceptual framework is essential as a guideline in identifying important variables and for effective and efficient data collection. Scarborough and Kydd (1992) suggest that such a framework should help to indicate the most useful area in which to focus the limited research resources and ensure that data collected are relevant to meet the objectives of the research. In this study, it is assumed that independent variables such as social economic factors influence the choice of market outlets among smallholder dairy farmers. These factors are assumed to be influenced by the background variables

(institutional and technical factors) like infrastructure, market intelligence, machinery and government policies. The conceptual framework for this study is shown in (Figure 5).

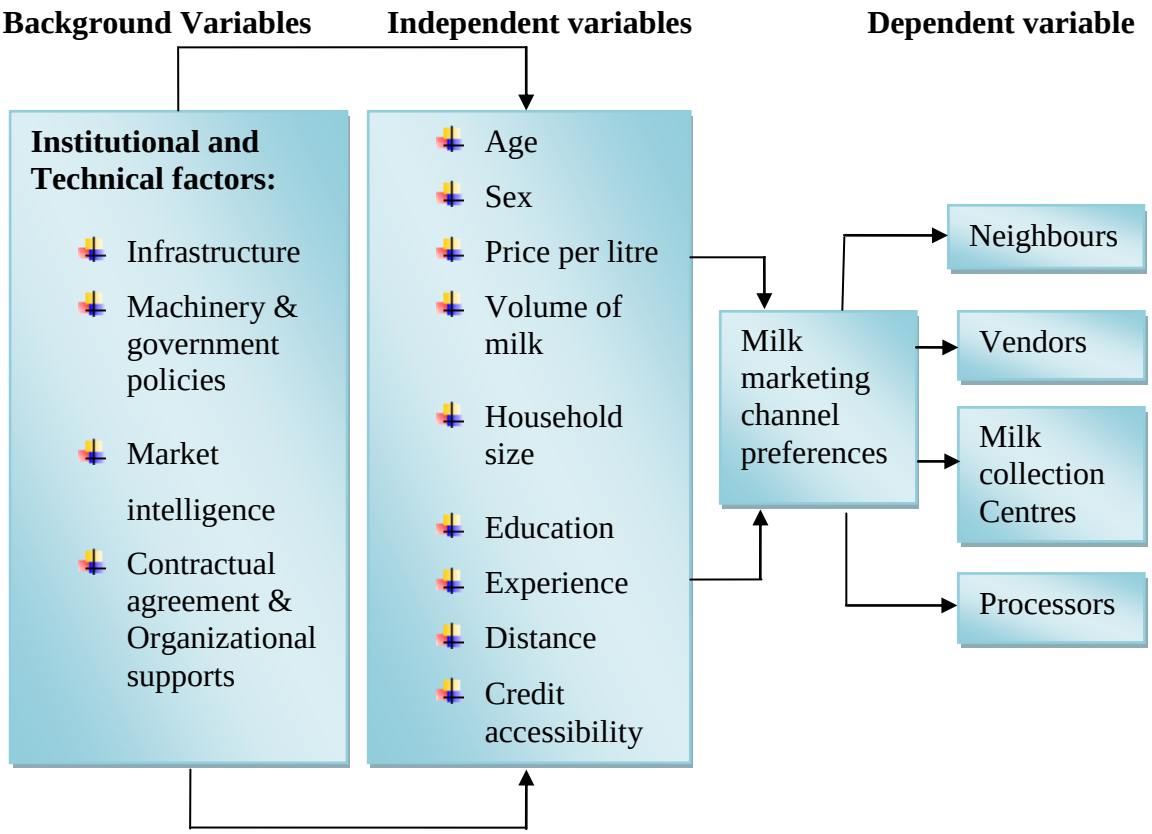

Figure 5: Conceptual framework for this study

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Areas

3.1.1 Justification for the selection of the study areas

This study focused on milk value chain inIringa Municipality and Tanga City withthe view of drawing specific impacts of urban dairy enterprises on income and poverty levels. These towns represent two distinct milk collection and marketing arrangements. Milk collection centers organized by farmer groups are well developed in Tanga City where the Tanga Dairy Development Programme (TDDP) has been supporting the Tanga Dairies Co-operative Union (TDCU), an apex organization of 10 primary co-operatives in five districts to promote joint marketing of small dairy farmers' milk. In contrast, processors in Iringa Municipality have not established and sustained own milk collection centers in an attempt to source milk from some producers. The two cases describe market arrangements found elsewhere in Tanzania and were selected to draw specific lessons with respect to impact of formal cooperation vis-à-vis individual farmer's effort to access formal value chains and its implication for value chain governance and income for all actors involved. The map of the study areas isshown in Figure 6below.

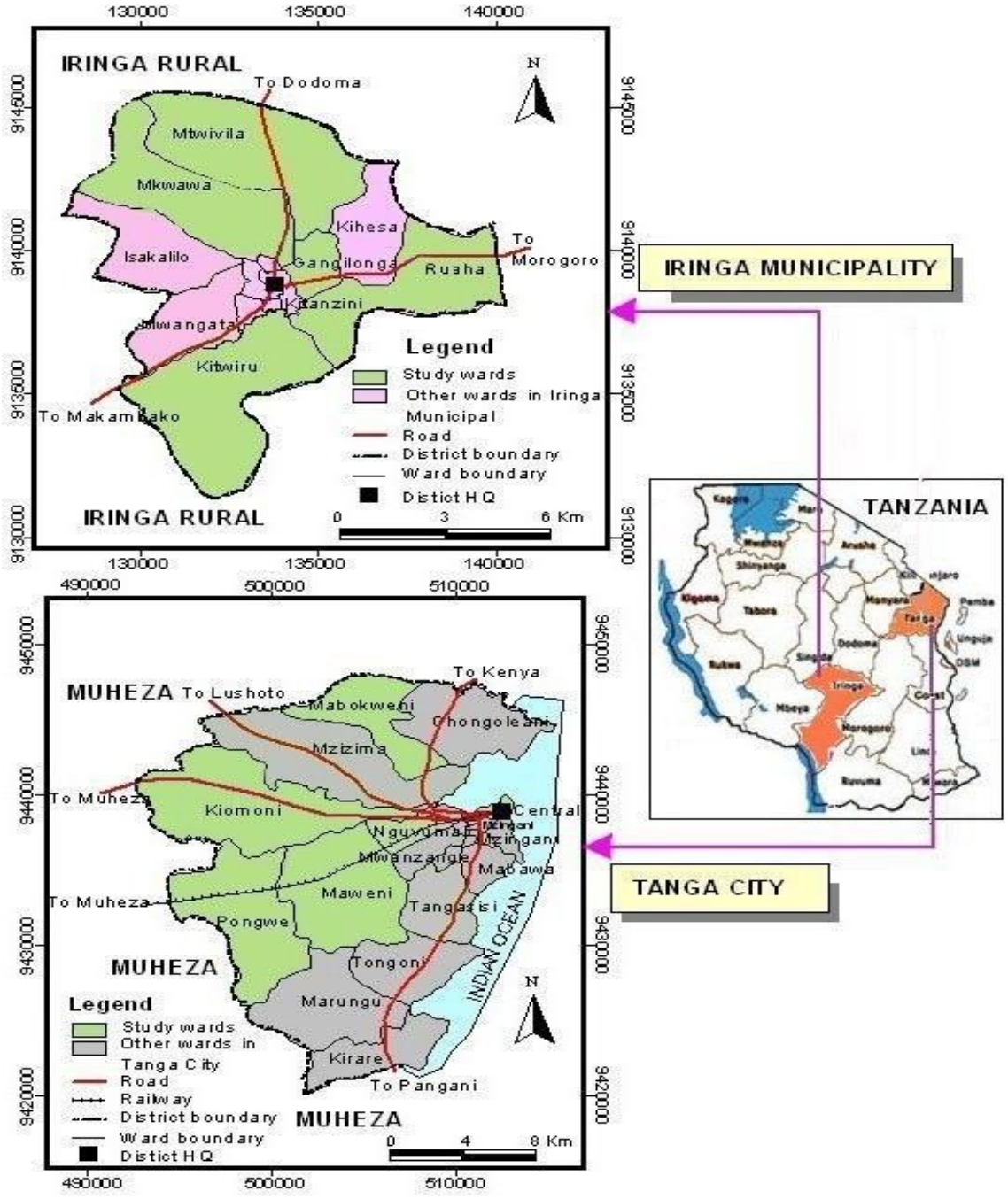

Figure 6:Map of Iringa Municipality and Tanga City

3.1.2 Iringa Municipality

3.1.2.1 Location and size

Iringa Municipality council is part of Iringa region. It lies between 7^{o}C south of the equator and between longitudes 35^{o}C East of the Greenwich Meridian. The altitude is between 1 560 and 2 000 meters above sea level. The Municipality covers an area of 162 squares Km. The Municipality is round bordered by the Iringa District except for Kilolo District to the South East. The Municipality is bordered by the Iringa Rural District,Nduli ward in the North West, Kalenga Ward in the West and Msekee ward in the South West. It is also bordered by Kilolo District, Magulilwa ward in the South East and Mazombe ward in the East (DADP, 2010).

3.1.2.2 Population size and administrative unit

According to the projection of 2002 population census Iringa Municipality Council has a total population of 142 762, of which 70 333 are males while 76 429 are females in 2002. The Council has an annual growth rate of 1.6% with population density of 916 and 34 010 households. Administratively, Iringa Municipality has one division, 14 wards, 3 registered villages, 13 unregistered villages/harmlets (*vitongoji*) and 149 neighbourhoodsstreets (*Mitaa*). Five of the 14 wards namely, Mtwivila, Mkwawa, Mwangata, Kitwiru, and Ruaha are situated in the peri-urban area while the remaining nine namely, Ilala,Makorongoni, Gangilonga, Kwakilosa, Kihesa,Mvinjeni, Kitanzini, Mshindo and Mlandege are situated in the urban area. The municipality is the headquarter of Iringa District and is a regional headquarters (DADP, 2010).

3.1.2.3 Climatic condition

The temperature is relatively cool throughout the year. The mean annual temperature is about 19^{o}C. June and July are the coolest months of the year with temperatures between 11^{o}C and 22^{o}C while December is the warmest month of the year with temperatures ranging from 15^{o}C-28^{o}C.Iringa Municipality has only one rainy season, which is from December to May. Annual average rainfall is about 600mm. The Municipality falls in Agro- Ecological zone three (AEZ III) (DADP, 2010).

3.1.2.4 Socio- economic activities

The main economic activities carried out in Iringa Municipality include; agriculture, livestock husbandry and forestry.

3.1.2.4.1 Agriculture production

Urban farming is one of the key economic sectors. It provides employment to over 40% of the labour force and contributes 40% of the food requirements for the Municipality. About 72 000 ha out 162 000 are suitable for farming. The dominant soil is sandy loam, this is mainly found along river valleys and in Itamba basin. Agricultural activities carried out in peripheral wards and generally dominated by smallholders. The main food crops grown include; maize, beans, sweet potatoes, vegetable crops, the major cash crops are sunflowers.

3.1.2.4.2 Livestock husbandry

Livestock keeping is mainly carried out in the outer wards such as Ruaha, Mkwawa, Mwangata, Gangilonga, Kihesa and Mtwivila. Livestock husbandry is an important incomegenerating activity and this income comes from the sale of milk, meat, skin, eggs

and horns. Iringa Municipality has the total of cattle is 3 564, pigs 1 529, indigenous chicken30 600, layers 24 800, broiler1 0120.

3.1.2.4.3 Forestry and forest products

The main forest reserve in Iringa Municipality is on Mawelewele hill and Kihesa Kilolo which covers about 233 hectares. About 113.1 hectares of this constitute of Miombo forest. This forest provides only a portion of fuel wood, charcoal and building materials needed in Iringa Municipality.

3.1.2.4.4 Infrastructure

The Iringa Municipal has necessary infrastructures that attract and support needed economic investments. It forms a hinterland to the commercial, industrial and administrative center of Iringa region and is located astride the main road connections from Morogoro town to the other well populated regions such as Mbeya and Dodoma. The Municipality has a good road network. Well developed telecommunications and electricity. Postal and banking services are also available. The social infrastructure includes health and education services and water supply.

3.1.3 Tanga City

3.1.3.1 Location and general features

Tanga City lies between $38^{o}53'$ and $39^{o}10$ E, and 5^{o} and $5^{o}16'$ S in the North East of Tanzania. It extends 20 km inland from the coast between 0 – 17 meters above sea level. It has an area of 600 square kilometers, of which 62 km^2 is covered with water bodies. The topography of the city is mainly flat with some small, gently sloping hills punctuated by river valleys and streams, notably the Zigi in the north, the Mwarongo and Mkwisha in the center, and Mgombani/Kakindu in the south(TCC, 2008; Mahenge, 2007).

3.1.3.2 Climatic condition

Tanga City has a tropical climate with seasonal average temperatures ranging from 24^{o}C to 33^{o}C. It has two rain seasons in a year: the long rains (*masika*) in March to May (100mm-1400mm) and short rains (*vuli*) in October-December (500mm-800mm). Humidity and evaporation levels are high and there is plenty of sunshine, as tropical coastal areas(TCC, 2008).

3.1.3.3 Administrative set up

Tanga City is the headquarters of both Tanga Regional and District administrations. The city is subdivided into 4 divisions consisting of 24 administrative wards of which 14 are urban, 2 are peri-urban and 8 are rural wards (Table 1).

Table 1: Administrative Units of Tanga City

Division	Urban wards	Rural wards	Peri urban	Total
Chumbageni	2	3	1	6
Ngamiani South	5	-	-	5
Ngamiani North	6	-	-	6
Pongwe	1	5	1	7
Total	**14**	**8**	**2**	**24**

Source: 2002 Population and Housing Census General Report

3.1.3.4 Population distribution

The population of Tanga City was 242 640 people in 2002 according to population and housing census of 2002. This population accounted for about 14.8% of the total regional population. The population size in 1988 was 186 818 persons and it grew at an average rate of about 1.9% per year.According to 2002 census there were 119 621 males (49.3%) 1nd 123 019 females (50.7%). About 37.5% of the population was children under the age of 15 years. The potential labour force comprised of 58.8% of the population who were

between 15-64 years. The average household size was estimated to be 4.6 persons and the dependency ratio (*i.e.* number of children and elderly as ratio of every 100 persons in the working 15-64 age group) was 70. As the major urban centre of the region, Tanga City is the most heavily settled amongst the seven districts with an average population of density of about 451 persons per sq. km of land area. This expanding concentration of population provides a growing market and source of labour.

3.1.3.5 Socio-economic activities

According to the 2002 National Population and Housing census, and the 2008 United Republic of Tanzania report, the main activities in the region are clustered into several groups such as agriculture, livestock, fishing, industry and manufacturing, tourism, transportation and communication, mining and quarrying; and forestry. Other activities are community services provision (electricity, gas and water); construction; trade and commerce. The reports further show that agriculture is the main industry in the region as it employs the majority of the labour force. Other industries that employ a significant number of the labour force include forestry, fishing and related activities; trade and commerce; and public administration and education; and manufacturing.

The city is built around an important harbour which is the second largest in Tanzania, which handles import and export goods of various types. The city is rich in history, natural attractions, good structural design of buildings and interesting aquatic activities such as fishing. South of Tanga Citylies the famous tourist attraction centre known as Pangani, with interesting beaches which are unpolluted and is thus an excellent beach holiday destination. Tourism is likely to grow in the near future following the recent establishment of Saadani National Park which is endowed with a good beach and wild animals (Richmond *et al.,* 2003). Tanga City residents are involved in different economic activities

such as tourism and fishing activities, also residents of Tanga City are involved in agricultural activities (URT, 2002). Dairying is one of the major agricultural activities in the Tanga City.

According to TCC (2008), milk production in the city has increased greatly and encourages local and foreign investors to invest in milk processing. The processing capacity at the moment stands at 50 000 litres of milk per day. Formally, there were four processing plants namely: Azania Fresh (with a capacity of 12 000 litres), Morani Dairies (with a capacity of 6000 litres), and Ammy Brothers (with a capacity of 1000 litres). However now days only Ammy Brothers and Company and Tanga Fresh Ltd remained whereby Tanga Fresh Ltd is the largest milk processor with the capacity of 15 000 litres per day. Apart from fresh milk, they produce pasteurised milk, cheese, yoghurt and cream.

3.2 Research Design

The research design for this study is cross sectional. This is a kind of research design in which the data are collected at a single point in time from a sample to represent a large population. The design is suitable in descriptive study and for determination of the relationship between and among variables. It is also economical in terms of time and financial resources (Babbie, 1993). However more triangulation and probing wasneeded to get accurate information.

3.3 Data Sources and Instruments for Data Collection

Primary data were collected through interview using semi structured questionnaire with both open ended and close ended questions (Appendix 1). Secondary data were collected from different sources including books, research reports and journals from internet and Sokoine National Agricultural Library (SNAL).

3.4 Sampling Procedures and Sample Size

The target population for the present study was the small scale dairy farmers however for meaningful analysis; the survey also included other actors along the milk value chain inTanga City and Iringa Municipality (urban areas). Both purposive and simple random sampling techniques were adopted in this study. Purposive sampling technique was used to select wards with access to formal milk marketing channel, and wards with no access to formal milk marketing channel (informal milk channel). The sample size constituted a total of 222 milk value chain actors from selected urban wards (suburbs). A total of 222 respondents were sufficient for statistical analysis. Sudman (1976) affirmed that a minimum of 100 respondents is enough for each group when comparative study is conducted. In addition, this sample is ideal due to limited time and funds as it fulfills the requirements of the study for meaningful analysis (Bailey, 1994).

From A total of 80 dairy producers were drawn from sampled wards each district (TangaCity and Iringa Municipality) summing up 160 dairy producers. The dairy producers sampling frame came from list provided at district levels (216 and 267 producers for Tanga City and Iringa Municipality respectively. Some of dairy producers had already been accessed by the Milk Value Chain Project (MVCP). A random sampling procedure was adopted to select 80 dairy producers from 6 sampled wards from eachregion(Table 2).

Table 2: Breakdown of wards and dairy farmers selected in the study areas

Iringa Municipality	Number of farmers	Tanga City	Number of farmers
Mtwivila	25	Pongwe	29
Mkwawa	14	Kilomboni	15
Ngangilonga	10	Mabokweni	09
Kitwiru	15	Mzizi	05
Ruaha	13	Mkanyageni	12
Kihesa	03	Maweni	10
Total	80		80

Other actors which comprised the sample were the 62 middlemen which included milk vendors, restaurants, hotels and supermarkets; the breakdown is as shown in Table 3. Milk traders in Iringa Municipality and Tanga City were not registered hence it was difficult knowing their population size. However, it was found that there were 5 locations in the city centre and 7 locations within Iringa Municipality where these milk traders gathered while waiting for selling milk or for breakfast at food vendors (*Mama Lishe*). Simple random selection method was used to select the aforementioned milk traders from each location emanating from unknown population size. For other traders such as restaurants, hotels and supermarkets a purposeful sampling was employed this due to the fact that not all were selling milk/dairy products.

Table 3: Sample components involved in the survey in the study areas

Milk value chain actors	Iringa Municipality	Tanga City	Total
Dairy producers	80	80	160
Vendors	14	15	29
Restaurants	9	8	17
Hotels	5	5	10
Supermarkets	4	2	6
Total	112	110	222

3.5 Model Specification and Data Analysis Techniques

To achieve the objectives of the study, several statistical techniques and methodologies were employed. Data from the primary source wereverified, coded and analysed using Statistical Package for Social Sciences (SPSS)computer software.Both qualitative and quantitative descriptive statistics were employed.The methodologies are described in the sections below.

3.6 Gross Margin Analysis (GMA)

Gross margin refers to the difference between total revenue and total variable cost costs (Msangi, 2000; Mlulla, 2003). Gross Margin Analysis (GMA) is one of the widely used analytical techniques for planning and analysis of projects by advisors, consultants, researchers and producers (Rogan, 2004). It is used as a measure of enterprise profitability and the means of selecting farm plans. The size of gross margin depends on the services provided, market structure, market price, perishability of the product as well as the distance between producers and consumers and may be influenced by market information especially overthe short-run.

The advantages of the GMA as an economic tool include its easiness to understand and utilize the logical interrelations of economic and technological parameters and its ability to forecast rational variants for the operational structure of an enterprise or individual farmer (Selejio, 2002). In addition GMA is an easy way to understand profitability of an enterprise as it shows how effective management can bring profits from sales and how an enterprise has to withstand downturn and fend off competition (McClure, 2004). The GMA model is very useful in cases where some data, for example profit of firms, are to be analysed. Just as important, the calculation of depreciation has often been difficult to undertake due to the ambiguity related to nature of estimating the lifespan of fixed assets, appreciation and salvage value in many firms, thus necessitating the use of GMA models rather than the normal profit margin models.

Johnsen (2003) defined GM as the difference between the values of an enterprise’s gross output and variable cost of that production.

$GM = TR - AVC$ ..... (1)

Where; GM = Gross margin (TZS/unit)

TR= Total revenue (TZS/unit)

AVC=Average variable costs (TZS/unit)

However, gross margin analyses do not include fixed or overhead costs such as depreciation, machinery purchases, or permanent labour costs and comparison can be misleading (Hassall, 2003). Gross margin analysis is not an exact estimate and reliable point of reference of an enterprise's pricing strategy and pricing profit but it does give a good indication of financial direction (Hassal, 2003). Additionally, Phiri (1991) has observed that although GM is not an absolute measure of profitability, it remains the most satisfactory measure of resource use efficiency available in small scale agriculture. The GM analysis requires proper records such as input costs, quantities sold and prices received (Msangi, 2000).

In Tanzania, a number of studies have employed the GM model. For instance the study by Mlulla (2003) who assessed the operation of border trade in northern Tanzania and Philip (2001) who studied the economics of medium scale sugarcane producers in Morogoro. The Model was also employed by Silomba (2000) who evaluated the performance of beans marketing in Kigoma region. Moreover, Fussi (2010) applied GM model in her study on Strategies to increase milk deliveries to the Tanzanian milk processing industry using Iringa region as an area of study.

Therefore, Gross margin (GM) analysis was used to estimate profit for urban dairy enterprises. GM was calculated using the following formula.

$GM = \sum P_y Y - \sum P_x X$ ..... (2)

Where;

P_y = Price of milk and milk products

P_x = Price of inputs used in urban dairy farming per dairy cow

Y and X = Quantities/volume of output/milk

The estimated mean GM by a dairy farmer was based on the average milk production per cow per day in litres and later on the monthly Average Gross Margin (AGM) was computed accordingly. Mathematically the AGM equation is presented below.

$AGM = AR - AVC$ ..... (3)

Where;

AR = Average revenue of milk and milk products

AVC = Average variable cost of inputs used in urban dairy farming per dairy cow

3.7 Analytical Framework

The theoretical framework to identify factors influencing urban dairy farmers to choose milk marketing channel is based on consumer preferences, which is centered in consumer theory. In consumer theory, demand functions are derived from considering a model of utility maximization coupled with underlying economic constraints and or decision making for the set of options that maximize utility (Varian, 1999; Nicholson, 2002; Dwivedi, 2004). In this study smallholder dairy farmers sell their milk produce in different market outlets includingneighbours, vendors, MCC and processors.

Specifically, this study intended to investigate factors influencing the dairy farmers and or actors in choosing milk marketing channel between the two principle categories of milk

marketing channels (formal and informal). However preliminary studies and observation in the study areas indicated that within the informal milk marketing channel there were sub-sets of market outlets such as vendors, hotels/restaurants, and milk collection centers. Thus, the use of the MNL modelis justifiable considering the multiple choices of outlets.

3.7.1 Multinomial logistic regression model

Multinomial Logistic Regression (MNLR)model allows for analysis of different individual characteristics when confronted with multiple choices (Maddala, 1983; Green, 1993; Borooah, 2002; Hill *et al.,* 2008). It estimates the probability of individual *i* choosing an activity *j* or a particular milk market outlet (neighbors, restaurants, milk collection center, and processors) given some set of explanatory variables.

The MNLR can be used to predict a dependent variable, based on continuous and/or categorical independent variables, where the dependent variable takes more than two forms (Griffiths *et al.,* 2001; Kohler and Kreuter, 2005). Furthermore, it is used to determine the percent of variance in the dependent variable explained by the independent variables and to rank the relative importance of independent variables.

Logistic regression does not assume a linear relationship between the dependent variable and independent variables, but requires that the independent variables be linearly related to the logit of the dependent variable (Gujarati, 1992). Pundo and Fraser (2006) explained that the model allows for the interpretation of the logit weights for the variables in the same way as in linear regression.

Moreover, MNLR is used when the dependent variable exhibits more than two categories (a polytomous variable) that cannot be ranked (Jari, 2009; Kohler and Kreuter, 2005). The

model has been chosen because it allows one to analyse data where participants are faced with more than two choices. In this study, smallholder urban dairy farmers are faced with four choices, which are; neighbor households, restaurants/migahawa, Milk Collection Centre (MCC),formal market (direct to milk processing plants). It is postulated that, the urban dairy households are keeping dairy cows for commercial purpose but this does not nullify the fact that they also keep dairy cows to provide milk for own household consumption. In marketing milk, urban dairy farmers have to decide on the marketing outlet to be selected so as to maximize their utility, subject to socio-economic and household constraints.

Therefore the MNLR is developed on the axiom of utility maximization. It assumes that if an individual makes choice *j* from a complete list of consumption bundle then, U*ij* is the maximum among the j^{th}option. The statistical model is driven by the probability that choice *j* is made. Based on the theory of consumer behavior, it is postulated that individual will choose a particular option (market channel) that offers the greatest utility. An individual *i* faced with the decision to choose from among milk market channelalternativesis perceived to make this decision following the utility function formulated by Greene (1993);

$$U_{ij} = \beta Z_i + \varepsilon_{ij} \quad \text{..... (4)}$$

Where;

U_{ij} is the maximum utility that an individual i^{th}derive from choosing j^{th} option

Z_i is a vector of individual characteristics

$\beta$is the parameter to be estimated and ε_{ij} is the error term.

The underlying assumption is that individual chooses option j if and only if the utility derived from it is greater than that of all other options.

From the utility maximizing functionspecified in equation 4, it can be seen that urban dairy households make decisions to produce, consume and market, subject to socio-economic and other household factors. It follows that if the costs that are associated with using a particular channel are greater than the benefits, households will be discouraged from choosing it, shifting to another option that maximizes their utility. For instance, if there are socio-economic and/or technical challenges specific to formal markets (processing plant), that increase marketing cost above the revenue, households will be discouraged from using formal market. They then, analyse the costs associated with informal markets (other marketsubsets besides processing plant). If the socio-economic and/or technical factors that are unique to a sub set of informal markets increase marketing costs above returns, then households will decide to sell their produce in a subset which is more rewarding. In the utility function, the amount of good say *k* that is consumed or sold does not have to exceed the amount that is produced.

Sheffrin*et al.* (2006) however pointed out that it is difficult to measure utility directly; therefore, it is assumed that households make choices based on the option that maximizes their utility. Thus, decisions to participate in either formal (selling to processing plant) or choosing among market subsets within informal markets signify the direction, which maximizes utility. With the given postulation, the multinomial logistic regression was used to relate the decisions to participate in formal markets, and selecting any channel within informal markets and the factors that influence these choices. The general multinomial logistic regression model which was used is as specified in equation 5and is drived from Schmidt and Strauss (1975) quoted by Kyalo (2009).

$$\Pr ob\ (Y_i = 1) = \frac{e^{\beta_j x_i}}{\sum_{k=0}^{J} e^{\beta_k x_i}}, j = 0,1, \ldots, J \quad (5)$$

Since there are four categories in the dependent variable, two equations were estimated to provide probabilities for the *J + 1* choice of a decision maker with characteristic Xi. The *βi*s are the coefficients to be estimated through the maximum likelihood method. The empirical specification was simplified as presented in equation 6.

$$\Pi_{ij} = \beta_0 + X_i\beta_k + \varepsilon_{ik} \quad (6)$$

Where Π_{ij} is the probability that dairy farmer *i* chooses to market milk produce through market outlet *j*, β_0 is the constant term, X_i are the dairy farmer's socioeconomic characteristics, and β_k are the parameters to be estimated and ε_{ik} is the error term. In this circumstance the parameters estimated represented the model coefficients.

This model (equation 6) can be normalized to solve a problem of indeterminacy through setting *β0 = 0*. This is because the probabilities sum up to 1, therefore only *J* parameter vectors are needed to determine the *J + 1* probability. Therefore the probabilities are;

$$\Pr ob(Y_i = 1) = \frac{e^{\beta_j x_i}}{\sum_{k=0}^{J} e^{\beta_k x_i}} for\ j = 0,1, \ldots, J, \beta_0 = 0 \quad (7)$$

In the model, market channel choice, with fourpossibilities, *viz.*neighbuors, restaurants/hawkers (Milk vendors), MCC, and processing plant; has been set as the dependent variable. The variable of neighbors holds the value of 1, Milk vendors take the value of 2, MCC takes the value of 3, and processing plant outlet takes the value of 4. The MNLR model suggested in this study was used to determine the odds of each/all market versus processing plant market channel. Paying attention to the that fact, the MNLR

model follows the theory of probability, therefore the probability that the dairy farmer prefers one market compared to the other was restricted to a range between zero and one ($0 \leq Pi \leq 1$). It should be noted that logit (Π_i) ranges from negative infinity to positive infinity (Gujarati, 1992).

3.7.2 Empirical studies on logistic regression

Studies that employed both multinomial and logistic regression in general are well documented in research; some of them include the study by Fertő and Szabó (2002) who applied the multinomial logistic model to reveal the determinants influencing the choice supply channelsin Hungarian fruit and vegetable sector whereby the choice alternatives were the wholesalers chain, marketing cooperative chain, and producer organ. The conditional (fixed effects) logit was employed by Staal*et al.* (2006) in an analysis that evaluated farmers' choice of milk marketing channels in Gujarat among the choice options that were available in the area. The choice options were: direct sales to individual customers, sales to generally informal private traders/venders and sales to cooperatives/private dairy processors.

Moreover, Kumar (2010) usedlogit model toanalyse factors that influence the decision of milk traders to participate in the value addition activities of milk.Bhuyan (2009) adopted a binary logistic regression as an analytical tool. Tsourgiannisa *et al.* (2008) also applied logit model. Additionally, Jari (2009) alsoused multinomial logistic regression model investigate institutional and technical factors influencing agricultural marketing channel choices amongst smallholder. Sonda (2008) employed the multinomial logistic regression in analyzing livestock related factors and farmers' choice of maize cultivars in Tanzania. The binary logit model was used by (Mbise, 2007) to determine factors influencing the decision of coffee farmers to adopt either co-operative or non-co-operative market

channels in Kilimanjaro Tanzania.Other studies that employed logistic regression are (Kyeyamwa*et al.,* 2008; Alexander *et al.,* 2007; Park and Lohr, 2006; Blandon *et al.,,* 2009; Bartels *et al.,* 2006; McFadden, 1974; Hall *et al.,* 2006; Onyango and Govindasamy, 2004; Karbauskas, 2010 and Mgeni and Temu, 2010).

3.7.3 Justification of the econometric model

The multinomial logistic regression model is useful in analysing data where the researcher is interested in finding the likelihood of a certain event occurring. In other words, using data from relevant explanatory variables, multinomial logistic regression is used to predict the probability (Π_i) of occurrence, not necessarily getting a numerical value for a dependent variable (Gujarati, 1992). This research analyses the probability of choosing different market channels by urban smallholder dairy farmers/traders, with given socioeconomic and specific household influences. Dougherty (1992) explained that the modus operandi for formulating a multinomial logistic regression model is the same as for a binary logistic regression. Whereas in binary logistic regression, the dependent variable has two categories (dichotomous variable), in multinomial logistic regression, it has more than two categories (polytomous).

Thus, multinomial logistic regression is an extension of binary logistic regression. According to Mohammed and Ortmann (2005), several methods can be used to explain the relationship between dependent and independent variables. Such methods include linear regression models, probit analysis, log-linear regression and discriminant analysis. However, multinomial logistic regression has been chosen because it has more advantages, especially when dealing with qualitative dependent variables.

Linear regression model (also known as Ordinary Least squares Regression (OLS)) is the most widely used modeling method for data analysis and has been successfully applied in most studies (Montshwe, 2006). However, Gujarati (1992) pointed out that the method is useful in analysing data with a quantitative (numerical) dependent variable but has a tendency of creating problems if the dependent variable is qualitative (categorical), as in this study. Amongst other problems, the OLS cannot be used in this study because it can violate the fact that the probability has to lie between 0 and 1, if there are no restrictions on the values of the independent variables. On the other hand, multinomial logistic regression guarantees that probabilities estimated from the logit model will always lie within the logical bounds of 0 and 1 (Gujarati, 1992). In addition, OLS is not practical because it assumes that the rate of change of probability per unit change in the value of the explanatory variable is constant. With logit models, probability does not increase by a constant amount but approaches 0 at a slower rate as the value of an explanatory variable gets smaller.

When compared to log-linear regression and discriminant analysis, logistic regression proves to be more useful. Log-linear regression may or not require that all independent variables be categorical and discriminant analysis requires them all to be numerical, but logistic regression can be used when there is a mixture of numerical and categorical independent variables (Dougherty, 1992). In addition, discriminant analysis assumes multivariate normality, and this limits its usage because the assumption may be violated (Klecka, 1980). According to Gujarati (1992), probit analysis gives the same results as the logistic model. In this study, the logistic model is preferred because of its comparative mathematical simplicity and fewer assumptions in theory. Moreover, logistic regression analysis is statistically more robust in practice, and is easier to use and understand than other methods.

3.7.4 Variable description

The study conjectured that the dairy farmer's choice of certain milk market outlet is influenced by a number of socioeconomic factors, used in this study as the explanatory variables. The basis for the assumption was theoretical considerations found in the literature. The variables used in the MNL model are summarized in (Table 4).

Table 4: Variables in the Multinomial Logistic Regression model

Variables	Description	Types	Values
Dependent Variable			Number of options
MLKCP	Milk market preference	Categorical	available to choose
Explanatory Variables			
AGE	Age of household head	Continuous	Number of years
PRICE	Price per litre offered at the market	Continuous	TZS
SEX	Sex of the household head	Dummy	0=female, 1=male
VMP	Volume/size of Milk Produced	Continuous	Number of litres
FSHH	Family size of household	Continuous	Man equivalent
EDLHH	Education level of household head	Categorical	Categories are based on number years
EXHH	Experience in dairy production	Categorical	Categories are based on number years
DNMM	Distance from dairy market	Continuous	Kilometer
ACCR	Access to credit	Dummy	0=no,1= Yes

3.7.5 A consideration of explanatory variables (Xi) of the logistic regression

3.7.5.1 Age of the household head (AGE)

Age of the household head is a continuous variable and is measured in years. Age is a proxy measure of farming experience of household. Aged households are believed to be wise in resource use, and therefore age is expected to have a positive effect on market participation and marketable surplus. Schnitkey*et al.* (1992) argues that age of the head of

the household normally provides a proxy for experience in farming. Further, these farmers are expected to have stronger social network and can establish reputation within the network. This implies that older heads are more informed about the marketing system. This relationship is expected to have a positive sign in the regression equation. Additionally, Tshiunza*et al.* (2001) identified age as the major farm characteristic that significantly affected the proportion of cooking banana planted for market in Nigeria. He found that younger farmers tended to produce and sell more cooking banana than older farmers did. According to Balint and Wobst (2005), if the household head is very young or very old selling becomes difficult. Therefore, age is positively associated with the aspect of choosing milk markets since older farmers may be more experienced in marketing management and tend to have stronger networks and more credibility, thus experience lower transaction costs.

3.7.5.2 Price per litre offered at the market (PRICE)

Farmers' marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. Therefore, it is hypothesized that market price is positively related to market channel choice. A study conducted by Bhuyan (2009) showed that a unit increase in price paid to dairy farmers by a cooperative significantly raised the probability of selling to this channel.

3.7.5.3 Sex of the household head (SEX)

This is a dummy variable that takes a value of one if the household head is male and zero otherwise. The variable is expected to have a positive relation with milk market channel entry decision and milk sale volume. In mixed farming system, both men and women take part in livestock management. Generally, women contribute more labour input in feeding,

cleaning of barns, milking, butter and cheese making and sale of milk and other dairy products (Somano, 2008). However, obstacles such as lack of capital, and access to institutional credit and extension service, may affect women's participation and efficiency in ruminant livestock production (Tanga*et al.*, 2000). Gabre*et al*. (2001) indicated that female headed households have smaller farms, lower per capita expenditures and lower marketed crop surplus. However, it is a fact that female-headed households in developing countries have less assets and less family labour to rely on to generate income, they are usually less well off than male-headed households (IFPRI, 2001). Tshiunza*et al.* (2001) found that the male farmers tended to produce cooking banana for market and therefore participated in banana market more than female farmers. Further, a study conducted by Gizachew (2005) indicated a negative relation between sales volume of milk and male-headed households. Study conducted by Musema (2006) confirmed the same result. However, in this specific study, the maintained hypothesis is thata male household head is expected to have a relatively strong influence choice of market outlets than male farmers.

3.7.5.4 Education Level of the Household Head (ELHH)

The education level of the household head is a categorical variable and is measured in years of formal schooling of the household head. Education plays an important role in the adoption of innovations/new technologies. Further, education is believed to improve the readiness of the household to accept new idea and innovations, and gets updated price information which in turn enhances the producers' willingness to produce more and increase market participation (Somano, 2008). Further, a person with a higher education level is expected to have a better access to information and more understanding about emerging marketing opportunities in the milk value chain (Kumar, 2010). A study conducted by Holloway *et al.* (1999) indicated a positive relationship between education and dairying farmer market participation and sales volume. Similarly, a study conducted

by Gizachew (2005), and Musema (2006) showed that formal education was positively related to household market participation and marketed volume. Therefore, in this specific study, formal education is hypothesized to affect milk market channel participation decision and sale volume of milk positively.

3.7.5.5 Volume of milk output (VMP)

Volume of milk outputis a continuous variable measured in liters. The variable is expected to have a positive contribution to smallholder dairy market choice participation decision and level of milk market participation. A marginal increase in dairy production has obvious and significant effect in motivating choice of market outlet. Production beyond consumption has two fates based on various reasons; either sell it as fluid milk or processed into different dairy derivatives. The processed part of the product may be used for home consumption or sales. This production in turn varies with the number of lactating dairy cows. As the number of dairy cow increases, production also increases and the percentage share of consumption declines and sales increase (Holloway and Ehui 2002). A study conducted by Singh and Rai (1998) observed that milk production hadpositive and significant effect on marketed surplus. In addition, Wolday (1994) observed that output of food grains (wheat *teff*and maize) had positive effect on quantity supplied in the market. Also a study byGani and Adeoti (2011) on farmers' market participation in Nigeria found similar correlation. Thus, the volume / size of the milk output is assumed to have positive effect on market outlet entry choice.

3.7.5.6 Distance to nearest dairy product market (DNMM)

Distance to nearest dairy product marketis the location of the dairy household from the nearest milk market and is measured in kilometers**.** The closer the dairy market to dairy household, the lesser would be the transportation charges, loss due to spoilage and better

access to market information and facilities. This closeness can improve return to labour and capital; increase farm gate price and the incentives to participate in economic transactions. A study conducted by Holloway and Ehui (2002) revealed that distance to milk market was negatively related to the milk market participation decision of dairy households. Similarly Wolday (1994) showeda negative relationship between distance from household residence to grain market and volume of the marketed food grain. Furthermore, a study conducted by Gani and Adeoti (2011) and Musema (2006) indicated similar results. Therefore, in this study, distance to the nearest milk market is hypothesized to be negatively related to market participation decision.

3.7.5.7 Experience in dairy production and marketing (EXPP)

Experience attained by a dairy farmer tends to influence his/her choice of market outlet. Well experienced farmers are expected to have better access to different market outlets and, as a result, it is hypothesized that a positive relationship between experience and market outlets' choice will exist. According to Schnitkey*et al.* (1992), farmers that are more experienced in marketing management and to have stronger networks and more credibility, thus experience lower transaction costs. Further, these farmers will have stronger social network and will have established reputation within the network. This implies that older heads are more informed about the marketing system. This relationship is expected to have a positive sign in the regression equation.

3.7.5.8 Family size (FSHH)

Size of household is a continuous variable and measured in adult equivalent. As dairying is labour intensive activity, dairy production in general and marketable surplus of dairy products in particular is a function of labour. Accordingly, households with more members tend to have more labor which in turn increases milk production thereby making them

more willing to participate in marketing (Somano, 2008). However, household members are both production and consumption units. When there are fewer opportunities to contribute productively, household units will be more consumption unit, as is the case in developing countries. That is, larger households have more mouth to feed and therefore less to sell (Makhura, 2001). In spite of the findings by Makhura, this study has hypothesized that dairy households are more productive units than consumption units and hence, in the same way, the variable is assumed to have a positive impact on the milk market channel participation.

3.7.5.9 Access to credit (ACCR)

Access to credit is measured as a dummy variable taking a value of one if the household has access to credit and zero otherwise. This variable is expected to influence the marketable surplus of milk and market participation positively. Access to credit improves the financial capacity of dairy households to buy more improved dairy cows and finance other expenses related to dairying thereby increasing milk production and market participation. Studies by (Luoga*et al.,* 2010; Philip, 2001; Freshwater, 1989) assert that access to credit enables dairy farmers to use improved inputs such as commercial feed supplements and veterinary services and paying hired labour, which in turn have a direct positive impact on dairy performance.

3.7.6 Model postulate summary

According to Gujarati, (1992), the coefficient on this variable measure the expected change in the logit for a unit change in each independent variable, all other independent variables being equal. The sign of this coefficient shows the direction of influence of the variable on the logit. It follows that a positive value indicates an increase in the likelihood that a household will change to the alternative option from the baseline group. On the

other hand, a negative value shows that it is less likely that a household will consider the alternative (Gujarati, 1992; Pundo and Fraser, 2006). Therefore, in this study, a positive value implies an increase in the likelihood of channeling milk to the particular marketing channel. On the other hand, a negative sign means that a unit increase in the explanatory variable will lead to a decrease in the probability of channeling milk to such particular market outlet, for this case the choice of marketing to either informal (market subsets) or formal market.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio- economic Characteristics ofRespondents in Iringa Municipality

The characteristics of respondents have important socio and economic implication on market access, participation and marketing decision making. This section describes the characteristics of sampled households based on age, sex, marital status, education level of respondents and household size in relation to milk marketing within household and traders (middlemen).

4.1.1 Age of the respondent

Mean age of the key actors in milk marketing chain ranged between 28 and 48 years. The study revealed that there was more involvement of middle age group in the study area. For the case of livestock keepers (dairy farmers) the mean age was 48 years. The average age for marketers particularly milk hawkers and milk vendors was 32and 33 years, respectively (Table 5). This implies that many of respondents in the survey area were mature people who could be actively engaged in milk production and marketing to generate sufficient income to run their lives as well as their families. Age influences the income generating capacity of an individual. Regnard (2006) urges that in total the accumulation of wealthy is highly dependent on age of an individual, whereby a direct relationship is experienced. Likewise, age determines individual maturity and ability to make rational decisions.

4.1.2 Sex of respondent

Sex of respondent has an economic implication in milk production and marketing. Sex has implication on the roles and responsibilities in the society, and therefore can influence households' abilities to generate income. Results in (Table 5) show no difference with

respect to sex of dairy households. On dairy farmers' side, male accounted for 51.1% while female accounted 48.9%. This may be due to the fact that, dairy cow handling and management particularly feeding and grazing cow involve manual works hence both male and female are engaging in the milk production and marketing chain. Likewise, the fact that actors in the milk value chain included both male and female, suggests a possibility of both men and women controlling most household resources and hence both play crucial role in household income generation.

Table 5: Respondents' socio- economic characteristics in Iringa Municipality

Category	Dairy farmers n=80	Hawkers/Vendors n=14	Restaurants and Café n=9	Hotels n=5	Supermarkets n=4
Age in years					
• Mean	48.00	33.00	32.11	35.60	27.50
• Minimum	22.00	16.00	22.00	24.00	20.00
• Maximum	75.00	46.00	44.00	46.00	38.00
Sex (%)					
• Male	51.1	64.3	44.40	40.00	50.00
• Female	48.9	35.7	55.60	60.00	50.00
Education (%)					
• None	2.5	7.10	-	-	-
• Primary	47.5	64.30	77.80	-	-
• Secondary	27.5	28.6	22.2	80.00	75.00
• University	22.5	-	-	20.00	25.00
Marital status (%)					
• Single	1.2	3.00	33.30	40.00	50.00
• Married	98.8	10.00	66.70	60.00	50.00
• Divorced	-	-	-	-	-
• Widowed	-	1.00	-	-	-
Household size					
• Mean	7.00	3.21	3.00	3.40	2.00
• Minimum	2.00	1.00	1.00	1.00	1.00
• Maximum	20.00	6.00	7.00	7.00	3.00
Primary occupation (%)					
• Employed	32.50	-	-	100.00	100.00
• Dairy keeping	45.00	-	-	-	-
• Business	16.00	100.00	100.00	-	-
• Crop cult.	6.20	-	-		
Secondary occupation (%)					
• Employed	-	14.30	33.40	-	-
• Dairy keeping	53.80	-	-	-	-
• Business	10.00	64.30	66.60	-	-
• Crop Cult.	36.20	21.40	-	-	-

4.1.3 Marital status of respondents

Marital status was categorized as single, married, divorced and widowed (Table 5). Results indicate that, many respondents were married. Only 1.2%, 3.0%, 33.3% and 40.0% of the dairy farmers, hawkers, restaurants and hotels were not married respectively. Marital status may induce someone to work hard due to family responsibilities. The situation can be further explained by the fact that married respondents engage in milk marketing activities in order to generate cash income to meet various household needs or requirement as well as expanding their household income base.

4.1.4 Household size

The household composition considered in the study area were the residential groups whose members line together in close contact by sharing resources held in common, such as accommodation and foodstuffs. Mean household size was sevenpeople among dairy farmers' household in Iringa Municipality (Table 5) while it was six individuals in Tanga City (Table 6). This might be influenced by African culture that, most families are extended. A Tanzanian household budget surveyin 2000/01 indicated that average household size of Tanzania mainland was five people. It is revealed from the survey that, surveyed area has a relatively high household size. However, it is expected that average household size decreases with the level of development although slowly and in most cases well-off household (higher income earner) tend to be smaller (NBS, 2002).

4.1.5 Education level of respondents

In both theoretical and practical situations, education level plays an immense role in ensuring household access to basic needs such as food, shelter and clothing. Skills and education amplifythe working efficiency resulting into more income and food security. Furthermore education is important to manage the business as well as in decision making. Education is one of the long term strategies that may be used to improve dairy cow and

milk production and marketing. Results in Table 5 indicatelow levels of literacy (primary and secondary level) almost in all categories of respondents (dairy farmers, hawkers,restaurants, hotels and supermarkets). The dominant level of education for all actors in the milk value chain was that of the primary category.

An interesting observation was that, all supermarket respondents had attained a secondary level of education level and above. This is because operations in the supermarket require competence in business management as well as language especially English to serve different customers entering the supermarket. This implies that education was perceived important by respondents in the study areas as suggested by the large proportion who at least have attained secondary education.

4.1.6 Primary occupation of respondents

Results in Table 5 show that majority of the dairy farmers (45%) were engaged in dairy farming. This is probably due to the reason that this activity is very demanding in terms of labour and hence dairy farmers find it difficult to engage in other activities. The results also show that all of the interviewed hawkers (100%) and restaurants (100%) were businessmen. Interestingly for supermarkets and hotels, again all respondents (100%) were employed holding positions of sales managers and sales personnel. Table 5 also indicates the relative literacy levelfor in all categories of respondents (dairy farmers and milk traders) in the study area.

4.2 Socio- economic Characteristics ofRespondents in Tanga City

4.2.1 Age of the respondent

A minimum age of respondent in Tanga City was found to be 23 whilemaximum age was 72 years. Mean age ranged from 37 to 43 years for hawkers/vendors and dairy farmers

respectively. Average age for respondents involved in restaurants/hotels and supermarket was 38 and 31 respectively (Table 6). This implies that majority of respondents in Tanga City were mature people.

4.2.2 Sex of respondent

More than two third of milk intermediaries particularly hawkers were male respondents this may be attributed to the fact that this is a difficult job for females to engage in (Table 6). The same observation was encountered in Iringa Municipality where no female was involved in a hawker business.A plausible explanation for the observed results is thathawkering business involves walking a long distance which might not be appropriate for females as they tend to be more involved in domestic chores like taking care of children.

Table 6: Respondents' socio- economic characteristics in Tanga City

Category	Dairy farmers n=80	Hawkers/Vendors n=15	Restaurants and Café n=8	Hotels n=5	Supermarkets n=2
Age in years					
• Mean	43.00	37.00	38.00	38.00	31.00
• Minimum	23.00	26.00	28.00	29.00	30.00
• Maximum	72.00	52.00	48.00	55.00	32.00
Gender (%)					
• Male	83.8	73.3	87.50	60.00	50.00
• Female	16.2	26.7	12.50	40.00	50.00
Education (%)					
• None	2.5	-	-	-	-
• Primary	65.0	53.30	50.00	-	-
• Secondary	21.2	46.70	37.0	60.00	50.00
• University	11.2	-	12.5	40.00	50.00
Marital status (%)					
• Single	7.5	13.30	12.50	20.00	50.00
• Married	92.5	86.70	87.50	80.00	50.00
• Divorced	-	-	-	-	-
• Widowed	-	-	-	-	-
Household size					
• Mean	6.00	5.33	4.00	4.20	4.00
• Minimum	1.00	1.00	1.00	3.00	2.00
• Maximum	20.00	11.00	8.00	6.00	6.00
Primary occupation (%)					
• Employed	11.20	-	12.5	100.00	100.00
• Dairy keeping	76.20	-	-	-	-
• Business	12.50	100.00	87.50	-	-
• Crop cult.	-	-	-		
Secondary occuptn. (%)					
• Employed	-	13.30	-	-	-
• Dairy keeping	25.00	-	25.00	-	-
• Business	11.20	20.00	37.50	-	-
• Crop Cult.	63.80	66.70	37.50	-	-

4.3 Milk Marketing Channels in Iringa Municipality and Tanga City

The survey in both Iringa Municipality and Tanga City has established that small dairy farmers market their milk through different outlets. It has been observed that smallholder dairy farmers in Iringa Municipalitysell their milk via outlets such as neighbors, milk vendors (hawkers, restaurants, migahawa, hotels, kiosk), and processors. Interestingly, the study observed no milk collection centers in Iringa Municipality. The research findings indicate that (89%)of the interviewed smallholder dairy farmers channel their milk to neighbors, 5% to milk vendors, and the remaining percent of dairy farmers (6%) sell milk directly to the processing plant owned by ASAS Dairy (Figure 7). These results are consistent with the results of Artukoglu and Olgun (2008) as quoted by Sayin*et al.* (2011) who indicate that, milk was mainly consumed at farm level (40%) and some was sold in streets (24%) as well as small scale dairy processing plants (27%) and large scale plants (9%).

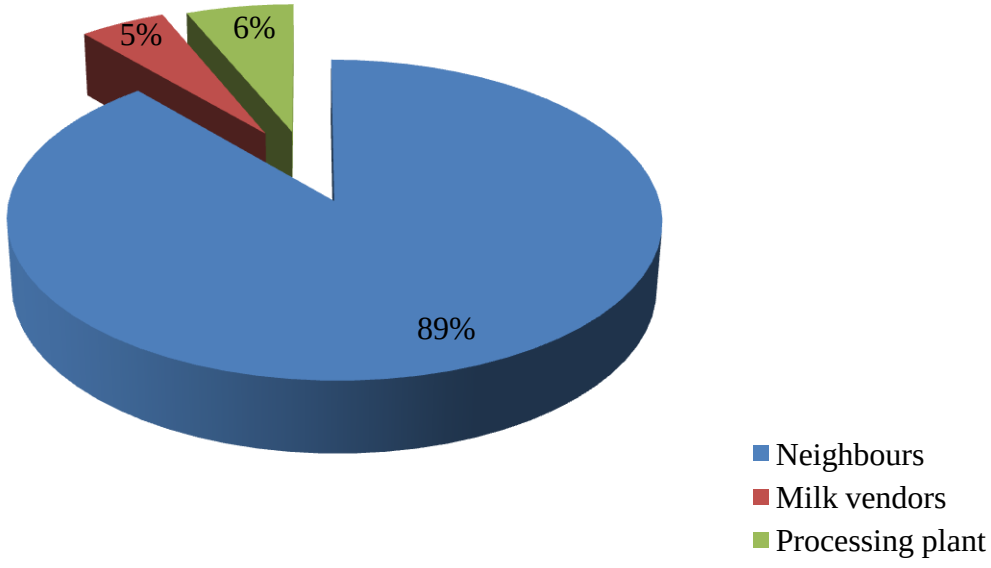

Figure 7: Distribution of smallholder dairy farmers by market outlets in Iringa Municipality

With reference to Tanga City, the survey has established that smallholder dairy farmers channel their milk tofour distinct market outlets. Unlike Iringa Municipality, the study has observed that smallholder dairy farmers in Tanga Citysell their milk throughneighbours, milk vendors, milk collection centers, and processors market outlets.The results indicate that majority (55%) of the interviewed smallholder dairy farmers market their milk through milk collection centers, 19% of dairy farmers market through the processing plant (Tanga Fresh), 15% through milk vendors, and the minority (11%) sell their milk to theirneighbours (Figure 8).

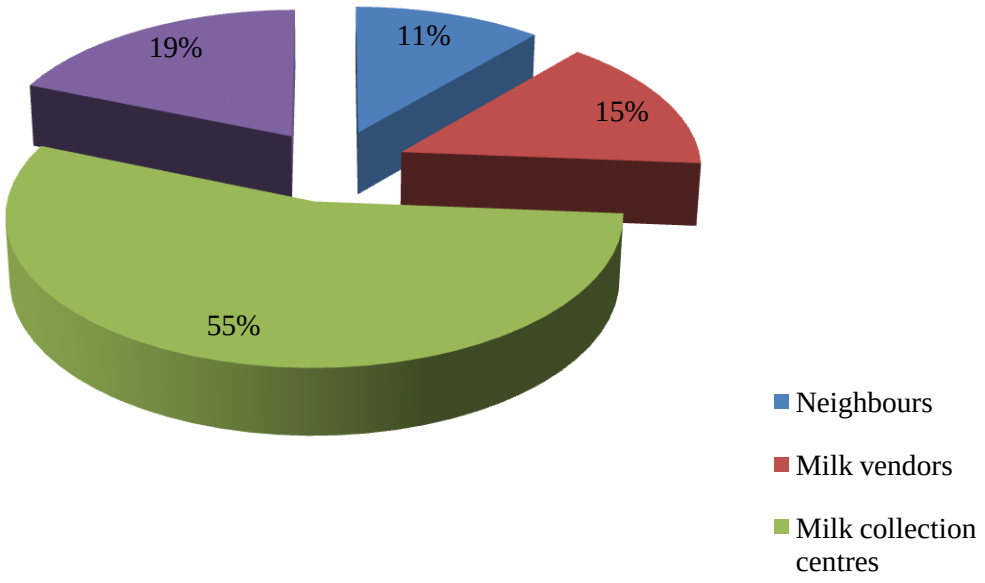

Figure 8: Distribution of smallholder dairy farmers by milk market outlets in Tanga City

Further, the study grouped the milk market outlets into principally two market channels which are informal channel and formal channel. Results in Figure 9show that majority (92.5%) of interviewed dairy farmers in Iringa Municipality channel their milk to the informal channel, while the study shows that only 7.5% of the dairy farmers channel their

milk through the formal channel. On the other hand, the findings indicate that minority (27.5%) of the interviewed smallholder dairy farmers in Tanga Citychannel their milk through the informal channel, whereas majority (72.5%) of the interviewed dairy farmers responded that they channel their milk via the formal channel. The probable explanation for what make majority of smallholder dairy farmers in Tanga Cityrely on formal channel is the presence milk collection centers in Tanga City. With the availability of milk collection centers farmers are encouraged to markettheir milk through the formal channel since milk collection centres can handle large volume of milk. These findings are consistent with the results that Sayin*et al.* (2011).

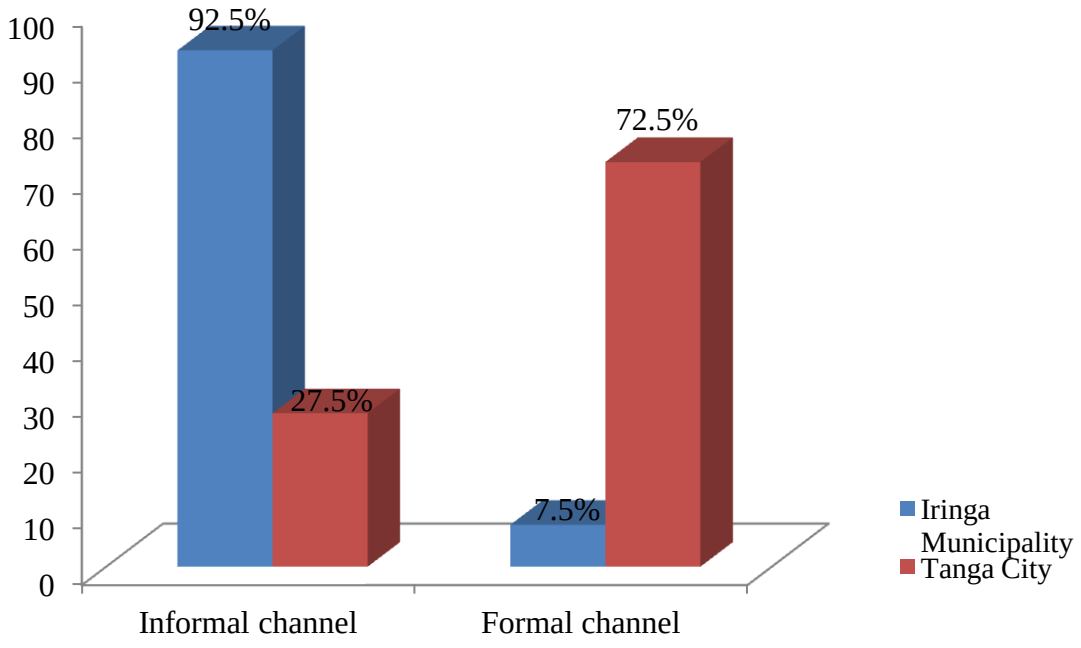

Figure 9: Distribution of smallholder dairy farmers by informal and formal market channels in Iringa Municipality and Tanga City

4.4 Marketing Margin

Fafchamps and Madhin (2006) defined marketing margin as the difference between the value of sales and purchases. Marketing margins at different nodes of marketing chain were calculated in both regions to reflect differences in wholesale and retail market levels. The difference between the buying price and the selling price was considered as cost of

marketing (what is incurred in getting the product from the producer to the consumer in the desired form).

4.4.1 Marketing margin for milk marketers in Iringa Municipality and Tanga City

The buying price and selling price of milk chain actors were examined. Dairy actors in raw milk (unprocessed milk) in Iringa Municipality were observed to receive more margins than those actors selling processed milk. The average retail price for raw milk was 1000 - 1600 TZS per litre (Table 7) while the average price for packed milk averaged 1600 - 2000 TZS /litre. Packed milk was mainly sold by retailers (normal shops and supermarkets) at retail levels. This group of traders depended on milk supplied by ASAS Dairy and CEFA Njombe.

Table 7: Marketing margin for raw milk marketers in Iringa Municipality

Marketing node	Average buying price/litre (TZS)	Average selling price/litre (TZS)	Marketing margin (TZS)
Hawkers (wholesale) to restaurants	600	1000	400
Restaurants to consumers	1000	1600	600

The results for both marketers of raw and processed milk show that, marketing margin was high at each stage of the marketing chain. Railey and Weber (1983) reported that, a common perception among officials in developing countries is that marketing agents charge unjustifiably high prices and receive unduly high profits, to the detriment of consumers. Government officials rarely appreciate the functions that marketing agents perform, including assembly of geographically dispersed foodstuffs and livestock products, transportation from production zones to centres of demand, storage, and product transformation.

The marketing margins, which are often high in developing countries, are perceived to reflect windfall profits rather than normal returns because of high transaction costs (transport, handling, storage and interest costs). Empirical evidence from livestock marketing costs in West Africa (Holtzman*et al.,* 1980) and in East Africa (Reusse, 1982; Evangelou, 1984) demonstrates that trader returns are not excessive, given the high marketing costs, significant risks, and the high opportunity cost of capital.

4.4.2 Marketing margin for milk marketers in Tanga City

Dairy actors in Tanga City as it was in Iringa Municipality, were observed to charge different prices for milk depending on the product handled that was either raw milk or processed milk. Dealers in raw milk received an average price of 900 – 1600TZS/litre (Table 8) while for processed milk the pricewas about 1400 – 1600 TZS.

Table 8: Marketing margin for raw milk marketers in Tanga City

Marketing node	Average buying price/litre (TZS)	Average selling price/litre (TZS)	Marketing margin (TZS)
Hawkers (wholesale) to restaurants	700	900	200
Restaurants to consumers	900	1600	700

The results were similar to that of Ashimogo *et al.* (1998) who reported the existence of price variations between different areas in the country and between different zones within Dar es Salaam City. Price varied among traders handling raw milk and those dealing with processed milk and between study areas.

4.5 Gross Margin for Actors in the Formal and Informal Channels

The study endeavored to assess and compare profitability between informal and formal milk value chain participants by evaluating costs, prices and revenue at different levels of the market chain, including dairy farmers/producers and milk middlemen (wholesale and retail levels). It was observed that, at every stage there were costs incurred in milk marketing although it was not easy to quantify marketing costs because getting such information was difficult. Gross margins were calculated and used in assessing relative profitability of the product at the different levels of the market for both informal and formal milk chain actors. This implies that, with cost based pricing method; prices are determined by the costs incurred in marketing resulting into variation in gross margin.

4.5.1 Gross margin per litre of milk by value chain actors in Iringa Municipality

4.5.1.1 Gross margin by smallholder dairy farmers

The average price per litre of milk at farm level in Iringa Municipality was 1000 TZSand 570 TZSfor informal and formal market channels respectively. The Gross margin per litre of milksold to the informal channel by dairy farmers was 676 TZSper month (gross margin per cow per month 243 500TZS)(Table 9).

Table 9: Gross margin obtained by dairy farmers per litre in the informal market channel in Iringa Municipality

Parameter		TZS	Total
Costs (Variable costs)			
Concentrates (mineral licks and Salt) /month		45000.00	
Spraying/per month		1500.00	
Veterinary services (drug/vaccine) per month		10000.00	
Labour cost (zero grazing/fodder and milking)		60000.00	
Total variable costs per month			116500.00
Average variable costs per litre of milk	116500/12/30		324.00
Revenue (Income/Returns)			
Average Milk production per cow per day (litres)12 litres * 30 days		360.00	
Price per litre (informal milk market channel)		1000.00	
Milk Revenue per cow per month			360000.00
Gross Income/Cow per month	360000 – 116500		243500.00
Gross Margin per litre	[360000 - 116500]/12/30		676.00
Gross Margin/Cow per 7 months Lactation period	[360000*7]-[116500*7]		1704500.00
Gross margin per cow (%)	1704500 /2520000* 100		67.60%

For the formal market channel farmers obtained the gross margin of 246TZSper litre (gross margin per cow per month 88 700TZS) (Table 10). The reported gross incomes were obtained after deducting all direct costs. For both informal and formal channels, dairy farmers obtained relatively high gross income however dairy farmers who channeled their milk produce through the informal channel obtained a bit higher gross margin. In terms of percentage, the gross margins were 67.60% for dairy farmers supplying milk in the informal channel and43.20% for the dairy farmers supplying milk in the formal channel (Table 9and Table 10).

These results counteract the pre-conceived conjectures thatdairy farmers and producers in general are exploited by their counterpart at the downstream of the chain (wholesalers and

retailers), this is because gross margins for dairy farmers were relatively higher than gross margins forother actors in the milk chain. However at this level it was difficult to ascertain the exact cost since many of the actors (dairy cow keepers) do not keep and maintain records due to ignorance and for business acumen.

Table 10: Gross margin obtained by dairy farmers per litre in the formal market channel in Iringa Municipality

Parameter	TZS	Total
Costs (Variable costs)		
Concentrates (mineral licks and Salt)	45000.00	
Spraying	1500.00	
Veterinary services (drug/vaccine)	10000.00	
Labour cost (zero grazing/fodder and milking)	60000.00	
Total variable costs		116500.00
Average variable costs per litre	116500/12/30	324.00
Revenue (Income/Returns)		
Average Milk production per cow per day (litres) 12 litres* 30 days	360.00	
Price per litre (formal milk market channel)	570.00	
Milk Revenue		205200.00
Gross Income/Cow per month	205200 – 116500	88700.00
Gross Margin per litre	[205200-1165200]/12/30	246.00
Gross Margin/Cow per 7 months Lactation period	[25200*7]-[116500*7]	620900.00
Gross margin (%)	620900 * 100/1436400	43.20%

4.5.1.2 Gross margin per litre by wholesalers and retailers in Iringa Municipality

Dairy business at wholesale and retail levels in Iringa Municipality and Tanga City involved diversified actors. Milk middlemen that were interviewed in the study areas were; bicycle hawkers, restaurants/*migahawa*, and formal retailers (min supermarkets and

shops). In Iringa Municipality hawkers obtained 287.5 TZSper ltre of milk (28.75%) (Table 11) while restaurants and *migahawa*obtained TZS512.5 (32.03%)(Table 12).

Table 11: Gross profit/gross margin per litre of milk obtained by hawkers in Iringa Municipality

Parameter	**TZS**	**Total**
Costs		
Average milk purchased per day (litres)	40lts/day*600/litre*30days	720000.00
Average buying price/litre	600.00	
Transport cost per day	2000.00	60000.00
Boiling cost per day	1500.00	45000.00
Other costs	1000.00	30000.00
Total direct costs per month		855000.00
Average variable cost per litre		712.50
Revenue		
Average sales price TZS/litre	1000.00	
Daily sales	40000.00	
Monthly sales/revenue		1200000.00
Monthly gross Income		345000.00
Gross Margin per litre		287.50
Gross margin (%)		28.75%

Table 12: Gross margin per litre of milk for restaurants in Iringa Municipality

Parameter	TZS	Total
Costs		
Average milk purchased per day (litres)	40lts/day*1000/litre*30days	1 200 000.00
Ave. buying price/litre	1000.00	
Boiling cost per day	1500.00	45 000.00
Other costs	2000.00	60 000.00
Total direct costs per month		1305 000.00
Average variable costs per litre		1 087.50
Revenue		
Average sales price TZS/litre	1600.00	
Daily sales	64 000.00	
Monthly sales/revenue		1 920 000.00
Monthly gross Income		615 000.00
Gross margin per litre		512.50
Gross margin (%)		32.03%

The observed difference in gross margins amongst hawkers and restaurants as indicated inTable 11 and Table 12 was attributed to the difference in marketing margins between the two actors. For formal retailers such as min supermarkets and shops, the gross margins were calculated based on the products handled by the retailer, therefore gross margins were specific to the products that were packed in different volumes. Common dairy products that were sold by these formal retailers included ASAS dairy products and CEFA dairy products. ASAS milk products were; fresh milk 250 ml, yoghurt 170 ml and sour milk commonly known as *mtindi* with 250 ml. CEFA dominant milk product were fresh milk which was packed into two separate containers with volumes of 250 ml and 1000 ml (1 litre). Gross margins for ASAS products were 30% for fresh milk, 12.5% for *mtindi* and 20% for yoghurt and the average gross margin per litre was 600TZS. Margins for

fresh milk from CEFA were 25% and 20% for 250 ml and 1000 ml; respectively,and the average gross margin per litre was 500 TZS(Table 13).

Table 13: Gross margins obtained by formal retailers in Iringa Municipality

Dairy products sold	**TZS**
ASAS fresh 250ml	
Buying price	350.00
Selling price	500.00
Unit profit	150.00
Gross margin (%)	30.00%
ASAS sour/ mtindi 250ml	
Buying price	350.00
Selling price	400.00
Unit profit	50.00
Gross margin (%)	12.50%
ASAS yoghurt 170ml	
Buying price	400.00
Selling price	500.00
Unit profit	100.00
Gross margin (%)	20.00%
Average gross margin per litre for ASAS products	600.00
Cefamtindi 250ml	
Buying price	750.00
Selling price	1000.00
Unit profit	250.00
Gross margin (%)	25.00%
Cefamtindi 1000ml	
Buying price	2000.00
Selling price	2500.00
Unit profit	500.00
Gross margin (%)	20.00%
Average gross margin per litre for CEFA products	500.00

4.5.1.3 Gross margin for processor in Iringa Municipality

The gross margin for processor per litre was calculated based on the operating costs and revenue that were listed by the processor. The revenue for the processor was obtained from the sales of milk and milk products. The processor (ASAS) obtained a gross margin per litre of400TZS(30.77%)(Table 14). The installed processing capacity for ASAS was estimated at 10 000 litres per day however the utilized capacity was only 6000 litres per day.

Table 14: Gross margin calculation for ASAS for one litre of milk per month

Parameter		**TZS**	**Total**
Inputs (costs)			
Cost of raw milk at factory gate		570.00	
Variable cost		90.00	
Packaging material		55.00	
Subtotal costs/month at factory	715*6000litres*30 days		128 700 000.00
Transport outward		30.00	
Distribution/retailing cost		155.00	
Subtotal cost	185*6000litres *30days		33 300 000.00
Total variable costs			162 000 000.00
Average variable costs per litre	[162000000/12/30]		900.00
Income (Revenue)			
Average price per litre		1300.00	
Sale of products	1300*6000litres *30days		234 000 000.00
Gross income per month			72 000 000.00
Gross Margin per litre	1300-900		400.00
Gross margin (%)	72 000 000/234 000 000*100		30.77%

4.5.2 Gross margin per litre of milk by milk value chain actors in Tanga City

4.5.2.1 Gross margin by smallholder dairy farmers

As it was observed in Iringa Municipality, the price differed between the two distinct market channels (informal and formal), which in turn affected the gross margins accrued to actors operating in the informal channel and formal channel. The price per litre of milk at farm level in Tanga City averaged at 900 TZSfor informal milk market channel, while it averaged at 560 TZSfor the formal milk market channel. On one hand dairy farmers who were selling milk through the informal channel received a gross margin per litre of 633TZSper litre (gross margin per cow per month was about 120 000TZS) (Table 15). Onthe other hand dairy farmers who were selling milk via the formal channel obtained the gross margin of293 TZSper litre (the monthly gross margin per cow per month was about 38 400TZS) (Table 16).

Table 15: Gross margin obtained by dairy farmers per litre in the informal market channel in Tanga City

Parameter	TZS	Total
Costs (Variable costs)		
Concentrates (mineral licks and Salt)	40000.00	
Spraying	1000.00	
Veterinary services (drugs/vaccine)	10000.00	
Labour cost (zero grazing/fodder and milking)	45000.00	
Total variable costs		96000.00
Average variable costs per litre	96000/12/30	267.00
Revenue (Income/Returns)		
Average Milk production per cow per day (litres) 8 litres* 30 days	240.00	
Price per litre (informal milk market channel)	900.00	
Milk Revenue		216000.00
Gross Income/Cow per month	216000 - 96000	120000.00
Gross Margin per litre	[216000-96000/12/30]	633.00
Gross Margin/Cow per 7 months Lactation period	[216000*7]-[96000*7]	840000.00
Gross Margin (%)	840000/1512000* 100	55.56%

The gross margins were 55.56%(Table 15) and 28.57% (Table 16) for the informal channel and formal channel respectively. Dairy farmers who sold their milk through the informal channel received a relatively higher gross margin than those who channeled their milk via the formal market channel. The observed difference in returns between dairy farmers channeling milk through the informal and formal channels was vastly attributed to the variation in prices paid in the two market channels. Dairy farmers who channeled milk through the informal channel received a relatively higher price (900TZS) (Table 15) than those who channeled their milk through the formal channel (560TZS)(Table 16).

Table 16: Gross margin obtained by dairy farmers per litre of milk in the formal market channel in Tanga City

Parameter	**TZS**	**Total**
Costs (Variable costs)		
Concentrates (mineral licks and Salt)	40 000.00	
Spraying	1000.00	
Veterinary services (drugs/vaccine)	10 000.00	
Labour cost (zero grazing/fodder and milking)	45 000.00	
Total variable costs		96 000.00
Average variable costs	[96000/12/30]	267.00
Revenue (Income/Returns)		
Average Milk production per cow per day (litres) 8litrs* 30 days	240.00	
Price per litre (formal milk market channel)	560.00	
Milk Revenue per month		134 400.00
Gross Income/Cow per month	134400 - 96000	38 400.00
Gross Margin per litre	[134400-96000/12/30]	293.00
Gross Margin/Cow per 7 months Lactation period	[134400*7]-[96000*7]	268 800.00
Percentage gross margin	268800 * 100/940800	28.57%

4.5.2.2 Gross margin by wholesalers and retailers

Gross margins obtained at wholesale and retail levels in Tanga City varied across actors as it was observed in Iringa Municipality. Bicycle hawkers, restaurants/*migahawa,* and formal retailers (min supermarkets and shops) were the key actors that featured at the wholesale and retail level. In Tanga City hawkers obtained a gross marginof 116.67 TZSper litre (12.96%)(Table 17) while restaurants and *migahawa* obtained a gross margin of 933 TZSper litre (37.50%)(Table 18).

Table 17: Gross margin per litre of milk received by hawkers in Tanga City

Parameter		**TZS**	**Total**
Costs			
Average milk purchased per day (litres)	60lts/day*700/litre*30days		1260000.00
Average buying price/litre		700.00	
Transport cost per day		2000.00	60000.00
Other costs		3000.00	90000.00
Total direct costs per month			1410000.00
Average variable costs per litre	[1410000/60/30]		783.33
Revenue			
Average sales price TSh/litre		900.00	
Daily sales		54000.00	
Monthly sales/revenue			1620000.00
Monthly gross Income			210000.00
Gross margin per ltre		900-783	116.67
Gross margin (%)			12.96%

Table 18: Gross profit/gross margins received by restaurants and *migahawa* in Tanga City

Parameter	TZS	Total
Costs		
Average milk purchased per day (litres)	40lts/day*900/litre*30days	1 080 000.00
Average buying price/litre	900.00	
Boiling cost per day	2000.00	60 000.00
Other costs	2000.00	60 000.00
Total direct costs per month		1 200 000.00
Average variable costs per litre		666.67
Revenue		
Average sales price TZS/litre	1 600.00	
Daily sales	64 000.00	
Monthly sales/revenue		1 920 000.00
Monthly gross Income		720 000.00
Gross margin per litre		933.33
Gross margin (%)		37.50%

Retailers operating in the formal channelin Tanga City included min supermarkets and shops as it was observed in Iringa Municipality, the gross margins were also calculated with regard to the products handled by the retailer, therefore gross margins were specific to the products that were packed in different volumes. Common dairy products that were handled by formal retailers were from Tanga Fresh Milk Processing Plant. These milk products included; fresh milk (250 ml), sour milk/*mtindi*(250 ml), and *mtindi* with (500 ml). Gross marginsobtained from the sale of milk products were 30% for fresh milk, 12.5% for *mtindi* and 20% for yoghurt with an average gross margin of 100 TZSper litre (Table 19).

Table 19: Gross margins obtained by formal retailers in Tanga City

Product sold	**TZS**
TANGA fresh 250ml	
Average units sold per day	30.00
Buying price	300.00
Selling price	350.00
Unit profit	50.00
Gross margin	14.29%
TANGA mtindi 250ml	
Average units sold per day	20.00
Buying price	350.00
Selling price	400.00
Unit profit	50.00
Gross margin	12.50%
TANGA mtindi 500ml	
Average units sold per day	15.00
Buying price	650.00
Selling price	700.00
Unit profit	50.00
Gross margin	7.14%
Average gross margin per litre	100.00

4.5.2.3 Gross margin for processor in Tanga City

As it was observed in Iringa Municipality, the gross margin for a processor per litre was calculated based on the operating costs and revenue that were listed by the processor. The costs that a processor incurred were almost similar to that incurred by ASAS. The revenue for the processor was obtained from the sales of milk and milk products such as fresh milk, sour milk, yoghurt and the likes. The processor (Tanga Dairy Fresh) obtained a gross margin of 368TZSper litre (28.31%)(Table 20). The installed processing capacity for

Tanga Dairy Fresh was reported to be 50 000litres per day, however the utilized capacity was averaged at 30 000litres per day.

Table 20: Gross margin calculation for Tanga Dairy Fresh for one litre of milk per month

Parameter	TZS	Total
Inputs (costs)		
Cost of raw milk at factory	560.00	
Variable cost	80.00	
Packaging material	67.00	
Subtotal costs at factory	707*30000litres*30 days	636 300 000.00
Transport outward	50.00	
Distribution/retailing cost	55.00	
Other costs	110.00	
Subtotal cost	225*30000litres *30days	202 500 000.00
Total costs		838 800 000.00
Average variable costs per litre	[838 800/30000/30]	932.00
Income (Revenue)		
Average price per litre of milk	1300.00	
Sale of products	1300*30000litres *30days	1 170 000 000.00
Gross income per month		331 200 000.00
Gross Margin per litre	1300-932	368.00
Gross margin (%)	72 000 000/234 000 000*100	28.31%

4.5.3 T- test for comparison of gross returns for dairy farmers selling through informal and formal milk channels

An independent sample T - test was carried out to test the hypothesis that the formal and informal milk value chains are equally rewarding to dairy farmers. Findings in Table 21indicatestatistically insignificant resultsat P<0.05meaning that the gross margin per litre

of milk between dairy farmers selling via the formal and informal channel are statistically not different.Therefore the null hypothesis that "the formal and informal milk value chains are equally rewarding to dairy farmers" is rejected at P< 0.05.

Table 21: Means comparison result of gross margin per litre of milk between informal and formal dairy farmers

Channels	Mean	Standard deviation	Standard Error Mean	t	df.	Sig.
Informal – Formal channels	385.000	63.640	45.000	8.556	1	0.027

4.6 Analysis of factors influencing dairy farmers' choice of marketing channels

Factors influencing milk market channels choice were estimated to determine how smallholder dairy farmers behave in making decision for multi- milk market outlets choice in marketing milk. The estimation of factors influencing dairy farmers' of milk market channels was conducted in order to test the first hypothesis which states that '*household socio-economic characteristics do not influence choices of milk market channels among smallholder dairy farmers'.*

In order to determine significant factors that influence dairy households in deciding which milk market outlet to use amongst the available options in the study areas, a multinomial logit model was adopted. The MNL accommodated the multi- milk market channels that were available in the study areas to represent the categorical dependent variable. The MNL equation that was developed for this study accommodated four milk market categories which were polytomized asneighbours, milk vendors, milk collection center,

and processing plants. These four milk market categories were later dichotomized into the formal market (sale to processing plant) and the informal market that squeezed the four different milk market outlets as mention earlier to suit the intent of the study. The explanatory variables that were accommodated in the MNL equation included; Age of household head (AGE), Sex of the household head (SEX), Family size of household (FSHH), Education Level of the Household Head (ELHH), Volume of milk output (VMP), Price per litre offered at the market (PRICE),Family size (FSHH), Experience in dairy production and marketing (EXPP), and Access to credit (ACCR).

4.6.1 Results of the Multinomial logit model estimation

The MNL was used to determine the dairy farmers' preferences, examine effects of explanatory variables on the likelihood of choosing milk market outlets from a number of alternative milk market channels that were available in the study areas. Table 23summarizes the socio-economic factors hypothesized to influence smallholder dairy farmers' choice of milk market channels. As it can be seen from the table, the specified multinomial model fits well the data as measured by Pseudo – R^2 (Cox and Snell = 0 .847, Nagelkerke = 0 .933, and McFadden = 0.788). The high value of Pseudo – R^2 which are 84.7%, 93.3% and 78.8% for Cox and Snell, Nagelkerke and McFadden respectively, suggest a good predictive ability of the model implying that the explanatory variables included in the model explain well the variation in the dependent variable. According to Louviere *et al.* (2000) pseudo-R^2 sometimes though rarely, reaches values as high as those of R^2 in linear regression; therefore, the presented Pseudo – $R^2$are still considered to have a good fit. A study conducted byGani and Adeoti (2011)also confirmed the same result.Furthermore, the Chi-square statistic shows the model is highly significant at1% ($P<0.01$) level of significance, indicating that coefficients for all variables included in the

model are jointly different from zero. All these confirm that there is a relationship between the dependent variable and explanatory variables included in the model.

4.6.2 Overall test of relationship

The first thing in MLR for any choice analyst is to describe the overall test of a relationship, in this case a relationship between the dependent and independent variables. The existence of a relationship between the dependent and independent variables is based on the statistical significance of the final model chi-square in the (Table 22), termed model fitting information. In this analysis, the model reveals that the probability of the model chi-square (300.774) was 0.000, less than the level of significance of 0.01 (P<0.01). The hypothesis that household socio-economic characteristics do not influence choices of milk market channels among smallholder dairy farmers is rejected.

Table 22: Model fitting information

Model	-2log Likelihood	Chi-Square	df	Sig
Intercept Only	381.452			
Final	80.678	300.774	36	0.000

As indicated in Table 23, some predictor variables influence milk market channel choices significantly. Of the 9 independent variables used in the model, five, three and three variables in neighbors, milk vendors and milk collection center (MCC) milk market choices, are statistically significant at 1% significance level respectively. In all but one of the cases, the signs of the estimated coefficients are consistent with the *a priori* expectations.

The results suggest that the probability of the choice of neighbor households as one of the market outlets is significantly and positively influenced by the family size of the household of a dairy farmer (FSHH) and price per litre offered at the market (PRICE), which is consistent with the *a priori* expectations. A credible explanation behind the observed relationships is that the positive and significant coefficient of household size (FSHH) reflects that the larger the household size, the more volume of milk is supplied to the market per day. The coefficient of the variable confirms that as the dairy household household size increases by one adult equivalent, volume of marketable milk surplus rises by 3.6 litres per day. This is because of the fact that household members represent labour resources for better management of dairy cows and, hence, are posited to be directly related to engagement in production and marketing activities. These results affirm findings ofSomano (2008) andGani and Adeoti (2011).

On the other hand a positive coefficient in PRICE implies that a unit increase in price offered per litre will result into an increase in the volume marketed to neighbor households by 0.15 litres per day. The rationale behind is that price is the main driving force of suppliers. Dairy farmers were selling milk to neighbors because they offered pricethat was greater than that offered by other market outlets. These findings are consistent with that ofBhuyan (2009).

Table 23: Estimated results of the Multinomial Logistic Regression (Processing plant is the reference choice category)

Variables	Neighbours		Milk vendors		Milk collection center (MCC)	
	Coefficient (β)	Significance	Coefficient (β)	Significance	Coefficient (β)	Significance
Intercept	-115.089***	0.000	-48.225	0.054	181.329***	0.000
AGE	0.275	0.421	0164	0.627	0.010	0.475
FSHH	3.633***	0.000	-0.194	0.716	-0.124***	0.002
VMP	-0.394***	0.000	-0.194	0.142	0.002	0.434
PRICE	0.153***	0.000	0.083***	0.000	-0.322***	0.000
DNMM	-1.575	0.188	-1.575	0.259	-0.029	0.547
[SEX=0]	9.883	0.173	12.397*	0.094	0.168	0.686
EDLHH (None=1)	-32.292	0.551	-19.152	0.723	37.467	-
EDLHH (Primary edn=2	-32.207***	0.000	-18.950***	0.009	-0.352	0.507
EDLHH (Secondary=3)	-45.647***	0.000	-34.331***	0.000	-0.5120	0.375
EXPHH (1-2 years ago =1)	0.620	0.958	3.974	0.736	79.675	-
EXPHH (2-3 years ago =2)	29.268	0.279	27.358	0.311	8.944	0.709
ACCR (No =0)	-7.955*	0.058	-3.058	0.454	1.132***	0.000

Note: ***, ** and * Significant at 0.01, 0.05 and 0.1 levels respectively.
Number of observations = 160
Pseudo R^2 : Cox and Snell = 0 .847, Nagelkerke = 0 .933, McFadden = 0.788

Contrary to the prior expectation, the coefficient that was attached to the volume of milk produced (VMP) revealed a negative impact on dairy farmers' decisionto use neighbor as a milk market channel and was significant at 1% probability level. The result of the informal survey confirms those dairy households having a larger volume of milk were unable to channel through neighbors because neighbors demanded small volume of milk to meet their family consumption.

Education (primary and secondary level) (EDLHH) has a negative effect and statistically significant effect(less than 1% probability) on the choice of neighborsas an outlet for milk which is contrary to the prior expectation.

The MNL results further indicate a negative and significant (0.058) relationship between the choice of neighbor milk market outlet and the access to credit (ACCR/no=0). The relationship implies that with no access to credit a dairy farmer is unlikely to sell milk via neighbor market channel. Unfortunately, the negative relationship is not significant at the 5% level but is at the 10% level. This relationship is most likely due to the influence of credits in expanding the scale of operation of the dairy farmers. The value of the odds ratio (0.000) supports the zero probability of the variable influence on the neighbuor milk market choice.

The probability of choosing to sell to milk vendors (being restaurants, *migahawa*, hawkers, or hotels) is positively influenced by the price paid per litre (PRICE) and a possibility of dairy farmer being a female (SEX female=0) than a male. The estimated significant values for price and sex are 0.000 and 0.094 respectively. However, the positive relationship between a female sex and milk vendors is not significant at the 5% level but is significant at the 10% level. As it was revealed in the choice of neighbor

households milk market outlet, education level (EDLHH) had negatively and significantly influences the dairy farmers' choice to sell to milk vendors.

A positive coefficient for PRICE and its influence on the dairy farmers' decision to sell milk to milk vendors is consistent with the prior expectation. A possible explanation is that milk vendors offer relatively higher price for milk as it was revealed for neighbors. Therefore, milk vendors who offer better price are likely to increase dairy farmers' willingness to market their milk produce through the milk vendor market outlet, which are more rewarding than milk collection centres and processing plant.

The revealed positive and significant relationship between being a female dairy farmer and the likelihood to choose vendors as milk market outlet mean that, female-headed dairy household would increase the probability for marketing milk to milk vendors. A conceivable explanation that can be given for this relationship is that females as head of the household are confronted with the household roles and therefore theychoose not to opt other market outlets because it requires moving out of the homestead to the point of buyers. Additionally, most milk vendors particularly hawkers tend to move from one farmer to another searching for milk, this attracts more female dairy farmers to contract with hawkers for the supply of milk.

According to the results of the multinomial logit, the probability of choosing to sell to a milk collection center is negatively influenced by the household size (FSHH) and the price of milk (PRICE).It was expected that the family size (FSHH) and the price of milk (PRICE) (significance value 0.000) could have a positive influence on alternative milk market choices. However, the *priori* expectations hold true for the neighbor and milk

vendor market outlets choice but only for the price of milk per litre (PRICE), and FSHH for the sell to the neighbourhouseholds market choice only.

There is sufficient evidence (significance value of 0.002) to support that large family size (FSHH) is unlikely to encourage households to market their milk produce through milk collection center market channel. With Milk collection center as one of the milk market outlets choice, large family size is not important for dairy farmers, as they supply their milk produce in bulk once milked an activity that can possibly be performed by a single family member. Family under neighbor milk market outlet revealed a positive influence because large family size supplies more labour that can be well utilized in distributing milk to neighbor households who offer a relatively better price unlike MCC.

Access to credit (ACCR) in milk marketing was expected to have a positive influence on the dependent variable. During the survey it was established that dairy farmers who were channeling milk through milk collection centres had access to credit, hence the probability of selling milk to milk collection centreswas high. The observed milk collection centers in the study area (Tanga City) were owned by dairy farmers' cooperatives. Being members to these, farmers were getting loans that could assist them in expanding their scale of operation. However, milk collection centers were not restricting non members to supply milk. These findings are in harmony with that of (Luoga*et al.,* 2010; Freshwater, 1989) which asserted that access to credit enables dairy farmers to to use improved inputs such as commercial feed supplements and veterinary services and paying hired labour, which in turn have a direct positive impact on dairy performance. Philip (2001) reported similar findings for Turiani dairy farmers who had access to credit facilities. Therefore, it can be concluded that credit is important in the produce market, regardless of the choice of the market being used.

The results shown in Table 23, for this variable is consistent with the *a priori* expectations. For all market outlets (formal and informal market choices in principle), there is enough evidence to support that when households access credits, there is a higher chance of participating in either formal or informal markets. Thus, access to credit encourages dairy production and market penetration among smallholder farmers who find it difficult to increase production and market milk without access to credit to gain market access. With access to credit dairy farmers are able to expand their production size and meet the demand deficit.

4.7 Problems Constraining the Integration of Informal Milk Chain Actors into the Formal Value Chain

Problems and constraints that were identified to be hampering informal milk chain participants to integrate into a formal value chain were similar in both Iringa Municipality and Tanga City. These problems and/or constraints are:

4.7.1 Low price offered per litre of milk

Low price offered per litre of milk was listed by the majority of smallholder dairy farmers to be the main obstacle hampering them from channeling their milk to processors either through MCC or selling directs to processing plants. Due to low price, farmers were readily willing to channel their milk produce via informal channel which was seen to be more rewarding than the formal channel.

4.7.2 Inability to adhere to standards and quality

Through discussion with farmers and workers at MCC, it was discovered that majority ofdairy farmers were unable to comply with standards and quality that were attached to milk by processors in both regions. An observation during the survey has shown that milk

passing through milk collection centers and processing plants weresubject to quality and standard tests using different instruments.One of the common quality tests was a lactometer which was used to measure water content in order to avoid purchasing adulterated milk.

4.7.3 Low volume of milk produced

Dairy farmers who were producing little milk had no motive to sell via formal channel since little milk was easily to be absorbed by the informal channel particularly via selling to neighbor households.

4.7.4 Long distance home to milk collection centre and processing plants

Some dairy farmers listed distance as one of the obstacles that was hampering them to channel milk via formal channel. This particular problem was commonly reported in Tanga City where MCCs were noted as the main channel through which milk were channeled to processors. Farmers who were dwelling afar from MCC were finding difficult to travel a long distance to reach these centers

4.7.5 Absence of milk collection centers within Iringa Municipality

During the survey, it was established that within Iringa Municipality there were no milk collection centers which would have encouraged dairy farmers and hawkers to channel milk via formal channel.

4.7.6 Inadequate knowledge

The study has established many smallholder dairy farmers had little knowledge on the importance of formal channel as well as the value of processed milk owing to the high

hygienic state and its preference to customers especially those attaching awareness of zoonotic diseases such tuberculosis.

Other problems and /or challenges that were hindering dairy farmers to channel milk through formal channel were; high demand of milk within the informal channel particularly in Iringa Municipality. Poor payment mechanism in Tanga City was reported by some farmers as one of the obstacles that were restricting them to sell their milk in the formal channel.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Descriptive statistics, gross margin and econometric model were used to analyse the data collected from the study sites. These analytical methods were meant to identify differences in choices of milk channels among smallholder dairy farmers. A multinomial logit model was adopted to test statistically whether choices of milk channels were different. This model was estimated using SPSS 16 software.

Available evidences from literature and the survey indicate that dairy farming and milk marketing in particular involve many actors including smallholder farmers and intermediaries such as wholesalers and retailers. Results from the analysis show that actors were different both individually and group wise. For example it was found that actors differed with respect to age (young, middle and elder age), educationlevels and sex. A detailed discussion of these and other variables hypothesized to influence participation in the milk value chain and choices of channels/outlets is provided in chapter four. The observed differences in socio-economic characteristics among actors in the milk value chain were found to have implication on milk marketing behavours.

5.1.1 Gross margin

It was also established that actors in the milk value chain performed differently in terms of profitability. Generally, milk marketing was found to be profitable in the study areas; however the extent of profit varied within market levels and between informal and formal milk chains as well as between the two regions. The presented gross margins substantiate the difference in profitability among actors. The gross margins show that actors in Iringa

Municipality obtained relatively higher profit than actors in Tanga City. Interesting, informal milk chain actors in both areas received large profit than their counterparts in the formal milk market channel. The observed difference in milk returns among actors selling milk in informal and formal milk chain was mainly attributed to difference in milk price. In addition, the noted differences in returns amongst formal and informal actors work against the null hypothesis which was formulated in chapter one stating that the formal and informal milk value chains are equally rewarding to dairy farmers.

5.1.2 Problems constraining marketing of milk via formal channel

The study has found several problems that hinder smallholder dairy farmers to market milk through the formal channel including low milk price (per litre) offered by processors both in Iringa Municipality and Tanga City. Low price was observed to be the main obstacle among smallholder dairy farmers that hampered them from channeling their milk to processors either through milk collection center or selling direct to processing plants. However, it should not be overlooked that price was the only factors limiting dairy farmers to sell milk through formal market channel. Reasons beside price that were identified included; inability to adhere to standards and quality that were attached to milk by processors in both regions, low volume of milk produced that could easily be absorbed by the informal channel particularly neighbours.Other reasons included inadequate knowledge on the importance of processed milk owing to high hygienic state and its preference, especially with regard to risks of zoonotic diseases such as tuberculosis.

5.1.3 Multinomial logistic results

The multinomial logit model as applied in this study was specifically intended to investigate factors influencing the dairy farmers in choosing milk marketing channel between the two principal categories of milk marketing channels (formal and informal).

Preliminary studies and observation in the study areas confirm that there were milk market subsets within the informal milk marketing channel such as vendors (hawkers, hotels/restaurants/*migahawa*), milk collection centers as well as selling direct to the processing plant. This variant of the logit model can accommodate these typologies of milk outlets. Results from the multinomial logistic regression model show that variables that were statistically significant at the 1% level of significance are price per litre of milk, size of household, education level (primary and secondary) of household head, sex of household head, volume of milk produced, and access to credit.

The implication is that the variables that have a higher probability of shifting dairy households from the informal market channel (neighbours, and milk vendors) to formal marketing channel are family size of household (FSHH) and access to credit (ACCR). The volume of milk produced (VMP) had a positive influence on dairy farmers' decision to sell their milk though the formal channel. The VMP though not significant had a positive sign, implying that households were likely to shift from informal market to formal market channel with increase in the volume of milk produced. However, households willing to participate in the formal markets have to be motivated by increase in price and open to new marketing ideas such value additions rather than reliance on traditions.

The variables that are likely to shift households from formal market channel to informal market channel include price offered per liter of milk, households' size and the volume of milk produced. The two variables (PRICE and VMP) revealed a positive influence. Thus, increases in each of the two variables result in a higher probability of households changing from the formal market channel to informal market channel participation. On the other hand a unit decrease in the volume of milk produced results in a higher probability of

households changing from the formal market to informal market channel participation since low milk volume can be easily absorbed by informal market channel.

Based on the MNL results presented in this chapter, the null hypothesis formulated for milk market choice in chapter one is invalid. Milk marketing channel choices amongst smallholder dairy farmers are influenced by household socio-economic characteristics/factors. It should be recognized that there is only sufficient evidence to support the influence of the significant variables, but that does not make the insignificant variables irrelevant. A plausible explanation is that devoid of the significant variables, it makes it difficult for dairy households being involved in different marketing choices to exercise choice that reward with higher profit.

With reference to the results of this study, several suggestions can be made on how smallholder dairy farmers can be actively involved in milk marketing. Generally, the findings suggest that an alteration in each one of the significant variables can significantly influence the probability of milk market channel choice. For instance, adjustments in price offered per litre of milk and volume of milk and related factors that affect such variables can help farmers improve participation and encourage them to channel milk through formal market. It is important to discover the ideal socio-economic factors that best fit the smallholder dairy farmers. In coming up with different ways of incorporating smallholder dairy farmers in mainstream agriculture and dairy marketing in particular, it has to be accepted that smallholder farmers cannot individually compete against commercial farmers in markets. In addition, it is difficult for them to get a better price as well as contractual agreements individually, owing to a small marketable output. This leads to the subsequent section where policy recommendations for improved formal market channel participation are suggested.

5.2 Policy Recommendations

Based on the findings of the study the following recommendations are made for increasing milk supply in the formal channel;

5.2.1 Dairy plants/processors should offer reasonable prices

To manage the supply-side constraints, the dairy plants should offer reasonable prices to the milk producers and a fair share in consumers' currency. Offering reasonable price per litre can inspire dairy farmers to sell milk through the formal channel (plants). In the survey areas, producers were observedpreferring selling milk to the informal channel because their milkfetches a better price than the price offered by dairy plants. Price is the key factor for producers to optfor the supplying outlet.

5.2.2 Formation of smallholder dairy organizations

Smallholder dairy farmers should be encouraged to form farmers' groups/organisations such as cooperatives that can possibly amplify their bargaining power through collective mechanism. Collective bargaining mechanism can make associations being able to increase negotiation power in setting price. This is because farmers acting individually become quite impossible to influence the price paid by processors. In addition, dairy farmers' organisations can be instrumental in linking producers with markets especially because the farmers are non entrepreneurial; contract farming may be one of the mechanism to propel collective action spirit with this category of farmers. Consumers are interested in a continuous supply of high-quality milk products and the processors are interested in a content customer and therefore in delivering a high quantity of quality milk continuously are obligatory for producers. This inclusion of the smallholder farmers will increase the milk supply base for the formal chain. Dairy farmers' organizations may however have limited capacity to carry out this, potential facilitators for change,

government, NGOs and consultants need to be invited to work with farmers' unions to build their capacity in value chain development.

5.2.3 Establish adequate MCCs to cutter for surplus raw milk from producers

Where milk collection centers are unavailable particularly in Iringa Municipality they should be established to enhance milk marketing through the formal channel. As Sayin*et al.* (2011) suggest that, these entities work as a bridge between producers and enterprises and therefore are a sort of connecting point in an organizational network. This method helps to decrease the street sale of milk. As such, MCCs could be affiliated to the private sector, producer cooperatives or unions and other non-governmental organizations. Another important function of the MCCs is to provide quality and safe raw milk by enabling cold chain in the period of passing from the milking stage to the arrival at the dairy plant, because this is one of the problematic areas for food safety conditions in raw milk marketing and sustainable market chain for milk in Tanzania and other developing countries.

5.2.4 Provision of non-price incentives

Besides monetary/price incentives, the provision of non-price incentives by the dairy plants, in the form of supply of quality feed inputs, regular veterinary medi-care services, artificial insemination (AI) facilities, extension services, training to the milk producers, etc. are instrumental in ensuring higher supply of milk to the plants. Findings by Sirohi*et al.* (2009) confirm that several private plants in Gurajat India have also secured their regular milk supply by providing various services to the milk producers in their area of operation. Unfortunately, the milk plants in Iringa Municipality and Tanga City either do not provide any kind of non-price incentives to the producers or the milk producers are not appreciative of the quality of inputs or services provided by them.

5.2.5 Revisit of dairy development policy guidelines

Policyon dairy development needs to be revised to create conducive environment for smallholderdairy development. Farmers need support to meet market, registration and certification standards that can link them to sustainable markets. Dairy services need to cover milk producing areas more and provide the regulatory services to the small holder farmers who are ignorant of the possibilities of formalising their milk sales. This will contribute to the inclusion of the small holder in the formal chain.

5.2.6 Adoption of best upgrading practices by farmers

Dairy farmers need to adopt best upgrading practices in order to enhance their competitiveness and increase the volume of milk channeled through the formal chain. These can include product upgrading, functional upgrading, process upgrading, vertical coordination and inter – chain upgrading. Improving the informal chain by means of upgrading traditional processing technologies will lead to higher quality, entrepreneurship and more supply.

5.2.7 Re-structuring of existing institutional arrangements

The re-structuring of existing institutional arrangements should go hand in hand with the efforts to tackle the demand and supply side constraints. On the demand side, there is an urgent need to launch a massive consumer awareness campaign to apprise the consumers that the value-added products of the organized sector are better than those of the unorganized sector from the health and public safety aspects. The government, in close liaison with other non-government players in the dairy processing industry, should take the lead in generating this public awareness.

5.2.8 The government should empower small and medium scale processors

The governments in collaboration with NGOs need to empower small and medium scale processors to enter in the milk processing business with the aim of creating competitiveness within the dairy processing industry via new investments. Competition can immensely abet to widen farmers' choice in the formal value chain this suggestion is logical one owing to the economic theory of monopoly market structure under which producer is a price setter, for example within the Iringa Municipality only ASAS is a single processor. Future investments in creating additional dairy processors should be preceded by sound *ex-ante* investment feasibility study and a well planned procurement and marketing strategy. In nutshell, instead of piecemeal efforts, a holistic approach is required for boosting the formal milk processing sector in the study areas and effectively linking the milk producers in the value chain.

5.3 Recommendation for Further Research

In regard with the findings emanated from this study, the researcher recommends further studies to focus on assessing the potential benefits of adopting best upgrading practices by the poor actors participating in milk value chain and poverty reduction chain with a view to drawing lessons for pro-poor growth and poverty reduction among chain participants.

Similarly, a thorough study on the transaction costs associated with the marketing of dairy products (vertical and horizontal coordination) in both informal and formal channels and a corresponding comparison should be studied accordingly. A thorough assessmentof the determinants of consumer preferences and formulation of appropriate market promotion strategies will be instrumental in overcoming the demand-side constraints.

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APPENDICES

Appendix 1: A questionnaire administered to urban smallholder dairy farmers in Tanga City and Iringa Municipality

TITLE: FACTORS INFLUENCING THE CHOICE OF MILK OUTLETS AMONG SMALLHOLDER DAIRY FARMERS IN IRINGA MUNICIPALITY AND TANGA CITY.

SECTION A. GENERAL INFORMATION

Name of respondent (optional)…….

Date of Interview……

Village/Street……Ward……District……..Region……

A: HOUSEHOLD'S CHARACTERISTICS

Please, circle the appropriate number only

01.	Age (years)	1 = below 18 years; 2 = 18 – 30; 3 = 31 – 45; 4 = 46 – 60; 5 = over 60
02.	Sex	1=Male 2= Female
03.	Marital status	1= Single 2 = Married 3 = Widowed 4 = Divorce 5 = Separated
04.	Family size	1 = 1 – 3; 2 = 4 – 6; 3 = 7 – 10; 4 = over 10
05.	Origin	1 = Native 2 = Migrant
06.	Education level	1= None 2 = Primary 3 = Secondary 4 = Post-secondary certificate 5=Diploma 6=Higher education
07.	What is your primary occupation	1= wage employed 2= Dairy cattle keeping 3= Business 4= Crop production 5= Others…..
08.	What is your secondary occupation	1= wage employed 2= Dairy cattle keeping 3= Business 4= Crop production 5= Others…..

SECTION B: INFORMATION ON MILK PRODUCTION: DAIRY ENTERPRISE INFORMATION

09. When did you start the dairy enterprise?

a) 1-2 years ago…. B) 3-4 year ago….. c) More than 5 years ago….

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

Cows…..Heifers….Bulls….Steers……Calves……..

11. What was the source of the initial capital for the establishment of your dairy enterprise?.....

a) Own saving…. b) Family / Friend….c) Formal credit……. D) Informal credit…… e) Others (Specify)….

12. How much did it cost for the Construction of the cow shed in TZS……..

13. Number of dairy cows and frequency of milking

Cows	No of dairy cows	No of milking cows	Average yield per day (in litre)	Lactation period	Average litre of milk consumed (per day)	Average litres of milk sold (per day)	Amount of milk used for processing
Local cows							
Crossbred cows							
Pure breed cow							
Total							

* Lactation period: 1=for 2 months, 2= for 3months, 3= for 4months, 4= for 6 months, 5= for a year

14. How many dairy cattle do you currently keep?.....

Cows…..Heifers….Bulls….Steers……Calves……..

15. What type of feeding do you practice?.....

Zero grazing…….. Semi grazing……Grazing……

16. How many cows do you milk a day…….?

17. What is the average amount of milk (in liters) per day during? Dry season…….Wet season…….

18. What are the production and marketing costs in your dairy enterprise?

Item	**Quantity**	**Cost/unit (TZS.)**	**Total cost (TZS.)**
Variable and overhead cost			
Feed/forage/hay/silage			
Concentrates			
Labour			
Utensils			
Fuel			
Transport			
Veterinary services			
Manual disposal			
Water and electricity			
Taxes			
Others (specify)			

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

Items	**Wet season**	**Dry season**
Consumed at home		
Sell to neighbours		
Send to local market		
Send to collection center		
Sell to hotels/restaurants etc		
Remain unsold		
Sell to the processing plant		

20. If there is unsold milk what do you do with it? (a) Preserve cold (b) Process to sour milk (c) Preserve after boiling (d) Others (Specify)
21. What means of transport do you use in distributing your milk? Head carrying……. Bicycle….. Public transport ……..Own vehicle…….. Hired vehicle…… Other (specify)……..
22. What is the distance from home to milk market in Km……
23. What is your unit of measure for selling milk? Liter……others (Specify)……..
24. What is the price of milk in Tsh during; Wet season……. Dry season……
25. Who sets the price of milk? Producer……Buyer……Negotiated…….
26. Do you process milk? YES/NO……If YES, what milk product do you make?
Sour milk……..Yoghurt……. …..Ghee……..Butter…….Cheese……..

SECTION C: MILK MARKETING
29. Where do you sell your milk?
At farm gate ( ) Milk vendors ( ) Cooperative ( ) Milk collection centre ( ) Processing plant ( ) Restaurants/hotels ( ) Others (specify) ( )
28. Which markets do you usually use for selling/channeling your milk produce?
1=Formal markets 0=Informal markets

29. Give reason(s) for the choice in question 28 and 29.
……
……
……
……
……

30. What price is offered?
At farm gate ( ) Milk vendors ( ) Cooperative ( ) Milk collection centre ( ) Procesasor ( ) Others (specify)

31. Provide information related to quantity of dairy products consumed at home and sold including sales arrangements

SECTION D. OUTPUT/REVENUE DATA

32. Dairy Enterprise

Type of output/product	**Quantity by outlet (monthly)**	**Price per unit**	**Total revenue (Tsh)**
Raw milk			
Sour milk			
Heifers			
Calves			
Bulls			
Farm yard manure			
Other (specify)			

33. What are the major milk marketing constraints you have observed?
1. Fluctuation in the quantity of milk obtained from cows
2. Distance of milk collection centers from my home
3. Lack of getting adequate market
4. Inadequacy of labor in the household to transport milk
5. Spoilage of milk during transportation
6. Unable to get market information
7. Others (specify) _____

33. List what you consider to be the major problems constraining you in channeling your milk via formal marketing channel.

……
……
……
……
……

34. Suggest ways in which such problems can be addressed

……
……
……
……
……
……

THANK YOU VERY MUCH FOR YOUR TIME AND CO-OPERATION

Appendix 2: Questionnaires for urban Milk traders (Middlemen) in Iringa Municipality and Tanga City

TITLE: INTEGRATION OF INFORMAL MILK CHAIN PARTICIPANTS INTO FORMAL VALUE CHAIN IN TANGA CITY AND IRINGA MUNICIPALITY: AN ECONOMIC ANALYSIS.

SECTION A. GENERAL INFORMATION
Name of respondent (optional)…….
Date of Interview……
Village/Street…….Ward…….District……
Region…….

A: HOUSEHOLD'S CHARACTERISTICS

Please, circle the appropriate number only

01.	Age (years)	1 = below 18 years; 2 = 18 – 30; 3 = 31 – 45; 4 = 46 – 60; 5 = over 60
02.	Sex	1=Male 2= Female
03.	Marital status	1= Single 2 = Married 3 = Widowed 4 = Divorce 5 = Separated
04.	Family size	1 = 1 – 3; 2 = 4 – 6; 3 = 7 – 10; 4 = over 10
05.	Origin	1 = Native 2 = Migrant
06.	Education level	1= None 2 = Primary 3 = Secondary 4 = Post-secondary certificate 5=Diploma 6=Higher education
07.	What is your primary occupation	1= wage employed 2= Dairy cattle keeping 3= Business 4= Crop production 5= Others…..
08.	What is your secondary occupation	1= wage employed 2= Dairy cattle keeping 3= Business 4= Crop production 5= Others…..

SECTION B: INFORMATION ON MILK/PRODUCT PROCUREMENT

09. Product procured

Product/source	Small farmers	Other traders	Processors	Unit of measure for purchase	Quantity purchased	Price/unit
Fresh milk						
Cheese						
Yoghurt						
Ice cream						
Others (Specify)						

10. Which source do you rely on your procurement?.....

11. Give reason (s)

High quality [ ]	Cheap product [ ]	Constant supply [ ]	Sufficient supply [ ]	Others (Specify)

12. Do you have contractual arrangements with suppliers? [Yes/No]

13. If yes what are the terms of contract?

Quantity of daily supplied	Model of payment	Date of payment	Time of supply	Price of milk supplied	Purchase of all milk supplied

SECTION C: MILK/PRODUCT MARKETING:

14. Product sold

Product	Where do you sell (market channel)	To whom do you sell	Quantity sold	Price/unit
Fresh milk				
Yoghurt				
Ice cream				
Cheese				
Other				

CODES

Market channel do you sell	**To whom do you sell**
1=Formal	1.Consumers 2.Wholesalers 3.Hawkers/retailers
0=Informal	4. Processors 5. Supermarket6.Milk collection centers

I. PROCUREMENT COSTS OF MILK/DAIRY PRODUCTS

Type of cost	**Payment (monthly)**	**Total cost (Tsh)**
Transport cost		
Municipal/city council levies		
Market service charges/fees		
Health inspection fees		
Taxes		
Hired labour		
Other costs…….		

SECTION D. OUTPUT/REVENUE DATA

1. Dairy Enterprise

Type of output/product	**Quantity by outlet (monthly)**	**Price per unit**	**Total revenue (Tsh)**
Raw milk	i)---------- ii) ---------- iii) ----------	i)---------- ii) ---------- iii) ----------	i)---------- ii) ---------- iii) ----------
Processed milk products			

15. An observation on the morning and evening market

1. What strategy do you use to get a regular supply of milk?----------
---

2. How do you guarantee quality of milk?----------

16. What are the major milk marketing constraints you have observed?

1. Fluctuation in the quantity of milk obtained from cows
2. Distance of milk collection centers from my home
3. Lack of getting adequate market
4. Inadequacy of labor in the household to transport milk
5. Spoilage of milk during transportation
6. Unable to get market information
7. Others (specify) _____

THANK YOU VERY MUCH FOR YOUR TIME AND CO-OPERATION

Appendix 3: Check list for Case Study Processor s in Iringa Municipality and Tanga City

RESEARCH TITLE: INTEGRATION OF INFORMAL MILK CHAIN PARTICIPANTS INTO FORMAL VALUE CHAIN IN TANGA CITY AND IRINGA MUNICIPALITY: AN ECONOMIC ANALYSIS.

1. What is the processing capacity per day? .....
2. How is milk supply secured? .....
3. What is the milk payment scheme for farmers? ……
4. How much do you pay for milk per liter from suppliers? ……
5. How much do you charge per liter of processed milk? .....
6. What support is given to farmers?

.....
.....

7. What challenges are involved in getting raw milk?

……

8. What strategies are employed in getting raw milk?

……
……

9. Indicate costs incurred in processing one liter of milk

Type of cost	**Amount in Tsh**

THANK YOU VERY MUCH FOR YOUR TIME AND CO-OPERATION

Appendix 4: Overall Estimated results of the Multinomial Logistic Regression (Processing plant is the reference choice category)

Market preference		Coefficient	Std. Error	Wald	Sig.	Odd ratio Exp(B)	99% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Neighbours	Intercept	-115.089	30.676	14.075	0.000			
	AGE	0.275	0.341	0.648	0.421	1.316	0.547	3.169
	FSHH	3.633	0.835	18.934	0.000	37.827	4.404	324.940
	VMP	-0.394	0.100	15.621	0.000	0.675	0.522	0.872
	PRICE	0.153	0.030	26.464	0.000	1.166	1.080	1.259
	DNMM	-1.575	1.196	1.734	0.188	0.207	0.010	4.507
	[SEX=0]	9.883	7.258	1.854	0.173	1.960E4	0.000	2.580E12
	[EDLHH=1]	-32.292	54.158	0.356	0.551	9.453E-15	2.457E-75	3.637E46
	[EDLHH=2]	-32.207	8.264	15.187	0.000	1.029E-14	5.855E-24	1.810E-5
	[EDLHH=3]	-45.647	9.622	22.505	0.000	1.499E-20	2.581E-31	8.703E-10
	[EXPHH=1]	0.620	11.767	0.003	0.958	1.860	1.278E-13	2.706E13
	[EXPHH=2]	29.268	27.033	1.172	0.279	5.140E12	2.950E-18	8.956E42
	[ACCR=0]	-7.955	4.192	3.601	0.058	0.000	7.167E-9	17.180

MNL results (continued)

Milk market preference		Coefficient	Std. Error	Wald	Sig.	Odd ratio Exp(B)	99% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Milk vendors	Intercept	-48.225	24.991	3.724	0.054			
	AGE	0.164	0.338	0.236	0.627	1.179	0.493	2.818
	FSHH	-0.194	0.533	0.132	0.716	0.824	0.209	3.249
	VMP	-0.095	0.065	2.153	0.142	0.909	0.770	1.074
	PRICE	0.083	0.021	15.572	0.000	1.087	1.029	1.148
	DNMM	-1.346	1.193	1.274	0.259	0.260	0.012	5.615
	[SEX=0]	12.397	7.401	2.806	0.094	2.422E5	0.001	4.607E13
	[EDLHH=1]	-19.152	53.993	0.126	0.723	4.814E-9	1.915E-69	1.210E52
	[EDLHH=2]	-18.950	7.253	6.826	0.009	5.892E-9	4.535E-17	0.766
	[EDLHH=3]	-34.331	8.359	16.867	0.000	1.231E-15	5.482E-25	2.764E-6
	[EXPHH=1]	3.974	11.779	0.114	0.736	53.221	3.545E-12	7.991E14
	[EXPHH=2]	27.358	26.988	1.028	0.311	7.608E11	4.904E-19	1.180E42
	[ACCR=0]	-3.058	4.081	0.562	0.454	0.047	1.280E-6	1724.996

MNL results (continued)

Market preference		Coefficient	Std. Error	Wald	Sig	Odd ratio Exp(B)	99% Confidence Interval for Exp(B	
							Lower Bound	Upper Bound
Milk collection	Intercept	181.329	38.415	22.281	0.000			
center	AGE	0.010	0.014	0.510	0.475	1.010	0.974	1.047
	FSHH	-0.124	0.039	9.904	0.002	0.884	0.799	0.978
	VMP	0.002	0.003	0.612	0.434	1.002	0.995	1.009
	PRICE	-0.322	0.068	22.125	0.000	0.725	0.608	0.864
	DNMM	-0.029	0.048	0.363	0.547	0.971	0.857	1.100
	[SEX=0]	0.168	0.416	0.163	0.686	1.183	0.406	3.451
	[EDLHH=1]	37.467	0.000	.	.	1.869E16	1.869E16	1.869E16
	[EDLHH=2]	-0.352	0.531	0.440	0.507	0.703	0.179	2.759
	[EDLHH=3]	-0.512	0.577	0.788	0.375	0.599	0.136	2.648
	[EXPHH=1]	79.675	0.000	.	.	4.003E34	4.003E34	4.003E34
	[EXPHH=2]	8.944	23.991	0.139	0.709	7.660E3	1.111E-23	5.281E30
	[ACCR=0]	1.132	0.309	13.450	0.000	3.101	1.401	6.866