

**MARKETING STRATEGIES AND UPGRADING OPPORTUNITIES IN THE  
INDIGENOUS BEEF CATTLE VALUE CHAIN IN MWANZA REGION,  
TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE  
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## ABSTRACT

The potential of the traditional beef cattle sector in Mwanza region and Tanzania at large have only been utilized marginally. The sector still suffers from limited access and linkages to premium markets, lack of entrepreneurial dynamisms by actors, as well as, use of poor production and processing technology. Based on this ground this study was carried out under the VicRes funding to evaluate the performance of the beef cattle value chain in Ilemela and Magu districts. The study applied various participatory approaches and questionnaire surveys to map the value chain, assess profitability in each node and to identify priority issues for short term intervention. Two major working hypotheses were tested. The first hypothesis is that profits gained by beef cattle actors in the value chain are unevenly distributed. The second hypothesis is that efficiency in cattle and beef production and marketing information dissemination will translate into increased marketing margins for producers and other actors in the value chain. The findings confirm the hypothesis that profit margins are distributed very unequally. Cattle producers obtain the lowest prices and profit margins. The largest share of gross margins is earned by butcheries and beef shop owners who generated an average daily gross margin of about TZS 106 000 per cattle at 200kg of carcass; followed by traders who fatten their beef cattle before selling and earn an average gross margin of TZS 255 700 per cattle at 300kg of live weight during the normal season and a gross margin of TZS 505 700 per cattle at 300 kg live weight during the peak season (December to January) around Christmas and new year. Of all the actors in the value chain, pastoralists/cattle producers earned the least, an average gross margin of about TZS 295 000 per cattle for a period of 4 to 5 years which

decreases significantly thereafter as the cattle are kept for many years. The value chain analysis identified several pitfalls, importantly being information asymmetry especially among actors upstream the value chain. An electronic mobile phone Information and Communication Technology (ICT) system namely the “e-Ng’ombe” was designed and developed and is proposed to be used as an attempt to tackle this problem.

**DECLARATION**

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

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**Kadigi Ibrahim Lwaho****(M.Sc. Candidate)**

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**Date**

The above declaration is confirmed by:

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**Dr. Jeremia R. Makindara****(Supervisor)**

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**Date**

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## **DEDICATION**

This dissertation is dedicated to my grandparents Willickster Nkuba, Lucas Ibrahim Kadigi and Juliana K. Lwaho. May you live to enjoy the greatest joys and pleasures of this work for which you bore the little pain.

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## LIST OF ABBREVIATIONS AND SYMBOLS

AGM	Average Gross Margin
AGDP	Agricultural Gross Domestic Product
AVC	Average Variable Costs
AR	Average Revenue
BCR or B/C	Benefit Cost Ratio
CCA	Commodity Chain Approach
CEX	Commodity Exchange
CIP	Competitiveness and Innovation Framework Programme
CKW	Community Knowledge Worker
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GM	Gross Margin
GMA	Gross Margin Analysis
ICT	Information and Communication Technology
IRR	Internal Rate of Return
IRRI	International Rice Research Institute
MLD	Ministry Livestock Development
MLFD	Ministry of Livestock Development and Fisheries
MMA	Match Maker Associates Limited
MM	Marketing Margin
NSCA	National Sample Census of Agriculture
PVCA	Participatory Value Chain Analysis
PMCA	Participatory Market Chain Analysis

PRA	Participatory Rural Appraisal
RML	Reuters Market Light
RVF	Rift Valley Fever
SAAFI	Sumbawanga Agricultural and Animal Feeds Industry
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SCP	Structure Conduct Performance
SDLC	System Development Life Cycle
SMEs	Small and Medium Enterprises
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
TIBL	Tanzania Investment Bank Limited
TCE	Transaction Cost Economics
TVC	Total Variable Cost
TSZ	Tanzania Shorthorn Zebu
TZS	Tanzania Shillings
UNIDO	United Nations Industrial Development Organization
URT	United Republic of Tanzania
USD	United States Dollar
VicRes	Lake Victoria Research Institute
WAP	Wireless Application Protocol

## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.1 Background Information**

Livestock production is a major component of the agriculture industry in the Tanzanian economy. Out of 4.9 million agricultural households, about 36% are keeping livestock (Njombe and Msanga, 2008) which is one of the major economic activities in rural areas. In 2010, the sector contributed about 3.8% of Tanzania's total Gross Domestic Product (GDP) and 16% of the Agricultural GDP (URT, 2011). This low contribution of the livestock sector to the national economy is due to low livestock growth rates, high mortality rates, low reproductive rates and poor quality of the final products from the industry (URT, 2011). Livestock plays multiple roles in the livelihood strategies of rural communities. In many livestock farming communities, it is intricately linked to social status through accumulation of wealth and savings (serves as a mobile bank), it provides social security/insurance, and social esteem (Davie *et al.*, 2007; David *et al.*, 2001). It also, provides a variety of benefits to rural communities such as risk mitigation, food security and improved nutrition. However, these contributions are predominantly in the non-monetary sector because of limited commercialization of production of meat and milk in the pastoral systems (Ruhangawebare, 2010).

Tanzania livestock population was estimated to comprise of 18.8 million cattle, 12.1 million goats, 3.6 million sheep, a million pigs and 60 million poultry (Njombe and Msanga 2008). Cattle population in the Mainland has increased by approximately 26% from about 15 million in 1995 to 21 million in 2008 giving annual growth rate

of 2%. The National Sample census of Agriculture (2007/2008), reported that the indigenous type dominates the cattle population (96.2%) while improved beef and dairy breeds contributed 0.9% and 2.9% respectively in the Mainland. The livestock census further shows a steady increase in the number of indigenous cattle from 15.3 million in 1995 to 20.7 million in 2008 representing a 25% increase. According to this statistic, Tanzania has the third largest cattle population in Africa after Ethiopia and Sudan (URT, 2011).

The production of beef in Tanzania has been growing steadily over the years, with few setbacks such as the Rift Valley Fever (RVF) that struck in 2007. Between 2002 and 2006 production increased by 14% most of which targeted the local market (Njombe and Msanga, 2008). In 2009 the annual meat production was 449 673 tons and currently the country produces 462 686 tons of meat annually for domestic consumption but also imports 800 tons high quality meat to meet demand for tourist hotels and mines (PASS, 2013). However, current per capita meat production in Tanzania is still very low. Given the human population of Tanzania, which currently stands at 44.9 million (URT, 2012), actual consumption is at 12 kg per capita, still less than one-quarter of the 50 kg recommended by the FAO (URT, 2011). A number of demand-sided trends suggest that the markets for beef and red meat will continue to grow in Tanzania. The numbers of urban middle class citizens is continuing to grow and with meat as a common food for these households, the demand is expected to grow. A particularly interesting niche is that of quality meat. Good quality meat is generally in short supply and the price has been increasing in recent years (PASS, 2013). Particularly, the growing numbers of urban middle to high-income families



are willing to pay more for good quality meat. Another fast growing meat market in Tanzania is in the food service industry. Tourism has been growing steadily and the number of hotels and specialized restaurants is increasing annually. Supermarkets are also increasingly coming in to capture a share of the growing market for quality meat. Institutional markets such as schools/universities, prisons and hospitals are growing in the country as well (SAGCOT, 2011).

According to SAGCOT (2011), marketing of live animals in the country takes place in primary, secondary, and tertiary livestock markets. Local Government Authorities manage the primary markets while secondary, tertiary and border markets are under the management of the Central Government. Trading is done through negotiation between buyers and sellers with less consideration for grading and exact measurement. Currently, livestock production is mainly subsistence whereby livestock and livestock products produced in the country is largely for the domestic market and only a small amount is exported. For example, in the year 2009/10 a total of 857208 cattle and 682 992 goats and 122 035 sheep were sold of which only 2 970 cattle and 302 goats were exported to neighboring countries and the Middle East (SAGCOT, 2011).

The National Ranching Company (NARCO) has remained to be the major commercial beef cattle producer in the country (MMA, 2008). However, presently there are also some private investors and smallholder farmers who are engaging in ranching and the feedlotting business. These include Glienshils ranch and Mtibwa Feedlot (Morogoro), Sumbawanga Agricultural and Animal Feeds Industries (SAAFI

- Rukwa), Manyara Ranch (Arusha), Kisolanza farm (Iringa) and small scale Livestock farmers in Arusha, Mwanza, Shinyanga and Mara regions (Njombe and Msanga, 2008). Among the neighboring countries, Kenya is the main livestock-trading partner although much of it is informally transacted, due to porosity of the borders (Kadigi *et al.*, 2013a). It is estimated that, about 300 000 herds of cattle cross the border every year to neighboring Countries (MLD, 2006). The market potential is high if the political situation remains stable in these neighboring countries (Njombe and Msanga, 2008 and MLD, 2006). Table 1; shows the trend of live and meat products exported between 2002 and 2010. Kenya, Comoro, Burundi and Uganda are the main live animal exporters while Oman, Kuwait, Dubai, Muscat and DRC are the main carcass exporters.

**Table 1: Export trend of live and meat products in Tanzania 2002-2010**

Live Animals					Red meat/carcass				
Year	Cattle	Goats	Sheep	Destination	Year	Beef	Goat	Mutton	Destination
2002	382	140	-	Kenya,	2002	-	-	-	-Oman,
2003	1 714	411	2	Comoro,	2003	-	-	-	Kuwait,
2004	5263	1 199	2	Burundi,	2004	1 080	-	-	Dubai
2005	4 075	2 177		Zanzibar	2005	600	-	-	(UAE),
2006	6 231	2 753	11	and Uganda	2006	163	16 774	20 335	Muscat,
									DRC,
2007	3849	736			2007	10 737	25 345	76 592	Zanzibar
2010	2 970	302			2010				

**Source:** Ministry of Livestock and Fishery, 2011.

The National Livestock Policy of 2006 aims at stimulating development in the livestock industry in order to exploit the sector's potentials with due concern for the conservation of environment. The policy emphasizes the importance of competitive markets; commercialized livestock industry, addition of value of livestock products and sustainable livestock development. The policy is amongst many of the initiatives

that invite and open the doors for private sector investments (MLD, 2006). Regardless of the production trends, the performance of the livestock industry, especially the beef sector, is still weak as mentioned before.

## **1.2 Problem Statement and Justification**

According to the 2007/08 Agricultural Sample Census, an estimated 2.33 million households (about 40% of the agricultural households) kept livestock. Cattle were the most dominant species followed by goats, sheep and pigs. The respective numbers and percentages were 21.28million (48%), 15.15million (35%), 5.72 million (13%), and 1.58million (4%) for cattle, goats, sheep and pigs respectively. The commercial value of livestock is limited to a few live animal sales and sales of hides and skins to the local market and across the borders within the region and beyond (Odhiambo, 2006 and URT, 2011).

The current level of contribution of the livestock sector in Tanzania is still below its potential given the size of the livestock population due to a number of factors including; low productivity of indigenous cattle breeds, low growth rates, high mortality rates, diseases, feed availability and quality, constrain cattle productivity (Njombe and Msanga 2008; URT 2006). Poor market infrastructure, price variability, limited marketing support services and market information and lack of credit services to traders and cattle keepers, absence of effective producer organizations at the grassroots and limited access to markets provide inadequate opportunities for increased incomes (Coetze *et al.*, 2005). Therefore the level of commercialization (market off-take) is low (10 - 15%) compared to other grassland based systems such

as those of Namibia (15% - 25%) and Brazil which fluctuates between 15 and 18% (FAO, 2006, Njombe and Msanga, 2008).

In addition to infrastructural problems (Turner and Williams, 2002; Jansen *et al.*, 2006) low level of commercialization is attributed to a number of disincentives for pastoralist to participate in the livestock markets. These include inadequate investments in non-livestock sectors in pastoral systems to provide local market for livestock products (Barrett *et al.*, 2004); disproportionate balance between socio-cultural and monetary values that pastoralists attach to livestock on the micro-level (Ashley and Nanyeenya, 2002; Moll, 2005) and export barriers and import restrictions at national level (Aklilu, 2002). Of these disincentives, the most prominent constraints for increasing market participation are the socio-cultural values that pastoralists attach to livestock and risk aversion strategy (Djamen *et al.*, 2008). These motives might be in conflict with commercial production objectives that emphasize production for the market (Patrick *et al.*, 1993).

Therefore, cattle herders keep animals as stores of wealth-in-kind and insurance scheme that smoothened returns from the market (Walters *et al.*, 1992; David *et al.*, 2001). As risk aversion strategy, pastoralists participate in the market primarily for convenience of adapting to inclement weather and disease incidences. Their monetary value is limited to the subsistence cash economy and the need for petty cash needs for medical bills, scholastic requirements, and occasional household needs (Oxfam, 2003). This situation accentuates erratic supply and price disincentive for producers as well as traders (Behnke *et al.*, 1993; Holtzman and Kulibab, 1994; David *et al.*, 2001).

Meanwhile, a study conducted by Mlote *et al.* (2012) on the value chain of beef cattle fattening in the Lake Zone shows that the beef cattle supply chain is characterized by low value addition among the pastoralist and high value addition among the beef cattle traders and fatteners. The study suggested different business models for enhancing the supply chain for beef cattle fattening in the area like conduction training to the livestock producers on commercialization production. Nevertheless, the study and others did not explain how this training could be conducted in this digital generation like the use of ICTs (mobile) as one of the major tool for immediate information dissemination.

Despite government's effort to commercialize agriculture through trade and market liberalization (MLD, 2006), indigenous beef cattle commercialization has remained low. This has been further exacerbated by the pastoralists' survival strategy of minimizing risks by maintaining large herds for production to not drop below subsistence level (consumption smoothening) and total herds become extinct (Mace and Huston, 1989) rather than maximizing benefits per animal in cash or energy currencies (Djamen *et al.*, 2008). As such, cattle keepers have not responded to the demand and sometimes have tended to hold on to their livestock and only sell when they are cash constrained; not when it is most profitable, resulting in low incomes (Asfaw and Jabbar, 2008). Sandford (1983) observed little supply response from the pastoralists to changes in prices for livestock, which the author attributed to low demand for cash other than essentials such as schools and taxes. However, there are limited information updates on the performance of beef cattle value chain and their actors along the chain, as well as limited understanding of marketing strategies to improve livestock market performance.

Throughout Africa including Tanzania, ICTs have become increasingly integrated into the dissemination of information to farmers. Currently, extension workers, radio or TV program provides most farmers' information. The number of extension workers has been growing down while that of farmers has been growing, hence the need for innovative information systems to address this gap (Gakuru *et al.*, 2009). The use of e-based ICTs can inculcate farmers' innovativeness in producing, storing, and distributing food. It can improve marketing and serve as an effective tool for short and long-term marketing information, agricultural inputs, logistics and transport (Kadigi *et al.*, 2013b). Livestock commercialization can only be successively if farmers have access to information on market prices and agricultural inputs.

The goal of the National Development Vision 2025 is to attain sustainable economic growth by year 2025 through modernization, commercialization, and utilization of natural resources in an overall sustainable manner. To achieve this long-term goal, an efficient and effective agricultural marketing system is critically important in transforming the agricultural sector (URT, 2008). The policy aims to promote the use of ICTs in agricultural marketing to key stakeholders to get adequate, quality and timely agricultural information (URT, 2008).

Therefore, this study conducted with the overall purpose of evaluating the performance of beef cattle sector through the value chain analysis approach, identify areas for intervention, and come up with an upgrading strategy to be implemented in the study area.

### **1.3 Objective of the Study**

#### **1.3.1 Overall objective**

The overall objective of this study is to analyze the performance of indigenous beef cattle marketing using value chain analysis approach and develop an advanced agricultural marketing strategy for enhancing beef cattle value chain in Mwanza region.

#### **1.3.2 Specific objectives**

- i) To map the beef cattle value chain in Magu and Ilemela districts
- ii) To evaluate profits obtained by different actors along the chain
- iii) To identify specific values chain upgrading interventions that are feasible by using the available resources, that can be implemented in short and medium term

### **1.4 Research Hypotheses**

- i) Profits obtained by beef cattle actors in the beef cattle value chain are unevenly distributed
- ii) Efficient information dissemination in beef cattle production and marketing can translate into increased market margins of cattle farmers in rural areas

### **1.5 Rationale of the Study**

One of the major challenges to the government of Tanzania is agriculture modernization so as to attain food security and commercial oriented production. Modernized agriculture leads to improved farm productivity, food security and farm

incomes. Knowing the performance of different actors in the value chain of indigenous beef cattle and identifying opportunities for upgrading the chain will help the policy makers and stakeholders to make valuable policies for enhanced beef cattle value chain in the study area.

### **1.6 Scope of the Study**

The study is limited to evaluating beef cattle performance using a value chain approach and developing an ICT tool to upgrade existing beef cattle value chains. The study focuses on key actors in Mwanza region, specifically Magu district and Ilemela Municipality given the number of pastoralists and cattle traders in these areas; Magu District holds the largest cattle population in Mwanza and Ilemela holds the largest cattle traders in the region. However, given the similarity of pastoralists farming systems in Tanzania the study result are of interest beyond the study sites.

### **1.7 Organization of the Study**

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



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Definition of Terms and Concepts**

##### **1.7.1 Value chain (VC) concept**

Different authors (like Kaplinsky and Morris 2000; Porter, 1985; UNIDO, 2012) define the concept of value chain differently. Explained the value chain as a mechanism that allows producers, processors, and traders (separated by time and space) to gradually add value to products and services as they pass from one link in the chain to the next until reaching the final consumer (domestic or global) (UNIDO, 2012). Kaplinsky and Morris (2000) defined value chain as the full range of activities which are required to bring a product or service from conception, through the intermediary phases of design, production (involving the combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. Major 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, roles of actors, like 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.*, 2008; Bolo *et al.*, 2011).

Porter (1985) on the other hand defines VC as “a systematic approach to examining the development competitive advantage. The chain consists of a series of activities that create and build value, including core activities (input supply, processing,

marketing, retailing, warehousing) and service activities (accounting, organizational management, human resource training and management, inter-firm relations, etc.) that support the core activities. They culminate in the total value delivered by a firm, including added value or marginal value”.

Additionally, GTZ (2007) described value chain as a sequence of related business activities (functions) from input supply to final sale or; a set of enterprises (operators) performing these functions of producers, processors, traders, and distributors of a particular product or; enterprises that are linked by serious business transactions. Value chains consist of a series of chain links.

Other authors like Stephen and Pirog (2006) 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 value based relationship are then called value chains.

In agriculture, the concept of value chain is very important as increasingly agricultural products are hardly consumed in the place where they are produced but are transformed, combined with other products, and transported from one actor (owner) to the other with value addition to the product, packaged and displayed until it gets to the final consumer (Roduner, 2007). The final consumer in turn, must be

able and willing to pay for the value addition and services involved in the transformation of the product (Fearne *et al.*, 2009).

Value chain analysis is therefore a process of understanding the systemic factors and conditions under which a value chain and its firms can achieve higher levels of performance. When using value chains as a means for fostering growth and reducing poverty, the analysis focuses on identifying ways to contribute to two objectives: i) improving the competitiveness of value chains with large numbers of small firms or farm and ii) expanding the depth and breadth of benefits generated. The value chain framework includes end markets, business enabling environment, vertical and horizontal linkages among value chain actors, support service markets (value chain finance, ICT), value chain governance, inter-firm relations and upgrading (Kurwijila and Mtenga, 2011).

Value chain interventions often have to do with improving the position of chain actors, linkages in the chain and the environment of the chain. According to Kit *et al.* (2006), there are two basic strategies that can be used to improve the position of producers in the chain; vertical and horizontal integration. Vertical integration means taking on additional activities in the value chain such as processing or grading produce, for example. Horizontal integration means becoming more involved in managing the value chain itself such as producers' improving their access to, and management of information, their knowledge of the market, their control over contracts, or their cooperation with other actors in the chain. A problem, however, is that vertically or horizontally integrating requires capability and capacities that rural

poor smallholder commonly lack. Thus the rural poor are usually unable to integrate without support (Vermeulen *et al.*, 2008).

In many rural areas, although there is abundant agriculture produce, actors in the sector are ignorant of the potential uses or possible niche markets for their products (Vermeulen *et al.*, 2008). Too often, the enabling policy and environment, supporting services are equally insufficient. Interventions such as linking farmers to markets could be a starting point for value chain development where the local producers and processors become actors in the chain. As simple chain actors, although their skills can be enhanced to improve quality of their products, they may not have influence on the chain (Igbinnosa, 2011). At a higher level, given that some basic chain elements are already in place, actors can take up more activities along the chain such as packaging. By so doing they add more value to their produce and consequently earn more for the product than when it is sold without any value addition.

Another direction could be improvement of collaboration of actors at the same level in the form of associations or cooperatives. These associations can greatly improve the bargaining power of local producers by taking charge of more chain management functions by providing economies of scale and mobilizing a large number of previously isolated producers. In a much desirable scenario, chain actors can improve in the two directions simultaneously. While they take up more activities along the chain, they also form associations to become more involved in the management activities of the chain such as securing contracts. In this case, the actors have become chain co-owners (Kit *et al.*, 2006)

### **1.7.2 Value chain governance**

Governance of value chains is all about the rules and regulations that determine the functioning of and the coordination in a value chain, the existing barriers to entry and the dominance of certain agents (e.g. buyer/supplier/trade agent power). It also relates to the contractual and informal relationships between the various actors in the chain that help businesses to operate efficiently, absorb and diffuse knowledge, technology and competencies (UNIDO, 2012).

### **1.7.3 Marketing chains**

Marketing chains can be defined as the series of steps a commodity moves from one point to the next. Formally, a marketing chain is a business structure of interdependent organizations that start with the raw materials and find its end with the consumer (Kotler and Armstrong, 2006). 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 about the final consumer/user.

According to Islam *et al.* (2001), define market chains as 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. In the livestock sector, it may also connect one or more milk or dairy sheds.

Marketing chains are important in understanding which firms/dealers are involved in the 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 (UNIDO, 2012).

#### **1.7.4 Value chain finance**

Value chain finance is all about how the various actors in the value chain finance their operations and to which degree the available finance mechanisms are appropriate and sufficient (Kadigi *et al.*, 2013a). A distinction must be made between credits provided by formal financial institutions such as banks and micro-credit agencies as well as informal finance through loans, advance and delayed payments that occur in buyer -supplier relationships. The existence of triangular relationships between buyers, suppliers and financial institutions may be an indicator for advanced finance mechanisms (UNIDO, 2012).

### **1.8 Agricultural Marketing**

A potential market consists of a group of people with similar needs for a particular good or service, sufficient resources to make a purchase, and the willingness and ability to buy (FAO, 1993). A market is said to exist whenever buyers and sellers of a particular resource or good freely come together leading to a flow of information that creates the opportunity for trade and exchange of resources and goods. Essentially, buyers and sellers need not come together. However, it has been observed that most

African markets for agricultural goods involve physical interactions between buyers and sellers, which give the markets a clearly defined geographic location (Ruhangawebare, 2010). Most villages have small markets where traders regularly gather to market their produce. Mugisha (1994) identified such markets as roadside markets, and rural/ village markets.

Similar kinds of markets are found to play a role in livestock marketing in Tanzania specifically in the Mwanza and Shinyanga regions. Some animals are bought at the farm gate while others are trekked to nearby livestock markets which operate on weekly or monthly basis at sub county and / county levels. It can be regarded as a multilayered sequence of physical and other activities and transfer of property rights from farm-gate to consumer including brokerage, storage, processing, transport and trade financing (Harris-White, 1995) with a mission of bridging the gap between the complementary capacities of producers and consumers to participate in the economy (Beirlein *et al.*, 1995).

Livestock marketing chains follow a five-tier system. The main actors in the first tier are the local cattle keepers and rural traders who transact with low volumes of 1- 2 animals per transaction irrespective of species involved. Those small traders from different corners bring their livestock to the local markets - primary markets (second tier). Traders purchase a few large animals to sell to the secondary markets. In the secondary markets (3rd tier), both the smaller and larger traders operate and traders and butchers from terminal markets come to buy animals. In the terminal markets (4th tier), big traders and butchers transact in large number of mainly slaughter type

of animals (Ayele *et al.*, 2003; Aklilu, 2002). The last tier comprises of traders named fattening entrepreneurs, who buy weak animals or semi-finished animals from the markets for the a purpose of fattening (adding value) or finishing for at least three months before reselling to the livestock markets for local consumption or export (Mlote *et al.*, 2012).

Cattle prices are settled through private negotiations on market between cattle keepers and traders except in areas where brokers are involved (Aklilu, 2004). Brokers are involved in the transactions and transportation of animals, obtain commissions of indefinite amounts from both the sellers, buyers and transporters, and are reported to be prominent particularly in the live animal markets (Jabbar and Benin, 2005). Cattle Keepers in Ethiopia reported that brokers charge very high brokerage fees, often misinform the sellers on prices paid by buyers, collude with buyers and hinder transactions if they were not allowed to be involved (Gebremedhin *et al.*, 2007). Generally, livestock prices are affected by several factors which include periods of sale, age, weight, colour and body condition of the animal, urgency of the household cash needs, the distance producers travel to sell animals and the ease of trekking animals back (Gebremedhin *et al.*, 2007; Aklilu, 2004).

Central to the cattle marketing system is the complex web of relationships among its key participants namely the cattle keepers, traders, butchers, abattoir dealers and exporters. Cattle keepers raise the animals; traders buy animals in and around periodic marketing events, hoping to sell them at a profit elsewhere to transporters, local butchers, terminal abattoirs in large towns and ultimately consumers (Ayele *et al.*, 2003). Households in the rural areas use a number of channels, which include



auctions in local markets, butcheries private sales and abattoirs (Musemwa *et al.*, 2007; Nkosi and Kirsten, 1993; Montshwe, 2006). The choice of the marketing channel is influenced by prices offered, distance to the market and the marketing potential to absorb stock on sale. According to Nkosi and Kirsten (1993), private sales are the most preferred channel in developing areas.

### **1.8.1 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 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 can also likely be high, even in competitive market due to high real market cost (Wolday, 1994).

### **1.8.2 Pastoral cattle keepers' marketing behaviour**

In developing countries, livestock are rarely sold because they play important subsistence functions in the life of rural households, which include provision of human needs like food, draught power, manure, social needs and provision of financial security to households (Tapson, 1990). Sales are more often stimulated by

the farmers' needs for cash than by the characteristics of the demand or the state of the market (Djamen *et al.*, 2008). Forced sales are also an adaptive strategy to dry season and feed shortage (Gebremedhin *et al.*, 2007).

Although it is argued that small scale cattle keepers are incapable of responding rationally to markets incentives there are however some of them who actively participate in livestock marketing (Nkosi and Kirsten, 1993). The differences in cattle keepers' objectives and perceptions to cattle production hamper the formulation of effective livestock policies aimed at improving the livelihoods of resource poor cattle keepers (Barrett *et al.*, 2004). Efforts to improve the rural cattle production and market supply of quality live animals should therefore emphasize the understanding of cattle keepers' objectives, perceptions and experiences (Dovie *et al.*, 2006).

The animals usually offered to cattle markets for sale are mostly local breeds and few crossbreds (Serunkuuma and Kent, 2001). The herder's decision as to which animal is to be marketed depends on a number of factors which include; the magnitude of the cost to be satisfied and the size, the species composition, age, sex and structure of the herd. For small recurrent expenses, the sale of animals will usually prove adequate but large expense needs like medication or school fees often necessitate sale of cattle (Ayele *et al.*, 2003). When the cattle keepers are confronted with the necessity of selling cattle, off-take is restricted to the non-productive elements of the herd such as cull cows, sterile heifers, non-breeding bulls and bull yearlings (Semenye, 1980). Marketing preference is often balanced with the fundamental pastoral considerations like securing the future reproduction of the herd and maximizing milk flows. The

herders' decision to sell a specific animal is guided by judging the usefulness of that animal on the criteria of fertility, physical resistance and milk production (John, 1987).

### **1.8.3 Factors affecting livestock marketing**

There are various factors affecting livestock marketing among the rural cattle keepers in the developing pastoral areas of Tanzania, which range from production, processing up to delivery. Inadequate infrastructure imposes a serious constraint on the marketing of livestock (Mahabile *et al.*, 2002). Most livestock keepers are located in areas remote from the major markets where there is a serious lack of both physical and institutional infrastructure (Coetze *et al.*, 2005). A study by Sara (2010) observed that pastoralists and agro-pastoralists are the main producers of livestock in the region, located in remote areas, at times in inaccessible terrain and far from town centers. Coupled with the seasonal market supply patterns, producers in Northern Kenya and Southern Ethiopia said that they sold a limited number of animals – one to two cattle or four to five shots at a time, either to livestock collectors or by trekking to primary markets. Mlote *et al.* (2012) observed that most of agro pastoralists living in rural areas do not often sell their animals; they only sell when they urgently need money. This partly explains the poor livestock supplies to formal marketing outlets. The most important physical infrastructural weakness for rural cattle producers are related to transport and holding facilities (Bailey *et al.*, 1999). In addition to the distance to formal markets, poor state of roads in rural areas affects the ability of cattle keepers to attract many buyers in their areas since bad road network is associated with very high transport costs (Musemwa *et al.*, 2007). Thormeyer (1989)

points out that increasing the level of sophistication of a transport system can improve the ability and accessibility of market opportunities (Bailey *et al.*, 1999).

### **1.9 The Beef Industry Sub-sector in Tanzania**

Traditional cattle keepers are the major source of beef in Tanzania. NARCO is the major player in commercial ranching. At the production level feedlots are emerging as preferred practice for fattening/finishing cattle before slaughtering in modern abattoirs. These include Grilienshills feedlot near Morogoro, the Kongwa NARCO near Dodoma, SAAFI (Sumbawanga Agricultural and Animal Feed Industry) company of Sumbawanga (Kurwijila and Mtenga, 2011).

Domestic trade in cattle and beef (mainly fresh beef) can be categorized into informal and formal trade. Most of the informal trade in live cattle and fresh beef takes place in rural areas between households that raise cattle and butcher men and/or none cattle keeping households. On the other hand, formal trade in live cattle takes place in cattle markets through auctions. There are over 300 primary markets, 13 secondary markets and 6 border markets (TIBL, 2012). Most of the secondary livestock markets are near urban areas for easy supply of cattle to butchers, who supply fresh beef to urban areas where there is high demand for meat compared to rural areas. Pugu livestock market is one of the secondary livestock markets that supplies cattle for meat supplies to Dar es Salaam city, which is the largest meat consuming centre in the country. Despite seasonal/quarterly fluctuation in the number of cattle supplied to the market, the annual cattle supply has been increasing overtime, implying increasing trend in beef consumption in Dar es Salaam, Mwanza and Arusha cities overtime (TIBL, 2012).

### **1.10 Theoretical Framework to Marketing Study**

The performance of a market is primarily influenced by structural market characteristics and the competitive behaviour of actors/participants in the market (Ruhangawebare, 2010). A detailed marketing study helps to understand how these market factors independently and jointly can provide a basis for identifying opportunities to be exploited and constraints that might need to be removed. Market studies involve analyzing competition, efficiency and integration in order to formulate of interventions particularly those aimed at lowering marketing costs and that reduce the tendency of excessive and asymmetric profit making (Harris- White, 1995).

The study of markets and marketing has witnessed a number of paradigm shifts including the Structure, Conduct and Performance (SCP) (Bain, 1959), the Commodity Chain Approach (CCA) (Shaffer, 1973) and Transactions Cost Economics (TCE) (North and Weingast, 1989; Williams *et al.*, 2006). The range of models suggests that any single theoretical framework is hardly adequate for studying markets particularly in developing countries (Kohls and Uhl, 1990). The choice of any combination of the approaches is usually guided by the nature of the problem. Complexity of the marketing systems and the constraints involved (Ruhangawebare, 2010). Hence, in studying livestock markets, there is a need to combine useful elements of both old and the contemporary models in order to understand the characteristics and performance of livestock marketing (Ruhangawebare, 2010).

A number of agricultural markets rely on the theoretical foundations laid by the perfect competition model particularly those based on the structure conduct and performance paradigm (Ajal and Adesehinwa, 2007). The structure components of a market include marketing channels, marketed volumes, degree of market information, the ease of entry and exit of buyers and sellers in and out of the market. Market conduct refers to the actions which make participants take out of their own discretion or patterns of behavior, which they follow in adopting or adjusting to the market in which they buy and sell. The conduct components of a market include exchange function methods of determining price, and product differentiation. Hence, market conduct refers to the various stages adopted by participants in buying, selling and pricing (Ajal and Adesehinwa, 2007).

The SCP approach postulates that when a market structure deviates from the paradigm of perfect competition. The degree of competitive conduct will decline and there will be a consequent decrease in output (supply), allocative efficiency and an increase in prices(Williams *et al.*, 2006). This implies that according to the SCP approach; the performance of markets can be assessed based on the level of competition and efficiency in those markets. This study attempts to distinguish marketing channels and identify traders/participants, roles and functions in the marketing chain in order to measure the structure and conduct of the market. Due to differences in the traders scale of operation (small, medium and large), it is hard to make generalizations and speculations about the traders conduct and market structure. Hence grouping traders according to their economic and social differences is expected to give a better understanding of how markets function because

participants in livestock trade operate at different scales. Existence of these strata implies a certain degree of price collusion could go on within and between strata, which in turn may affect entry conditions and thus result in changes in market structure (Williams *et al.*, 2006).

One of the assumptions of perfect competition in neoclassical economic theory is perfect information under which it is presumed that traders in each market have perfect knowledge of the situations in all other markets as such, inter market price differentiation only reflect transportation and handling costs between concerned markets. TCE unlike neoclassical theory recognizes that commercial activity does not occur in a frictionless economic environment (Williamson, 1986). Costs usually incurred include costs of purchasing a product, and transaction costs which can further be sub divided into information (ex-ante), negotiation and monitoring or enforcement (ex-post) costs (Williamson, 1986). Transaction costs include *inter alia*, the costs of searching for a partner with whom to exchange, screening potential trading partners to ascertain their trustworthiness. Bargaining with potential trading partners (and in some cases officials who can hold up trade) to reach agreement, transferring the product (typically involving transportation, processing, packaging and security title if necessary), monitoring the agreement to see if conditions are fulfilled and enforcing (or seeking) damages for violation of the exchange agreement (Ruhangawebare, 2010).

The smallholder nature of livestock production in Tanzania has implications for increasing transaction costs because more intermediaries are involved between the

smallholder producers who are located several kilometers away. In addition, the volumes of cattle handled by these cattle keepers are small requiring market agents to move around these cattle keepers to collect the few cattle that are to be sold. It is expected that if transaction costs were lowered, there would be an increase in traded volume with economic benefits for producers and traders (Kadigi *et al*, 2013a).

In many studies (like Keefe, 2004 and 2008; Gundlach, 2007), the imperfections in marketing systems which lead to loss of competitiveness and efficiency have been attributed to high and sometimes prohibitive transaction costs. But still, there are only few studies in which detailed empirical evidence is provided on the magnitude and importance of transaction costs (Staal *et al.*, 1997). They observed that this may be due to the existence of conceptual and measurement difficulties when either transaction costs are so high that exchange is prevented from occurring, but also due to the differences in the nature of the observed transaction costs. For example, the farmer's decision to sell at the farm gate rather than a more distant market may be influenced by the desire to avoid transaction costs involved in the latter option. On the other hand, the same farmer may decide to go all the way to a distant market because of the excessive profits made by intermediaries in order to leave returns to producers.

### **1.11 Profitability of Beef Cattle Marketing Enterprises**

The main motivating factor of beef cattle value chain actors in producing and marketing of beef cattle is the level of enterprise profit generated. There are various measures of profitability of the enterprises, which are 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 executives and professionals revealed that 68% of marketing executives have difficulties in measuring profitability on investments and 73% of them reported that there is an inadequate profitability measurement tool.

However, the GM is an important measure of resource efficiency in Small and Medium Enterprises (SMEs). GM is the 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 competitive market conditions is the outcome of supply and demand for marketing functions, and should therefore be equal to the minimum costs of services 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 the 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, to calculate GM of different enterprises in different segments along the value chain of beef cattle 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 has been concerned with identifying

returns (profit) obtained by traders at each stage along the value chain of beef cattle marketing.

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

$$\text{Ratio} = \frac{\text{Total Revenue} - \text{Total Variable Cost}}{\text{Total Revenue}} \dots\dots\dots (1)$$

The expression is useful for comparing profit across different enterprises and different segments along the value chain (Mendoza and Rosegrant, 1995).

Eskola (2005) used the GM as a measure of enterprises' profitability for rice/milk in the markets which of Ifakara and Dar es Salaam. Eskola (2005) reported the profit obtained by different traders in the rice market along the rice national value chain. The report shows that local traders and brokers of rice in Ifakara market obtained a profit of 10-20% per kg of the overall profit margins of the value chain. Large scale trader obtained a profit of Tshs. 20 000 per trip; rice wholesalers at Kariakoo market obtained a profit of Tsh. 10 000 to 15 000 daily; and rice wholesalers at Tandale market obtained a profit of Tsh.40-48 per kg.

The limitation of the methodology used by Eskola (2005) is that it does not have a uniform unit of profitability measurement across the different traders. In addition, traders are not grouped into homogeneous groups performing similar functions,

which might be misleading and difficult to interpret when attempting to formulate policy.

Debertin (1993) identified some problems of using GM as a measure of profitability, which is the 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 to SMEs. It gives a good indication of the financial health of enterprises and shows deep insight into traders' management efficiency of the enterprises (Hammod, 2001). Thus, without adequate GM received by traders, their ability to pay operating costs and hence their business sustainability is jeopardized (Hammod, 2001). Therefore, an examination of enterprise profitability along the value chain will harmonize the attitude of consumers, politicians and policy makers toward cattle traders who are thought to take too large share of the value chain profit margins. The amount of profit received will separate the facts from prejudice and enable one to refute allegations that traders exploit both farmers and consumers.

### **1.12 Information and Communication Technology within the Value Chain**

ICT is the combination of three words means Information Technology and Communication Technology. It is used as a general term for all kinds of technologies, which enable users to create access and manipulate information (McCormick and

Onjala, 2007). The growing demand for agricultural products, however, also offers opportunities for producers to sustain and improve their livelihoods. ICT has the potential to improve efficiency by reducing the cost of doing business along the agricultural commodities and livestock value chain and improving conversion of inputs into outputs (horizontal integration)(Sifeat *et al.*, 2010). Though distinctions are often made between new ICTs such as computers and mobile phones, and old ICTs such as radio, television, and landline telephones, the current technological convergences increasingly blur such divisions. Thus, single devices such as mobile phones can now receive, process, store and display text, image and sound together (Sife *et al.*, 2010).

There is enormous hope that electronic ICTs can serve as an effective tool to address the perpetual problem of information asymmetry in the VC of agricultural products and agro-inputs in developing countries. Consequently, several donors and international agencies, including the World Bank and the Food and Agriculture Organization of the United Nations (FAO) are promoting the use of e-based ICTs in smallholder agriculture (Kadigi *et al.*, 2013b). A significant move started following the Millennium Declaration (MD), when key stakeholders from various sectors came together in Geneva in 2003 and again in Tunis in 2005 to discuss a broad range of subjects related to ICT for development. Access to ICTs is listed as one of the targets of the Millennium Development Goal No. 8 (MDG 8), which emphasizes the benefits of new technologies, especially ICTs in the fight against poverty (Kadigi *et al.*, 2013b).

Another significant move is demonstrated by the recent launching of the World Bank's ICT in Agriculture e-Sourcebook (2011) and the growing demand for knowledge on how to use ICT to improve agricultural productivity and raise smallholder incomes (World Bank, 2011a; 2012; Dixie and Jayaraman, 2011). Connectivity whether the Internet or mobile phones is considered as having the potential to change rural farmers' lives in unprecedented ways. According to the World Bank (2009) an increase of 10% in high-speed internet connections may result in an increase in economic growth by 1.3%.

The use of e-based ICT can inculcate farmers' innovativeness in producing, storing, and distributing food (Robertson, 2012). It can improve marketing and serve as an effective tool for short- and long- term market information, agricultural inputs, logistics, and transport (Dixie and Jayaraman, 2011; World Bank, 2011a; 2012).

ICT provides information and support which is needed to improve the capacity of farmers to act. A recent study showed that, in Eastern Uganda, farmers who have access to CKWs receive 17% higher maize prices than those that do not. It was also found that CKWs who set-up off-grid charging enterprises (where farmers can pay a small fee to charge their mobile device) earn approximately USD 40 per month (World Bank, 2012).

With appropriate technology, farmers improve the performance and reduce the risks related to their enterprises. Improved performance either reduces the amount or quality of an input needed for an activity, or increases the amount or quality of an output produced. Risk reduction activities broadly defined, reduce variation in

outcomes (Robertson, 2012). In this dissertation, the priority issues for urgent intervention in the VC of beef cattle in Ilemela and Magu districts was identified using the information and data collected during the Value Chain Workshop (VCW) held in Mwanza on 31st October 2012 as well as the baseline surveys which followed thereafter. Inadequate flow of information on potential markets and inputs distribution was the key issue raised by beef cattle value chain stakeholders during the VCW. This dissertation therefore identified the area of intervention by developing an electronic mobile phone system named “e-Ng’ombe” to tackle the pit fall of information asymmetry.

The “e-Ng’ombe” ICT based idea emanated from the realization that the economy of Mwanza region is dominated by smallholder agriculture employing about 85% of the total population in the region followed by the fisheries and mining sectors. Importantly, the livestock sub-sector commands a recognizable share in the economy of the region, it is the third leading economic sub-sector in the region making Mwanza the second region in terms of number of livestock in Tanzania. Therefore, the development of reliable and timely livestock market information is vital for the development of the region. It will provide a basis for livestock producers and traders to make informed marketing decisions.

### **1.13 Analytical Framework for ICT Application in Economic Theory**

Economic theory often relies on the notion that market participants have access to sufficient and symmetric price information to engage in optimal arbitrage. Knowing that elsewhere they can sell at a higher, or buy at a lower price, they will trade in the market that allows them to achieve the most favorable deal (Jensen, 2007). This is

captured in the law of one price, which states that the price of a good on two markets will not differ any more than the cost of transportation between them (Jensen, 2007).

In reality, however, the law of one price is often not adhered to; because information is costly or inaccessible, excess price dispersion arises (Stigler, 1961). To obtain price information, market participants have to engage in search. Where the cost of search exceeds the expected gains, however, it is not undertaken. In this case, prices come to an equilibrium in which dispersion is higher than expected according to the law of one price (Jensen, 2007).

Reducing the cost of information then lowers the threshold for expected gains at which search is conducted, and should lead to a decrease in price dispersion (Stigler, 1961). As agents can engage in better arbitrage, adherence to the law of one price is improved, and the market gains efficiency. In particular, goods can be allocated more efficiently across markets. By dissolving market inefficiencies, improved access to information can be expected to yield welfare gains for both producers and consumers of goods (Jensen, 2007).

Excess price dispersion is particularly common in developing countries (Jensen, 2007), partly because of insufficient access to information and communication technology (ICT), which raises the cost of search. Many developing countries have very low rates in ownership of fixed-line telephone and Internet subscription (Fredriksson, 2010); costs are often prohibitively high (Fredriksson, 2009), and in many cases infrastructure, particularly in rural areas, is insufficient or non-existent (Horezky, 2009). The introduction of an ICT that reduces the cost of search, then,

should reduce price dispersion in these markets. Mobile phone are said to be the fastest and less costly ICT facilities to improve market efficiency.

#### **1.14 Empirical Review of ICT Application in Agriculture**

Much of the available literature on the use of ICT in agriculture acknowledges the fact that when carefully developed, ICT can help tackle the problem of information asymmetry in smallholder agriculture by producing and disseminating quality price and market information (Dixie and Jayaraman, 2011; World Bank, 2011a). The increase in connectivity and affordability of ICT in developing countries is widening this prospect. In Africa, the penetration rate of mobile phones was estimated to reach 41% by the end of 2010, a growth rate of more than 200% from the 2005 levels (Asenso-okyere and Mekonnen, 2012). Available evidence shows that e-based ICT is being effectively used in some countries of the developing world and in Africa with remarkable success on market price information, weather forecasts, information on storage facilities, and information related to crop and livestock diseases and general advice related to agriculture (Gakuru *et al.*, 2009).

Evidence of success stories in developing countries is numerous. In Mozambique, CTA (2006) and Jenson *et al.* (2004) have shown that farmers with access to market information obtain higher farm prices. The Mozambique Agricultural Marketing Service (SIMA) collects and disseminates nation-wide and provincial data on market prices, product processing and availability through a variety of media including text messages, email, internet, national and rural radios, television and newspapers.



Aker (2008) examines the impact that the introduction of cell phones has had on grain trade in Niger. The author shows that cell phones reduced grain price dispersion across markets by a minimum of 6.5% and trimmed down intra-annual price variation by 10%. In another study using panel data collected between 2003 and 2005 on 856 Ugandan households in 94 communities, Muto and Yamano (2009) found that, after the expansion of the mobile phone coverage, the proportion of the farmers who sold banana increased in communities more than 20 miles away from district centers.

In Nagapattinam district India, Raj *et al.* (2011) argued that project farmers who used mobile technology (SMS and interactive voice response system) and individual web pages recorded higher net income (15.2% higher) than that of their counterpart non-project farmers or control group. In addition, spending of project farmers on seeds, nursery, nutrient management, and weeding was significantly less than that of non-project or control farmers. The project farmers were able to reduce costs by using the recommended quantities of seeds and inputs, and realizing better market prices as they had better information on the inputs (Raj *et al.*, 2011).

Transportation and logistics is another area with potential for e-based ICT use (see Ilin and Dragan (2013); Köhler (2013); CISCO (2012); GSMA Mobile Money Tracker (2012); GSMA Health Tracker (2012); World Bank (2011a, 2012); Dixie and Jayaraman (2011); Pew Research Centre (2011); Finest (2011); Evangelista and Sweeney(2003). The two are characterized by high transaction costs and therefore, constituting expensive barriers to market access for smallholders (World Bank, 2011a). The available information shows that the cost of delivery to urban consumers

in Africa constitutes 10-20% of the wholesale price with nearly half of it being incurred in the first 25% of the journey (World Bank, 2011a). The mobile phone ICT could therefore be used to generate more efficient transportation routes and distribution systems to reduce such costs.

In Bangladesh and Northeast India, weekly consumer markets have transformed into daily wholesale markets due to improved logistics and aggregation (World Bank, 2011a). In Ghana, companies like Esoko provide price information through SMS messages purchased primarily by agribusinesses (Asenso-okyere and Mekonnen, 2012).

In Ethiopia, ICT enables the novel Commodity Exchange in the country (CEX) to transmit commodity price information to farmers in real time - within two minutes of a deal being made at CEX from Addis Ababa. According to the World Bank (2011b), market data feeds directly to farmers via electronic display boards in 31 centers spread across Ethiopia as well as on the exchange's website. Market data is also provided via text messaging to interested mobile phone users. CEX also provides market data in four local languages via automatic telephone messaging.

In Kenya, market information is provided through SMS to smallholders. This includes information on daily agricultural commodity prices, extension messages and information, which shows opportunities to sell or bid through text messages and/or voicemail. In addition other rural-based market information points are developed, which are linked through an electronic information system that allows farmers to link with buyers in different urban centers (KBDS, 2004; Muriithi *et al.*, 2009; Davis and Addom, 2010).

In Senegal, Manobi provides access to price data on various crops, collected from different markets across the country. Manobi personnel use mobile phones to send the price data to the Manobi database using the wireless application protocol (WAP). Farmers use their mobile phones to query the database (ITU, 2010). In Uganda, the SMS-based comprehensive system developed by the Grameen Foundation has helped to deliver market information to farmers (Pyramid Research, 2010). The Kenyan mobile phone based ICT is another interesting example. It is used for delivery of animal health services, which has reduced transactions costs and increased efficiency of animal care (Kithuka, *et al.*, 2007).

Success stories are also reported in Nigeria where the cassava growers receive market information through a new initiative called the Integrated Cassava Project - based on mobile phones and internet and an online marketplace called Trade Net Africa (Asenso-okyere and Mekonnen, 2012). In India, the Reuters Market Light (RML) is one of successful ICT initiatives in agriculture. RML sends four SMS messages a day to its subscribers at an annual subscription of Indian Rupees 800. Farmers receive information about the weather, crops, and current and projected commodity prices at different markets (Hardikar, 2010).

In Philippine, the International Rice Research Institute (IRRI) launched a program called Nutrient Manager for Rice Mobile (NMRiceMobile) to provide rice farmers with advice via their mobile phone on the optimal timing, amount, and type of fertilizer to apply to their rice crop to maximize production and profit, and reduce waste (IRRI, 2011). In northeastern Kenya, southwestern Ethiopia and Mali the

Texas A&M University employed the NASA's satellite technology products to develop operational waterhole monitoring for precipitation, water hole identification and watershed delineation (NASA LEWS, 2011; Senay, 2010).

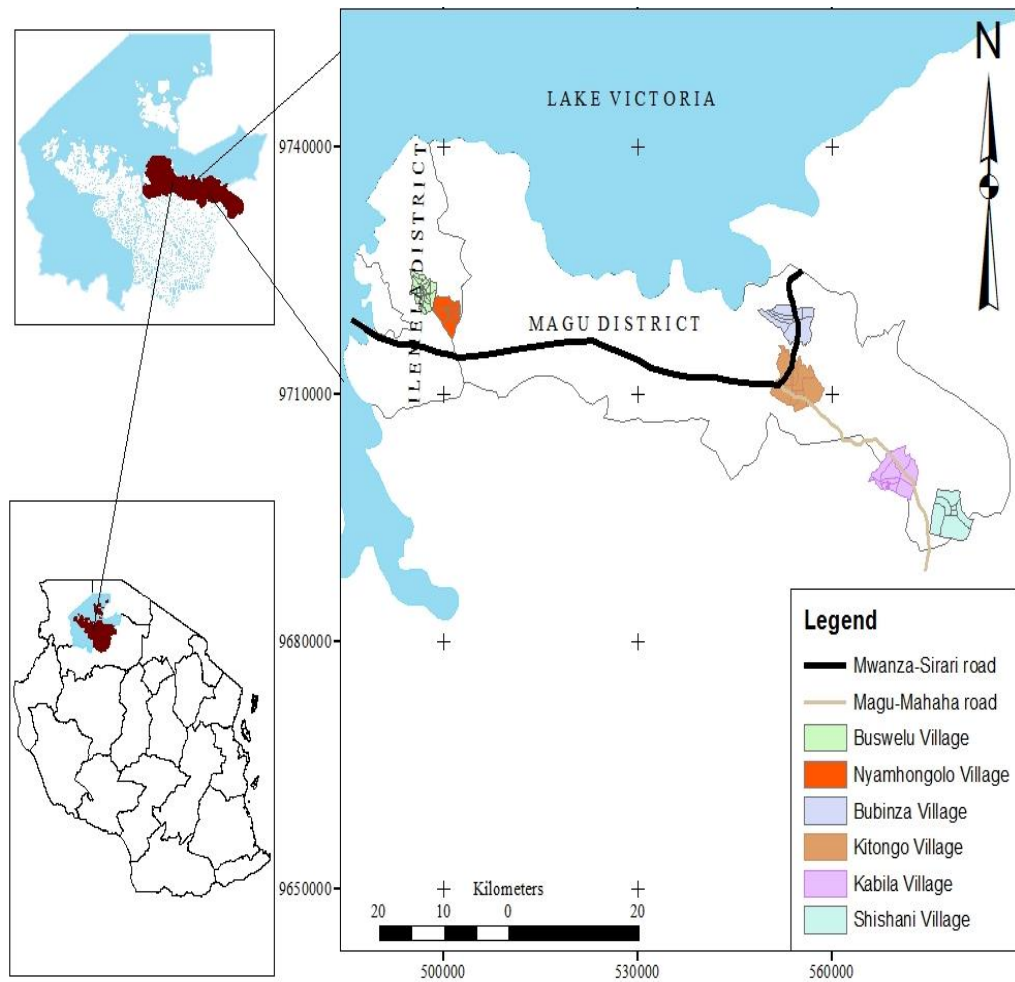
## CHAPTER THREE

### METHODOLOGY

#### 3.1 Description and Justification of the Study Area

The study was conducted in two districts (Ilemela and Magu) of Mwanza region (Figure 1). The region is located in the northern part of Tanzania just south of Lake Victoria. Lake Victoria waters separate the region from the neighboring countries of Kenya and Uganda. To the east, north and west are the sister lake-dominated regions of Mara and Kagera. To the south, the region is boarded by Shinyanga region. Mwanza region lies between latitude  $1^{\circ} 30'$  and  $3^{\circ} 0'$  south of Equator and the longitudes  $31^{\circ} 45'$  and  $34^{\circ} 10'$  east of Greenwich (Kadigi *et al.*, 2013a).

Magu and Ilemela districts were selected with regard to concentration of beef cattle actors and market accessibility. Of all districts, Magu is the leading district with the highest herd size in Mwanza region. Much of the cattle traded in Mwanza region come from Magu district. Ilemela has a small number of agro pastoralists but remains the base for cattle trading and cattle fattening/finishing. Nyamhongolo secondary market is the only big market in the district.



**Figure 1: Map Showing the Study Districts**

### **3.2 Regional Economy**

The economy of the region is dominated by smallholder agriculture employing about 85% of the region's population followed by the fisheries sector. Mining and Livestock sectors also command a recognizable share in the economy of the region. On a national level, Mwanza is the second most important region in terms of livestock in the country after Shinyanga region.

#### **1.14.1 Agriculture**

Mwanza is the leading producer of cotton, which is one of Tanzania's major export cash crop. For the past two decades, cotton production has declined basically due to low profitability and inefficient marketing arrangements (URT, 2008). For this reason, agriculture has been pushed to second position in terms of foreign exchange earnings. Fisheries activities have instead taking the lead, followed by mining at third position. Meanwhile, the major food crops in the region are maize, cassava, sorghum, millet, sweet potatoes, paddy, and legumes (URT, 2008). Maize, cassava and sweet potatoes constitute about 71% of all food crops grown in the region. Apart from cotton, paddy and maize can also be important cash crops for some households.

Mwanza region is blessed with plenty of water from the lake and from ponds along the numerous river valleys within the region making irrigation a large-scale option. Unfortunately, irrigation is currently carried out on very small scale, which is about 6.4% of the total irrigable land area in the region (URT, 2008).

### **1.14.2 Livestock**

Livestock keeping is the third leading economic activity of the majority of people in the region. On a national level Mwanza is the second most important region in terms of number of livestock in the country after Shinyanga region with combined livestock number estimated at approximately 2.89 million cattle, sheep, goats, pigs and donkeys. The Tanzania Agriculture Sample Census (2007/08) shows that Mwanza had a population of 1.98 million cattle (URT, 2012).

A key constrain of the livestock sector in Mwanza region is that it is still, predominated with tradition methods of keeping livestock. As a result, yields and production are very low leading to animals with low weights. They need to be reared in a modern way, for example by introducing high yielding varieties/species by crossbreeding with exotic or improved species to have higher yields or by selecting the best animals and fatten them. This can improve their quality and as a result, it can increase their weight and lead to quality products such as milk, meat, hides, skin and horns, which will create more markets within and outside the country.

### **1.14.3 Fisheries**

Fishing on the fresh waters of Lake Victoria is one of the most important undertaking by the people of Mwanza especially those living along or close to the lakeshore and those living in the numerous islands of Lake Victoria. According to March 2006 census, the region had a total of 56 321 fishermen with 16 911 fishing boats/canoes. There were 208 079 fishnets, 3 455 special finest for “dagaa” (*restrineobola argentiis*) and 2.264 million fishhooks. The fish products area, Nile perch (*Sangara*),



Plagic cyprinids (*Dagaa*), Synodontis (*Furu*), Tilapia (*Sato*), Monmyrus and catfish (*mumi*).

#### **1.14.4 Wildlife Resources and Tourism**

The eastern part of Magu district borders Serengeri National Park and this has provided an ideal condition for the virtually undisturbed survival and proliferation of various wildlife species in the eastern part of Magu District. The estimated population of all wildlife species is put at some 700,000 animals (URT, 2008).

Mwanza region has a lot of very interesting tourist sites, games reserved and national parks worth visiting. Some of these areas are Kayenze Ports, Uhuru parks, big stones, State House, Utemini (Lords Palace), Old Boma, Sanane Island and many sites that are more interesting.

#### **1.15 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 a 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 are needed to get accurate information.

#### **1.16 Data Sources and Instruments for Data Collection**

Interviewing different actors in the value chain of beef, including agro pastoralists, cattle traders, fatteners, sellers of meat, butcher shops, collected primary data and

livestock input sellers. General information was collected during Participatory Rural Appraisal (PRA) sessions. These included informal meetings; focus group and key informant discussions using checklists of information and actor-specific information gathered during household interviews using structured questionnaires, covering three categories of actors (agro pastoralists, cattle traders and fatteners). The PRA enabled the analysis of markets and existing marketing functions in a participatory manner. Secondary data was collected from different sources including books, research reports and journals from internet and Sokoine National Agricultural Library (SNAL).

### **1.17 Sampling Procedure**

The target population for the present study was the beef cattle value chain actors in the study area. Both purposive and simple random samplings data collection methods were adopted in this study. A purposive sampling technique was used to select villages with large cattle herds and access to the market. The sample size constituted 186 beef cattle value chain actors from selected villages village population of herd size and cattle traders. A total of 186 respondents were enough for meaningful analysis of the study following the argument by Sudman (1976) who confirmed that a minimum of 100 respondents is enough for each group when a comparative study is conducted. In addition, the choice of this sample is reasonable due to limited time and funds but fulfills the requirements of the study for meaningful analysis (Bailey, 1994). The households were drawn within Magu and Ilemela districts as shown in Table 2.

**Table 2: Distribution of respondents by location**

Categories	District	Ward	Village	Sample size
Pastoralist	Ilemela	Buswelu	Nyamhogolo	20
		Buswelu	Busenga	20
		Shishani	Shishani	20
	Magu	Nkunguru	Kabila	20
		Sukuma	Kitongo	20
		Lubugu	Bubinza	20
		Buswelu	Nyahongolo	26
Beef cattle traders	Magu	Shishani/Sukuma	Shishani/Bubinza	4
Butchers	Ilemela	Buswelu	City	18
	Magu	Itumbili	Town	18
<b>Total</b>				<b>186</b>

### 1.18 Model Specification and Data Analysis Techniques

To address the objectives of the study, several statistical techniques and methodologies were employed. Data from the primary source was verified, coded and analysed using Statistical Package for Social Sciences (SPSS) computer software. Both qualitative and quantitative descriptive statistics were employed to capture the necessary information. The methodologies are described in sections 3.6.1 to 3.6.3.

#### 1.18.1 Participatory value chain analysis

Participatory Value Chain Analysis (PVCA) is one of the methods used to map the value chain by involving all the key informants/stakeholders. In its simplest form, PVCA involves bringing together stakeholders with knowledge of different levels of the chain to construct a standard flow mapping (Mayoux, 2003). This map identifies the main activities in the chain, their geographical spread, the main stakeholders and a rough idea of the relative size and importance of each element. Different types of governance relationships are identified on the map like situations where one firm exercises undue control over others; cases where a lead firm directs others as in a

buyer-driven chain and hierarchical relationships where parent companies control subsidiaries (Mayoux, 2003).

This study employed PVCA to map the beef cattle value chain through workshop and focus group discussions held in each village. The workshop was attended by a total of 40 participants representing different actors, including livestock keepers, beef cattle fatteners and traders, inputs suppliers, researchers and local government officials (e.g., hydrologists, natural resources officers, veterinary officers, livestock officers, environmental officers and meat inspectors).

Four groups of 10 people were formed. Each group was asked to visualize the beef cattle value chain. The four drawings were combined together to get a clear map of the chain. The work of CIP (Bernet *et al.*, 2006) for example in developing the Participatory Market Chain Approach (PMCA), of CIRAD and IICA in the development of Cadenas y Diálogo para la Acción (CADIAC) (Bourgeois and Herrera, 2000) and that of the Regoverning Markets Programme (Vermeulen *et al.*, 2008) each embed a strong participation of stakeholders in the value chain mapping. UNIDO (2011) in its report of Diagnostics for Industrial Value Chain Development suggested that mapping the value chain needs involvement of various stakeholders affected by the chain and must contribute to the development of the strategic options and their implementation.

### 1.18.2 Gross margin analysis (GMA)

Following Msangi (2000) and Mlulla (2003) gross margin analysis is used to find the difference between total revenue and total variable cost costs. 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 for short-run margins.

The fundamental 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). Just as important, calculations of depreciation have often been difficult to undertake due to the ambiguous nature of estimating the lifespan of fixed assets, appreciation and salvage values in many firms, thus necessitating the use of GMA models rather than the normal gross 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;

$$GM = TR - AVC \dots\dots\dots (2)$$

Where; GM = Gross margin (Tshs/unit)

TR= Total revenue (Tshs/unit)

AVC=Average variable costs (Tshs/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). Phiri (1991) observed that although GM is not an absolute measure of profitability, it remains the most satisfactory measure of efficient use of resources available in small scale agriculture. The GM analysis requires proper records such as input costs, quantities sold and prices received (Msangi, 2000).

A number of successful studies have employed the GM model in Tanzania. For instance, the study by Mlote *et al.* (2012) who studied the value addition of beef cattle fattening in the Lake Zone and Mlulla (2003) who assessed the operation of border trade in north Tanzania. Philip (2001) who studied the economics of medium scale sugarcane producers in Morogoro also adopted the model. Silomba (2000) who evaluated the performance of beans marketing in Kigoma region also employed the Model.

In this study, Gross margin (GM) analysis was used to estimate profits obtained by each actor in the chain. Data were analysed using descriptive methods to obtain information on frequencies, means, percentages and the respective gross margins

(GM) of different actors along the value chain. The gross margin of an enterprise is the difference between the Total Revenue (TR) and Total Variable Costs (TVC): -

Mathematically;

$$GM_i = TR_i - TVC_i \dots\dots\dots (3)$$

Where;  $GM_i$  = Gross margin at point i (in TShs)

$TR_i$  = Total revenue at point i (in TShs)

$TVC_i$  = Total Variable costs at point i (in TShs)

i = represent points along the value chain such as production, un-fattened cattle trading, beef cattle fattening, cattle slaughtering and meat selling

TR in this case is the summation of the number of cattle sold (Y) times their corresponding selling price ( $P_y$ ) and TVC is the summation number of inputs (X) times their corresponding prices ( $P_x$ ) of all variable costs as shown in the formula below.

$$GM = \sum P_y Y - \sum P_x X \dots\dots\dots (4)$$

Where;  $P_y$  = Price of a cattle

$P_x$  = Price of inputs used in producing a cattle

Y and X = Quantities of cattle/output

In the case of butcher owners, the same equations (3 and 4) were applied; where Y stands for the number of cattle slaughtered and  $P_y$  stands for the price per kilogram of meat sold. X stands for the quantity of inputs used and  $P_x$  stands for the price of that input. For comparison purposes, the Gross Margins per head for Agro-

pastoralists/Pastoralist, Traders, Beef cattle fattening operators and Butcher owners were calculated.

### 1.18.3 Value chain upgrading strategy using ICT

The areas of intervention were identified after PVCA and GMA. The priority issues for urgent intervention in the VC of beef cattle in Mwanza region were also identified and as a way forward, the electronic mobile phone ICT System dubbed “e-Ng’ombe” was designed and developed (Value Chain Innovation).

The development of e-Ng’ombe System followed the technical system development life cycle (SDLC) as shown in Table 3.

**Table 3: The e-Ng’ombe information system development life cycle**

S/N	Stage	Description	Deliverable
1	System analysis and design	In depth analysis of functional of functional and non-functional of the system is done, hardware require requirements and developments were also depicted.	Requirement document to show the design of the system
2	System development	Design of the system is implemented by implementing the back end database and writing code for the application part of the system using preferred programming languages	A working database and its application which work together to serve the purpose of the system
3	Testing and verification	The development is taken to the site	A tested and verified system ready to be put into use
4	System documentation	Production of user manual and other additional documents necessary for the running and maintenance of the system	System manual
5	System deployment and training	The system is put into use and user (value chain actors) are trained on how to use the system	



## **CHAPTER FOUR**

### **4.0 RESULTS AND DISCUSSION**

#### **4.1 Respondents' Socio- Economic Characteristics**

The characteristics of respondents have important socio and economic implication on product making, marketing, and decisions on when to sell the product. This section describes the characteristics of sampled households based on age, sex, marital status, education level of respondents and household size in relation to production and marketing the beef cattle and cattle products.

##### **4.1.1 Age of the respondents**

Table 4 depicts respondents' age categories. There were 3.75% of pastoralist household head aged below 31 years in Magu district while Ilemela district has no such young family heads. About 18.75% and 17.5% of the pastoralists found to be aged between 31-40 in Magu and Ilemela respectively. The age group between 41 to 60 years, which include 62.5% from Magu and 55% from Ilemela, dominated pastoralists. However, the remaining group was that aged between 61 and above which was found to be 37% in Magu district and only 27.5% in Ilemela district. Age influences the income generating capacity of an individual. Kadigi (2012) urges that in total the accumulation of wealth 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. The table also shows the age groups of the rest beef cattle actors directly influence the beef cattle value chain.

#### 4.1.2 Sex of respondents

**Table 5: Sex of respondents by district**[illegible]

### 4.1.3 Marital status of respondents

As it is to the sex of household head, marital status is also an important socio-economic implication to the economy as it may induce someone to work hard due to family responsibilities. Marital status was categorized as single, married, divorced and widowed (Table 6). Results indicate that, the large majority of beef cattle actors were married.

**Table 6: Marital Status of household head**

Marital status	Magu district			Ilemela district		
	Pastoralists (%)	Cattle Traders (%)	Butchery (%)	Pastoralists (%)	Cattle Traders (%)	Butchery (%)
	n=80	n=4	n=18	n=40	n=26	n=18
Single	0.0	0.0	30.2	0.0	33.0	37.2
Married	87.5	100.0	67.8	82.5	59.9	61.0
Separated	8.8	0.0	2.0	7.5	4.9	0.0
Widowed	3.8	0.0	0	10.0	3.2	1.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

### 4.1.4 Household size

Household membership was defined in the study as the groups of members who live together in close contact by sharing resources held in common, such as accommodation and food. There were no enormous differences in means of the household size in the two districts. The means were 7.3 people per family in Ilemela Municipality and 8.4 in Magu district. This might be influenced by African culture that, most families are extended. A Tanzanian population and housing census conducted in 2012 indicated that average household size of Magu is 5.8 and that of Ilemela is 4.8 (URT 2013). It was revealed from the study that, the surveyed area has a relatively large household size. However, it is expected that the average household

size decreases with the level of development although slowly and in most cases better household (higher income earner) tend to be smaller (NBS, 2002).

#### 4.1.5 Educational level of respondents

In both theoretical and practical situations, education level plays an important role in ensuring household access to basic needs such as food, shelter and clothing. Skills and education amplify the working efficiency resulting more into income and food security. Furthermore, education is important to manage the business and make the right business decisions. Education is one of the long-term strategies that maybe used to improve beef cattle production and marketing. Table 7, shows that 85% and 67.5% were agro pastoralist with primary education in Magu district and Ilemela municipality respectively; 15% in Magu district had no formal education while 27.5% in Ilemela was found to have no primary education. In addition, the results indicate that there were no pastoralists with secondary education in both Ilemela and Magu districts. Only 2% of pastoralists were observed to have a college/university education in Ilemela district. The table also shows the percent of cattle traders and butchery operations with their education level.

**Table 7: Education level of the household heads by districts**

Educational level	Magu district			Ilemela district		
	Pastoralists (%)	Cattle Traders (%)	Butchery (%)	Pastoralists (%)	Cattle Traders (%)	Butchery (%)
	n=80	n=4	n=18	n=40	n=26	n=18
No formal education	15.0	0.0	0.0	27.5	0.0	0.0
Primary education	85.0	88.6	90.0	67.5	80.0	76.0
Secondary education	0.0	11.4	10.0	0.0	15.0	20.0
A-level	0.0	0.0	0.0	0.0	4.0	3.0
sec.ecudation	0.0	0.0	0.0	0.0	1.0	1.0
College	0.0	0.0	0.0	5.0	1.0	1.0

Mobile phones might be an effective strategy to improve market information dissemination because they are easy to use, cheap and highly available all over the country including in rural areas. Results in Table 8 show the number of household members possessing a mobile phone. The expected e-Ng'ombe system only requires single Mobile phone per family. About 81% and 95% of agro pastoralists families in Magu district and Ilemela Municipality respectively were reported to have at least one mobile phone, while only 19% of the families in Magu and 5% from Ilemela municipality did not possess a phone. This result shows that mobile phones are highly available and used in rural areas, and might be effectively used to upgrade the value chain for beef cattle.

**Table 8: Family members of the respondents who possess mobile phoneby district**

[illegible]

## **4.2 Beef Cattle Markets in Mwanza Region**

The study found out that, there were more than 15 operating livestock markets in Mwanza region. Nyamhongolo is the largest and only secondary market in the region. Many cattle consumed in the region come from Magu district, where primary markets are predominant. Nyamhongolo handles about 8 000 to 11 000 cattle per month and an average of 14 500 (13 000 to 16 000) cattle during the top marketing season from October to January. This important secondary market operates usually 6 days per week.

## **4.3 Beef Cattle Marketing Channels in Magu and Ilemela Districts**

In both Magu district and Ilemela municipality two main beef cattle channels were observed. Commonly the first involved a direct channel where traders linked by middlepersons who buy beef cattle from producers at primary markets and sell at profit to butcher operators. It was observed that 95.6% of pastoralists sell their animals to middlepersons (Wagaragaja), and these middlepersons resell the animals to traders before the animals reach to butcher operators.

The second channel involves some value addition where traders buy weak animals and feed them with extra feed (supplements) for some months before they sell them again to secondary markets. The cattle is kept in feedlots for about three to four months and when the animal reconditions, it is sold to secondary markets at Pugu in Dar es salaam, butcher operators and exporters. Moreover, the results show that 83.8 percent of traders sell their animals to Pugu secondary market in Dar es salaam.

Additionally, it was discovered that producers keep animals for many years as they would prefer to keep such animals as their live banks. Sometimes they prefer to see the herd size increases than to see it decreases.

**Table 9: Markets for beef cattle**

Market name	Fattened cattle	None fattened cattle
	Percentage (n=40)	Percentage (n=40)
Pugu	87.5	15
Nyamhongolo	5	80
Export	7.5	5
Total	100	100

The data shows that 87.5% of the fattened cattle were sold to Pugu market in Dar es Salaam and only 7.5% was exported while 5% was consumed in Mwanza region. This is contrary to none fattened cattle that was largely consumed in Mwanza region (80%) and only a small percentage was trekked to Pugu and elsewhere across the border.

#### **4.4 Beef Cattle Value Chain Actors**

The main beef cattle actors in the value chain were observed to be agro pastoralists and traders (middlemen, beef cattle traders and butcher operators). Intermediaries/middlemen dominate the market with 95.6% the remaining 4.4% belongs to those pastoralists who manage to sell their cattle direct to traders. Middlepersons were also reported to be the major source of market information between pastoralist and cattle traders in the study area. The role of beef cattle traders are as explained below;

#### **4.4.1 Beef cattle producers**

Beef cattle producers include both pastoralist and agro pastoralist who kept about 97.3% of cattle found in Tanzania (Mlote *et al.*, 2012). The National Sample Census of Agriculture, (2007/2008) reported that of the 145 461 beef cattle producers in Mwanza region agro pastoralist made up the major share, accounting for 97.3% of all the cattle owners in the region. Mwanza region has total cattle population of 1 976 971, Magu is the second largest district in cattle population after Geita with the total herd size of 485 056 (URT, 2012).

#### **4.4.2 Beef cattle traders and fattening unit operators**

Beef cattle traders in Mwanza region are those who involve in purchasing cattle from pastoralists through primary markets and reselling in other auctions at higher profit. Middlepersons who act as a bridge between buyers and sellers dominate beef cattle markets in the study area. Pastoralists have often limited direct contact with cattle buyers as the middlemen are all over the market, only few of pastoralists manage to meet the buyer (4.4%) and make a deal, but 95.6% of cattle keepers use middlemen to negotiate prices.

Two types of traders were identified in the study area. The first type involves traders who buy healthy and heavy animals from producers and re-sell to other cattle buyers including butcher operators at secondary markets or other niche markets. Then there is another category of traders termed fattening entrepreneurs, who buy weak animals or semi-finished animals from the markets for the purpose of fattening (adding value) or finishing for at least three months before reselling them to the livestock markets



for local consumption or export. The price for non-fattening cattle was observed to be TZS 350 000 during the normal season (from May to October). At this time, the Sukuma people sell fewer cattle as they have enough food in their stocks (harvesting season). Weak bulls which are commonly sold for fattening are normally purchased at a lower price of about TZS 320 000 and are later sold at TZS 500 000 to TZS 900 000 per herd after fattening and during peak season (November to January). A well fattened bull is commonly sold at the range of TZS 700 000 to 1 200 000 at Pugu in Dar es Salaam. Cattle traders in the study areas incur several costs in bringing up beef cattle from the production area to the markets. These costs include, among others, the costs of feeds for those traders who practice beef cattle fattening, treatment costs, market fees, cost of acquisition of permits (buying and selling permits) and transport cost, as well as, the unofficial costs and fines incurred en-route, especially to the terminal market of Pugu in Dar es Salaam. Table 12 provides a summary of the costs, revenues and gross margins for beef cattle trading, both for un-fattened and fattened beef cattle.

#### **4.4.3 Butchery operators and meat shop owners**

Owners and operators of butchery and meat shops are the actors who buy animals from the primary or secondary markets for immediate slaughter. These actors bridge between traders and consumers. Similar to the previous actors, they also incur costs including the costs of purchasing beef cattle, holding pen fee, slaughtering fee, market fees, meat transportation fee and movement permit. Butchers play an important role in the livestock sector as they link producers and consumers. Mwanza

region was reported to have about 230 butcher shops, many of them located in Mwanza region.

#### **4.5 The Value Chain Map**

The value chain map illustrates the way in which beef cattle and their products move from production area to the end markets and how the overall beef cattle sector operates. It is “a visual representation of the structure of the value chain and its main characteristics or a narrative description of the main characteristics of the value chain” (UNIDO, 2012). In the value chain map (Figure 2), the marketing functions are represented on a vertical axis on the left hand side of the diagram and the existing actors are represented using boxes with solid lines, which may encompass several vertically integrated functions. Dashed lines represent missing functions. Dotted lines represent the potential new actors, markets and linkages. The product and/or service flows between nodes are represented by arrows; for example, from production to wholesaling, from wholesaling to retail or export, or from primary wholesaling to secondary wholesaling (in the case of a series of ‘middleperson’). The movement of a good or service between nodes implies that value is added to the product. The end market segments are placed at the top of the diagram and represented by ellipses. There are several channels or ‘strands’ in the value chain. These are denoted by numerals at the top of the diagram and defined by product types, routes to market and end market segments. The number of actors in each segment, the flow volumes and profit margins constitute an important input to the value chain.

The map was developed from the participatory value chain analysis (PVCA). The key informants participated fully in developing the map, by identifying potential markets, functions of each actor along the chain and the entire flow of products from production to the final consumer. This map also identified potential illegal/unofficial markets in foreign neighboring countries, such as Kenya. Kenya markets attract Tanzanian traders because of high prices offered by a robust Kenyan export-driven meat industry.



**Figure 2: The beef cattle value chain in Ilemela and Magu districts.**

#### **4.6 Marketing, Value Chain Governance and Financing**

Marketing of cattle is carried out at various levels of livestock markets, where pricing is mainly through negotiation and to some extent based on grading while weighing done through visual estimation. The retailing of beef is mostly done by privately owned butcheries. Butchers face serious shortage of appropriate tools and equipment used in meat handling and cutting. Marketing information on beef, which include different marketing channels for beef and beef products, is limited. Domestic processing is considered insignificant. The domestic demand for quality beef is met by imported products, including premium beef cuts, sausage and canned beef. Still a large proportion of the local demand (estimated at more than 95%) is for warm “mixed beef” (UNIDO, 2012).

Traders and butchers, few of whom are of considerable size and financially endowed with access to credits, dominate the beef cattle value chain in the study areas. These actors are able to exercise market power vis-à-vis a large number of small-scale livestock farmers and traditional herders. Integration (both vertical and horizontal) is an important concept of a net chain or “a set of networks comprised of horizontal ties between firms within a particular industry or group, such as these networks (or layers) are sequentially arranged based on the vertical ties between firms and different layers” (Lazzarini *et al.*, 2001). The driving force is the recognition that each member of a net chain can enhance its performance and the product quality by integrating its goals and activities with other organizations to optimize the results of the entire net chain (Lazzarini *et al.*, 2001). If the performance of the total net chain increases, the individual links will benefit more than in case of one individual link being optimized

in isolation (Kadigi *et al.*, 2013a). Unfortunately, integration, especially the vertical integration of livestock farmers, beef processors, and traders, in the value chain of beef cattle is limited. This calls for more strategic steps to be taken, especially by the Tanzania Meat Board (TMB) to bring together stakeholders who can articulate their needs and jointly get to build solid business relationships and a better organization of the chain.

Finance is insufficient in each segment of the beef cattle value chain. Formal financing from banks and financial institutions is constrained due to limited understanding of livestock rearing; feed lotting, trading, butchering, and processing businesses and inadequate conditions that are applied to the granting of loans. Informal financing, through individual, family and friends, and through delayed and advanced payments is prominent.

#### **4.7 Beef Cattle Chains Actors' Gross Margins**

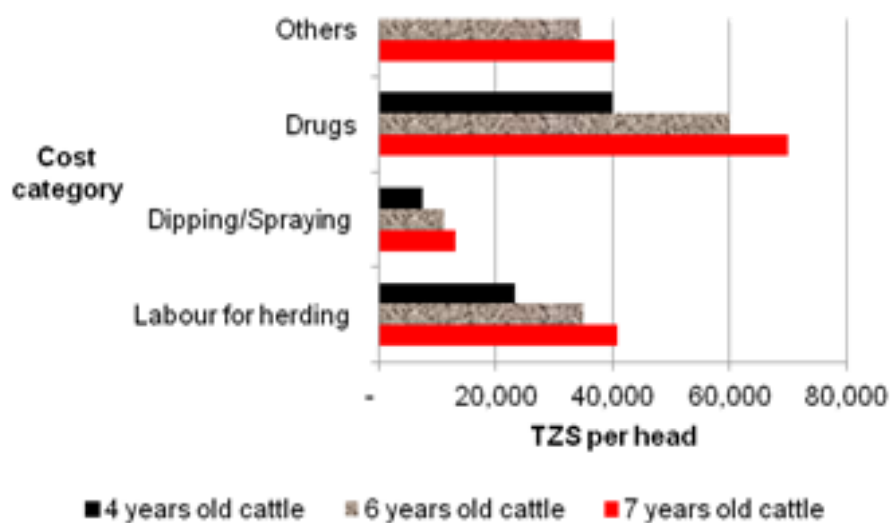
The study endeavored to evaluate profitability accrued by different actors along the beef cattle value chain by evaluating costs, prices and revenue at different nodes of the market chain, including cattle producers, cattle traders and meat sellers (butchery operators). It was observed that, at every node there were costs incurred from producers to the final consumers although it was not easy to quantify production and marketing costs because obtaining information was difficult. Gross margins were calculated and used in assessing relative profitability of the product at the different nodes of the chain for all key participants (beef cattle value chain actors).

#### **4.7.1 Agro pastoralist gross margins**

The analysis of profitability of beef cattle keeping addresses a comparison of gross margins from the beef cattle keeping enterprise at the producer level. Two periods are evaluated that is, beef cattle kept for 4 to 7 years and those kept for more than 7 years before they are sold. The types of costs that are commonly incurred by beef cattle producers include; labour for herding, drugs and costs of dipping services (Figure 3). Other costs relate to unexpected costs like fines when the cattle graze on farmers' farms. Pastoralists may also incur costs of trekking to cattle markets but this is atypical in the study area, as this cost will normally be covered by middlepersons who buy cattle from cattle keepers.

Table 11 presents a summary of costs, revenues and gross margins earned by pastoralists and agro-pastoralists in Magu and Ilemela districts respectively. These were computed and compared with beef cattle sold at three different ages of raising (that is, 7, 6, and 4 years) using information gathered during the Focus Group Discussions (FGDs) and questionnaire interviews with producers or agro pastoralists. The comparisons of average raising costs by cost item and age of sold beef cattle (for the pooled sample) and gross margins by district and age of sold beef cattle are depicted in Figures 4 and 5 respectively. The results of analysis of the profit margins at the producer level suggest that returns are greater if cattle are kept for short periods (fewer years) than longer periods. On average, the sale price of a 7-year old bull, for both Ilemela and Magu districts, was reported to earn a margin of TZS 185 762.5 which is equal to 53.5% of the value of sales. Meanwhile the sales of a bull aged 6 and 4 years old resulted in average gross margins of TZS 249 225 and 306 150, equivalent

to 64% and 76.5% of the sales value, respectively. This supports the assertion that costs of keeping cattle for many years are much higher than that of keeping the animal for fewer years. Overall, the costs of drugs and treatment constitute the largest cost element in the pastoral system of both Ilemela and Magu districts. This is followed by the cost of labour for herding. It was interesting to note that production costs were higher in an urban setting (Ilemela District) than in a rural area (Magu district). While this could be attributable to many other factors, the inadequacy of grazing area was considered to have played a major role. The Ilemela district is located in the city of Mwanza, which is growing fast and is now overpopulated. Land resource is therefore more limiting in this area than in Magu district.



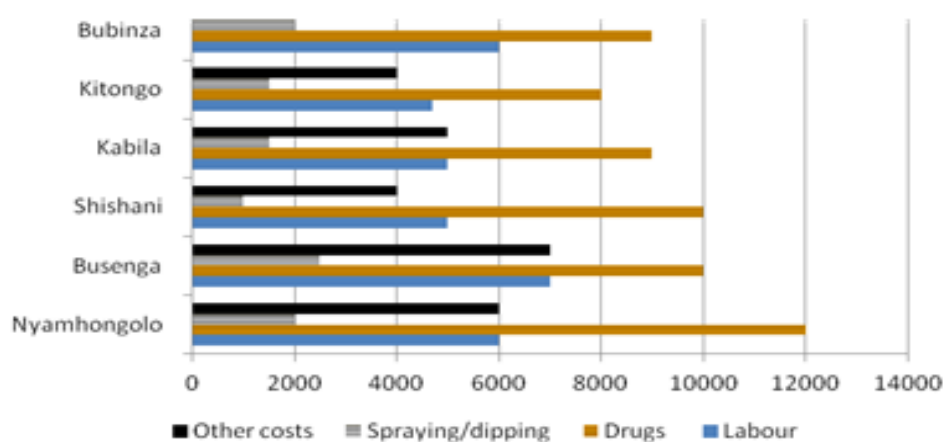
**Figure 2: Average costs of raising beef cattle in the study areas by cost category**



**Table 10: Costs, revenues and gross margins for beef cattle farmers in the study areas**

ITEMS	Magu district n=80			Ilemela district n= 40		
	7yrs	6yrs	4yrs	7yrs	6yrs	4yrs
<b>a) Costs in years (in TZS)</b>						
Labour for herding	36 225	31 050	20 700	45 500	39 000	26 000
Dipping/Spraying	10 500	9 000	6 000	15 750	13 500	9 000
Drugs	63 000	54 000	36 000	77 000	66 000	44 000
Miscellaneous costs	35 000	30 000	20 000	45 500	39 000	26 000
<b>Total costs</b>	<b>144 725</b>	<b>124 050</b>	<b>82 000</b>	<b>183 750</b>	<b>157 500</b>	<b>105 000</b>
<b>b) Revenue</b>						
Average selling price (TZS)	350 000	390 000	400 000	350 000	390 000	400 000
Gross Margins (GM) (TZS)	205 275	265 950	317 300	166 250	232 500	295 000
GM as % of sales	59	68	79	48	60	74

Cost of drugs was observed to be the highest cost in the study area followed by the labor costs and miscellaneous costs as shown in Figure 4. However, spraying and dipping was the lowest cost in both Magu and Ilemela districts.



**Figure 3: Unit costs of raising beef cattle by sample village (TZS/head/annum)**

#### **4.7.2 Beef cattle traders and fattening unit operators**

Cattle traders in the study areas incur several costs in bringing beef cattle from the production area to the markets. As mentioned earlier, these costs include among others, the costs of feeds for those traders who practise beef cattle fattening, treatment costs, market fees, statutory costs (buying and selling permits), transport cost, as well as, the unofficial costs and fines incurred en-route, especially to the terminal market of Pugu in Dar es Salaam. Table 12 provides a summary of the costs, revenue and gross margins for beef cattle trading, both un-fattened and fattened beef cattle.

Overall, cattle traders who add value to beef cattle through fattening before selling earned a gross margin of TZS 190 700 per cattle at 300 kg, equivalent to 27.2% of the total value of sale, which is higher than the TZS 79 000 traders earn who do not fatten their animals equivalent to 16.5% of the total value of sale. The major cost element for traders was that of purchasing cattle (76.56% for traders who fattened their trading herd and 97.26% for traders who did not fatten their cattle), followed by costs of feeds (17.68%). Market fees, transportation costs, as well as the costs of acquiring movement permits and unofficial payments en-routes, which are relatively low (<1%). Fattened cattle found their final destination at the Pugu terminal livestock market in the city of Dar es Salaam. Most of the un-fattened healthy and heavy beef cattle were sold in the livestock markets located within the region, especially at the Igoma secondary market in the city of Mwanza.

**Table 11: Gross Margins for beef cattle traders and fatteners**

Item	Non fattened cattle		Fattened cattle	
	TZS/head	% of total cost	TZS/Head	% of total cost
Purchasing price	390 000	97.26	390 000	76.56
Buying/Movement permit	1 500	0.38	1 500	0.29
Market fees	3 000	0.75	3 000	0.59
Buying/transportation cost	1 500	0.37	1 500	0.29
Feeds	0	0.0	90 000	17.68
Treatment	0	0.0	8 000	1.60
Food	0	0.0	5 300	1.04
Labour (header wages)	3 500	0.88	7 000	1.37
Selling/movement permit	1 500	0.37	1 500	0.29
En-routefines/unofficial payments	0	0	1 500	0.29
<b>Total cost</b>	<b>401 000</b>	<b>100</b>	<b>509 300</b>	<b>100</b>
<b>Revenue from sale of one cattle</b>				
Cattle selling price normal season		480 000		700 000
Gross Margin at normal season		79 000		190 700
Gross margins % of sales		16.5		27.2

### 4.7.3 Butchery operators and meat shop owners

Owners and operators of butchery/meat shops act as a bridge between traders and consumers.

As for the previous actors, butchery operators incur costs, which include the costs of purchasing beef cattle, holding pen fee, slaughtering fee, market fees, meat transportation fee and movement permit (Table 13). However, the highest cost was that of purchasing a live animal, which represented about 94.86% of the total costs followed by labour cost, which comprised 1.98% of the cost. The other of the costs were less than one percent (>1%) each, as shown in table 14.

**Table 12: Costs for butchery/meat shop operators**

Item	TZS per cattle
Purchasing price for live animal	480 000
Market fee	3 000
Transportation cost from market to slaughtering area	2 000
Holding pen fee	2 000
Slaughtering fee	5 000
Meat transportation fee from slaughtering area	4 000
Labour (Meat seller)	10 000

The analysis shows that operators of butchery/meat shops have a daily average GM of TZS 306 000 as shown in Table 14.

**Table 13: Gross margin for operators of butchery/meat shops**

Item	TZS/head	% of total cost
Purchasing price (live animal)	480 000	94.86
Market fee	3 000	0.59
Transportation from market to slaughtering area	2 000	0.40
Holding pen fee	2 000	0.40
Slaughtering fee	5 000	0.99
Meat transportation fee from slaughtering area	4 000	0.79
Labour (meat seller)	10 000	1.98
<b>Total costs</b>	<b>506 000</b>	<b>100.00</b>
<b>Revenue from one cattle</b>		
Carcass 200 kg @4000	800 000	
Head	7 000	
Hide	4 000	
Legs	10 000	
<b>Total revenue</b>	<b>812 000</b>	
Gross margin	306 000	
Gross margin as percent of sales	37.7	

Overall, the largest share of gross margins was earned by butchery and meat shop owners who generated an average gross margin of TZS 306 000 per day. These were followed by traders who fattened their beef cattle before selling and earn an average gross margin of TZS 190 700 per cattle. The latter would transport their trading stock and sell at the terminal market of Pugu (in the city of Dar es Salaam) three times a year on average. The study identified that, most of the fattened cattle are transported to Pugu terminal market. Of all the actors in the value chain, pastoralists earned the least, average gross margin of TZS 295 000 per cattle at less than 300kg live weight for a period of 4 to 5 years.

#### **4.8 Constraints Identified During the Study by the Respondents**

The respondents identified several constraints that are hamper efficient operations of the beef cattle value chain in Mwanza region (Figure 5). These constraints are:

**i) The issue of price discrimination**

Price discrimination especially to rural producers (Magu District) ranked the first. The current cattle marketing system in the study areas is dominated by middlepersons, locally known as *Wagalagaja*, who discriminate producers by offering low prices to their cattle taking advantage of producers' limited access to market information.

**ii) The issue of pasture and land tenure**

Inadequate pasture and feeds as well as land tenure issues were prominent in the urban settings (Ilemela District). This is influenced by the rapid population growth in the region.

**iii) Unreliable supply and quality of inputs**

Unreliable supply and low quality of inputs were observed to originate from counterfeiting by unscrupulous dealers. Problems also exist in the input market; particularly regarding subsidized drugs that do not reach the targeted producers.

**iv) High cost of inputs**

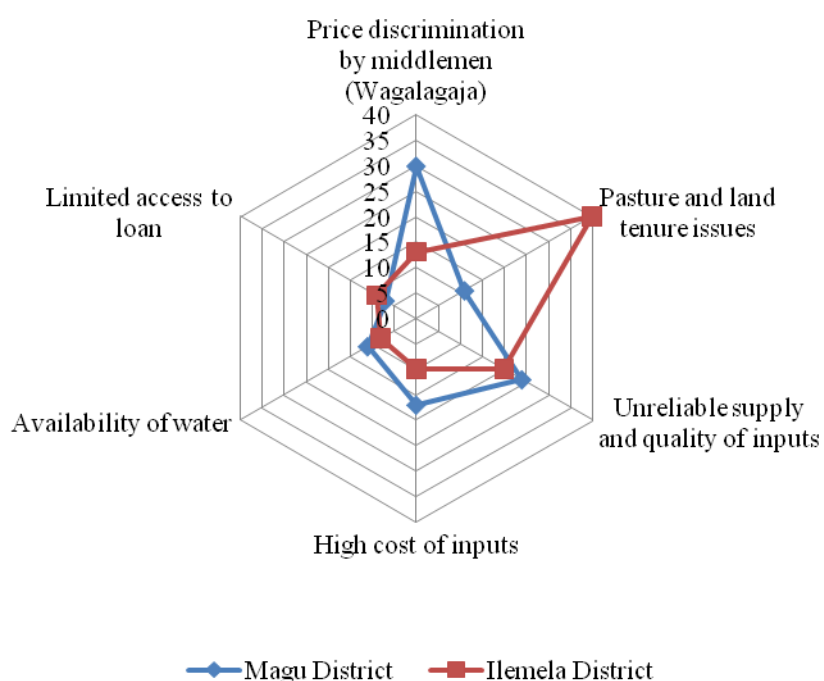
Of all costs in raising cattle, treatment costs were the highest costs. Stockiest purchase the drugs at low prices and sell at a high prices to farmers, again taking advantage of their ignorance on the actual price for subsidized inputs (drugs).

**v) Availability of water**

During the survey, it was established that water availability was the prominent problem in both Magu and Ilemela Districts. Cattle keepers face the problem especially during the dry season.

#### vi) Limited access to loan

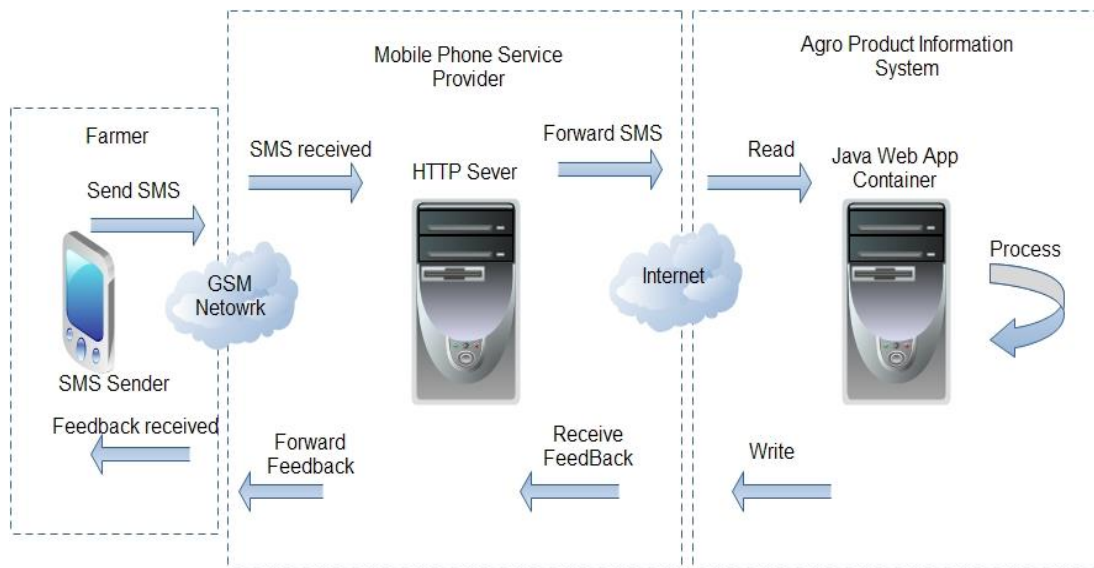
Loan accessibility is very low, as no livestock keepers was reported to have any access to credit and only few cattle fatteners were able to get loans as shown in figure 5.



**Figure 4:**  
**Challenges in the beef cattle value chain in Mwanza region**

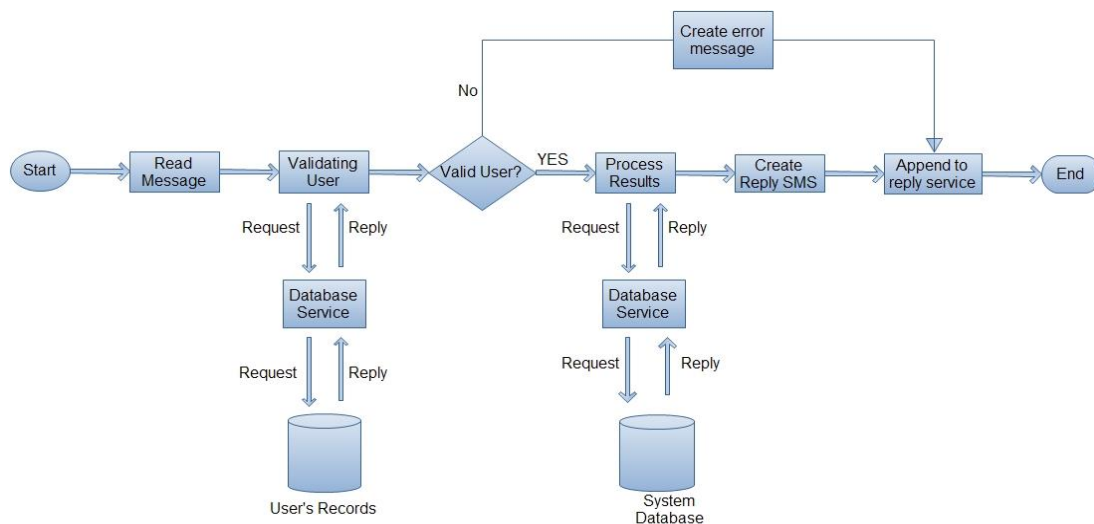
#### 4.9 Development and Procedures of the “e-Ng’ombe” Information System

An electronic mobile phone ICT system dubbed the “e-Ng’ombe” System was developed as one of the value chain innovating/upgrading strategies. The “e-Ng’ombe” system will be used to deliver queries and any vital information between the information provider and beef cattle producers. The querying and receiving information will be through mobile phones using both the “pull” (farmer requesting specific information, e.g. prices of drugs) and “push” methods (government providing information to producers, e.g. availability of inputs to registered farmer). The sending and receiving of SMS using the system will follow the steps shown in Figure 6.



**Figure 5: The e-Ng'ombe architecture**

The overall sending and receiving SMS in the proposed system will be carried out in the following five(5) steps, which are also shown in, Figure 7.



**Figure 6: The e-Ng'ombe processing algorithm**

Specifically the system will:

1. Undertake a continuous check for SMS (via its server).

2. Verify a user from the database of users (registered users).
3. Process user's request (keywords will be updated depending on the available information service). The query should entail words, which match with the key words in the system, otherwise the system will send an error message.
4. Added to message sending service to the message-sending service, and
5. Send relevant feedback to the user.

#### **4.10 The Main Functions of the e-Ng'ombe System**

- i) **Registering the farmer:** respective farmer will send a registration message to the system and receive feedback whether registered successfully or failed with reason for failed registration.
- ii) **Farmer requesting for specific information:** Allows the farmer to query the system about specific information such as price of livestock drugs, current market price of a given type of cattle etc. by sending relevant message to the system.
- iii) **Broadcast information to all registered farmers:** Allow information provider (MLDF, primary and secondary beef cattle markets) to broadcast livestock input information, or any other relevant information to all registered farmers.

#### **4.11 The e-Ng'ombe Beneficiaries**

##### **4.11.1 Registering the Farmer**

For a farmer to register himself/herself to the system has to send the message in the following format to the system sever short code.



“Sajili role district region” i.e. each word is separated by a single space.

### **Key**

**Sajili:** is the key work for system registration service.

**Role:** is the role of the registration user e.g. farmer/producer, extension officer, beef cattle buyer etc. each role will have its specific keyword.

**District:** The district where the user resides or performs his/her role.

**Region:** The region where the user resides.

Example ,“sajili mfu magu mwanza” where mfu used as the keyword for the role as a cattle keeper/producer.

NB. The registration message can contain any other information that will be needed and found relevant to the scope of the system.

#### **4.11.2 Farmers requesting for specific information**

For a farmer to request the system about specific information he/she has to send the message in the following format to the system server short code.

Message format: “item\_keyword item\_name criteria\_searched”.

### **Key**

**Item\_keyword:** is the keyword for what the type of item farmer wants to request the system e.g. Drugs, price of beef cattle, each item type will have its own keyword.

**Item\_name:** the name of a particular item type e.g. If its drug, then what specific drug the farmer is asking for?

**Criteria\_searched:** what specific information does the farmer wants about the searched item e.g. Price or market where the item is available.

Example, “dawa para price”, means the farmer request for item type “dawa” which is drugs, and the specific type of drug he/she is looking for is paranex presented as “para” as the keyword, and the farmer interest is the price of this drug.

#### **4.11.3 Broadcast information to all registered farmers**

The government or any other authorized user can send any information of interest to all registered users, or users that meet certain category e.g. users of certain districts, region or role. Therefore, the system through the mobile phone will be used as a media to deliver any necessary (qualitative) information to the users timely.

However, to do so, the system administrator log in and open SMS broadcast service where he/she specify recipient of the message and what message to broadcast to them.

#### **4.12 The e-Ng’ombe Challenges**

As for any other ICT pilot projects, the e-Ng’ombe is not a challenge-free system. Challenges exist including that of the system to serve as a “pro-poor tool”. Available evidence shows that most of the services (and almost all of the paid services) are accessed by comparatively well off farmers (World Bank 2011a; Richardson, 2009).

Such farmers are often early adopters of new technologies because they have the ability to pay, take risks, and are more educated.

Secondly, there is possibility that if the SMS message is not provided in farmers' vernacular or local languages, farmers may have more difficulties in interpreting the message and responding to it. This may be pronounced in areas where literacy is low.

Thirdly, there is the challenge of scalability. Evidence elsewhere in the literature suggest that most market information services use ICT only in pilot projects with difficulties of making the service sustainable (Robertson, 2012; World Bank, 2011a). Sustainability of the ICT will largely depend on financing the development and refreshing of core datasets by stakeholders, which in turn will depend very much on whether users benefit from the technology. Even if the cost of developing and operating the ICT system is covered by the government or a donor, users must still derive greater value from the system than their cost to use it.

Fourthly, there challenge of realizing the potential impact of the system. Available evidence for piloted ICT system suggests that their impact is not yet clear, especially in terms of pinpointing exactly who benefits. For example, groups who may benefit the least are rural women, who already have limited access to new technologies.

Fifthly, there is the challenge of creating an appropriate environment for the system to work. The environment surrounding the smallholder farmers in developing countries is not always enabling, preventing them from converting "information" to "benefits". It is worth noting here that the messages, staff, and other critical resources to be invest

in the provision of communication service or data collection all cost money. This may necessitate the use of additional incentives, like free airtime, to make farmers participate or subsidize the costs of the messages that they are asked to send.

Lastly, rural people mostly live sparsely and this would make provision of infrastructure and public utilities such as electric power and some devices of modern ICTs very difficult to deploy in rural areas. In addition, provision of ICT services would require electricity, which is limited in most places of rural Africa. In effect, the combination of these constraints would result in what Aker (2008) calls “a digital divide” between the urban and rural areas.

However, all these challenges notwithstanding the e-Ng’ombe ICT, being a demand-driven communication technology might be successful. Its development process is participatory and hence welcomes support from different stakeholders, including the government. The “e-Ng’ombe” ICT is a problem solving tool – it is neither anecdotal nor a showcase as Robertson (2012) clarifies: “...Successful ICTs .... are never showcases for technology but are solutions to a pressing problem facing the community. Second, they tend to be based on improving user’s access to a service or an asset rather than providing ownership. Third, they tend to be managed to ensure availability of services to all stakeholders in a community by providing equitable access to information resources, such projects avoid exacerbating social, political, and economic inequalities in the community. Fourth, they tend to be designed with a view to sustainability, either as public services or as private enterprises. Last, they operate in comparatively well-regulated environments”



## **CHAPTER FIVE**

### **5.0 CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Conclusion**

Descriptive statistics, PVCA and gross margin were used to analyze the data collected from the study sites. SDLC was used to develop the e-Ng'ombe system as the way of addressing the pitfall of information asymmetry in the study areas. Analytical methods were meant to identify differences between actors with their key functions/roles, market access, opportunities and linkages within the value chain and come up with a tangible solution to upgrade the value chain.

##### **5.1.1 Value chain map**

Mapping of the beef cattle value chain enabled the identification of actors from production level to the final consumption of the cattle products. Cattle producers were reported to be the most important actors in the chain as they play an important role in raising an animal to a point that is ready to be harvested. Middlemen were also reported to be predominant in the study area and act as a bridge between cattle producers and traders. By using the advantage of limited access to market information middlemen discriminate producers by offering low prices to cattle and sell at profit to traders. This is the reason why pastoralists in the study area do not consider livestock keeping as a business/commercial enterprise but merely the way of keeping wealth (informal banking) for cushioning difficulties during times of economic shocks (shortage of food, disease, loss and damage of physical properties, need for school fees etc). This calls for tailor made campaigns and training to sensitize them to treat

livestock keeping as a business. This should be carried out alongside with the sensitization of producers to set aside animals for sale, at least a few animals for sale in a year, fatten them using locally available feeds and produce animals of good quality which will earn them good money. Upgrading the beef cattle value chain and accessing potential and niche markets also requires that pastoralists keep and sell livestock that are free from diseases. This is particularly important because food safety requirements are currently at the forefront of most foreign markets, especially in developed countries, trying to protect their consumers.

Access to extension services by agro-pastoralists is also equally important as it is through these visits that animal health and production related problems can be identified by the extension officers and solved together with livestock keepers. The extension agent is also an important link to research. Closely related to access to extension service is the access to credits: to become commercial, pastoralists need tailor-made lending institutions or arrangements.

Finally yet importantly, the need to strengthen the vertical integration of livestock farmers, meat processors, and traders needs not be overemphasized. This requires that more strategic action steps are taken, especially by TMB to bring together stakeholders who can articulate their needs and jointly get to build solid business relationships and a better organization of the chain.

### **5.1.2 Gross margin**

Overall, the largest share of gross margins was earned by butchery and meat shop owners who generated an average daily gross margin of TZS 306 000. These were followed by traders who fattened their beef cattle before selling and earned an average gross margin of TZS 190 700 per cattle. The latter usually transports their trading stock and sell at the terminal market of Pugu (in the city of Dar es Salaam) three times a year with an average stock of 25 cattle per trip. Of all actors in the value chain, pastoralists earned the least, average gross margin of TZS 295 000 for a period of 4 to 5 years. This calls for a tailor made technology to motivate to continue producing and provide enough knowledge farmers/producers to consider livestock keeping as an enterprise. The e-Ng'ombe is expected to be one of the tools to frequently disseminate information on the importance of the cattle industry.

### **5.1.3 Value chain upgrading**

An electronic mobile phone ICT system dubbed the “e-Ng'ombe” has developed for trial in Ilemela and Magu Districts in Mwanza region, Tanzania. The system is intended to help tackling the problem of information asymmetry in line with our fundamental hypothesis that the introduction and use of appropriate ICT by actors at different nodes of the indigenous beef cattle VC is likely to add value to the beef products and upgrade the VC.

However, the study also realizes the fact that developing and testing an ICT is one thing; important is the creation of a “right environment” and ‘right package’ for the ICT to realize its potential. Emerging lessons from pilot projects elsewhere in



developing countries where ICT is being used for MIS show that despite the benefits that farmers glean from using the ICTs, many challenges remain, especially the challenge creating the “right environment” and ‘right package’ for the ICT to work. Put different this implies making the “right investments” at the “right time” and “right place”.

For example, investment funds are needed for knowledge transfer (like teaching farmers how to use new ICT tools or applications); changing consumer behavior and supporting farmers in accepting new mediums of information. In extreme cases, infrastructure investments may be needed, especially where mobile operators and telecommunications industries may not be willing to extend networks to rural areas if it is not profitable. Financial and human resources are also needed to update the system database. Quality data and reliable service provision are important because they set the groundwork for long-term viability of ICTs.

At times, these investments may necessitate engagement in public-private partnerships. Provision of marketing information is by large and foremost a public good, but public-private partnership may go a long way in realizing immense ICT impact. In line with this is the need to invest resources into the creation of functional farmers’ organizations. Working with farmers’ associations may not only help the ICT service providers to gain trust and support from farmers but will also help to enhance usability and financial stability.

## **5.2 Recommendations**

Based on the findings of the study, the following recommendations are suggested for the improvement/upgrading of beef cattle value chain, especially pastoralist actors who earn less GM than their counterparts.

### **5.2.1 Recommendations to the beef cattle value chain actors**

Cattle keepers should be encouraged to form associations/cooperatives that can possibly amplify their bargaining power through collective mechanism. Collective bargaining mechanism can make associations be able to increase negotiation power in setting cattle selling price and not only depend on middlemen (Wagalagaja). This is because farmers acting individually become quite impossible to influence the price paid by traders.

### **5.2.2 Recommendations to the policy makers**

There is a need to develop well-functioning information systems that are accessible and can efficiently reach the widely dispersed livestock producers with information on animal and meat prices, buyer preferences, input supply and demand levels within different region of Tanzania. The e-Ng'ombe system will be the model for this recommendation. The cattle keeper needs to possess only a mobile phone of any type.

Pastoralist should be sensitized on the production of market oriented cattle production and the benefits of wealth storage diversification through workshops. The use of electronic systems like e-Ng'ombe used be encouraged as they can deliver information to farmers timely and at low-cost. Farmers should be trained to keep

animals for commercial purposes than keeping them for many years and get less return when they tend to sell the animal at old age.

To reduce credit access difficulties in the value chain, special credit and guarantee schemes both by banking and microfinance sector and the government agencies are required.

There is a need for investment in areas such as improvement of road networks, transport systems, building water catchment areas like dams, creating credits/loans to cattle farmers and setting up modern market infrastructure (i.e. weigh stations and slaughter slabs/abattoirs) through increased public investment.

### **5.2.3 Recommendations for further research**

Although this study suggested the use of ICT to improve beef cattle value chain, by developing an electronic mobile phone system dubbed the “e-Ng’ombe system”, further marketing innovations should be undertaken to other meat source livestock (Goat, Sheep, pigs and poultry) and even agricultural crops, which are also economic activities in Mwanza region and other regions in Tanzania.

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## APPENDICES

**Appendix 1: A questionnaire administered to beef cattle actors in Magu and Ilemela Districts in Mwanza region**

TITLE: INDIGENOUS BEEF CATTLE VALUE CHAIN AND MARKETING  
STRATEGIES FOR IMPROVED CATTLE RETURNS IN MAGU AND ILEMELA  
DISTRICTS

**SECTION 1. IDENTIFICATION OF PARTICULARS, STAFF AND SURVEY TIME DETAILS**

3. DISTRICT: 1) Ilemela 2) Magu				
4. DIVISION: 1) Ilemela; 2) Ndagaro; 3) Itumbili				
5. WARD: 1) Buswelu; 2) Bugogwa; 3) Shishani; 4) Nkungulu; 5) Sukuma; 6) Lubugu				
6. VILLAGE: 1) Nyamhongolo; 2) Busenga; 3) Shishani; 4) Kabila; 5) Kitongo; 6) Bubinza				
7. HOUSEHOLD CATEGORY : 1) Pastoralist 2) Beef cattle Traders 3) Butcher operators				
8. HOUSEHOLD CODE/NAME:				
9. NUMBER OF YEARS LIVED IN THE VILLAGE:				
10. SEX OF HEAD OF HOUSEHOLD:	1) Female 2) Male			

NAME OF INTERVIEWER: \_\_\_\_\_

DATE OF INTERVIEW	DD		MM		YYYY			

STARTING TIME			:			Hours : minutes

ENDING TIME			:			Hours: minutes

**SECTION 2: HOUSEHOLD'S CHARACTERISTICS**

Please, circle the appropriate numbers 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 3: FACILITATING AND LIMITING FACTORS IN BEEF CATTLE

#### PRODUCTION

		Code	Remarks
<b>PERCEPTION ON ACCESS TO EXTENSION SERVICES</b>			
3.1	Do you have access to extension services		
3.2	Quality of services		
3.3	Affordability of services		
3.4	Frequency		
<b>PERCEPTION ON AVAILABILITY OF BEEF CATTLE KEEPING INPUTS(treatment, food, diseases control)</b>			
3.5	Do you have access to inputs		
3.6	Quality of services		
3.7	Affordability of inputs		
3.8	Frequency		
<b>PERCEPTION ON LIVESTOCK HERD SIZE</b>			
3.9	Keeping large cattle herd size is a prestige		
3.10	Keeping large cattle size reduces productivity		
3.11	Keeping large cattle size causes environment degradation		
<b>PERCEPTION ON MARKETING</b>			
3.12	Markets of cattle are readily available		
3.13	Prices of cattle are satisfactory		
3.14	I only sell my cattle if I have a problem		
3.15	Agro-pastoralists have full access to the market		
<b>PERCEPTION ON ACCESS TO CREDIT</b>			
3.16	Pastoralists have full access to credits		
3.17	Credits are satisfactory		
3.18	Credits are frequently offered		
<b>PERCEPTION ON ADEQUACY OF FAMILY LABOUR</b>			

<b>3.19</b>	We need more than family labour to be able to adequately handle all our livestock activities		
<b>3.20</b>	Family labour is just enough for handling our livestock activities		
<b>3.21</b>	We are too many for the work on our farm		
<b>3.22</b>	The current family labour can accommodate more livestock activities		
<b>3.23</b>	Family labour is adequate for all our livestock activities		
<b>3.24</b>	We are too few to adequately handle all needed activities at our livestock farm		
<b>code</b>	<b>1=Strongly agree; 2=Agree; 3=Disagree; 4=Strongly disagree; 5=Don't know</b>		

#### SECTION 4: BEEF CATTLE PRODUCTION INFORMATION

<b>Q No.</b>	<b>Question</b>	<b>Answer/response</b>
<b>4.1</b>	For how long have you been keeping cattle?	
<b>4.2.</b>	What is the current size of the herd you keep?	
<b>4.3.</b>	Do you use current value of agricultural implements and tools?	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>4.4</b>	What current value of non-production items do you own	
<b>4.4</b>	What is the opinion of the family on the future size of the beef cattle production?	<input type="checkbox"/> To expand <input type="checkbox"/> To reduce <input type="checkbox"/> To maintain as it is <input type="checkbox"/> It depends <input type="checkbox"/> Other _____
<b>4.5</b>	Is the cash income you are generating from beef cattle production increasing or decreasing?	<input type="checkbox"/> Increasing <input type="checkbox"/> Decreasing <input type="checkbox"/> It varies <input type="checkbox"/> I don't know <input type="checkbox"/> Other.
<b>4.6</b>	For what purpose do you rear beef cattle?	<input type="checkbox"/> Selling <input type="checkbox"/> Farming <input type="checkbox"/> Other (specify) .....
<b>4.7</b>	Do you have livestock keepers' association?	<input type="checkbox"/> Yes <input type="checkbox"/> No

#### 4.8 BEEF CATTLE PRODUCTION ACTIVITIES AND DURATION OF CONDUCTING THEM

<b>Person ID</b>	<b>Beef cattle production activities</b>	<b>Days per week he/she involved in the beef cattle activities</b>	<b>Remarks</b>
	Grazing		
	Feed collection		
	Feeding		
	Watering		
	Cattle sales		
	Health management and care		

#### 4.9 Beef Cattle Market Information Market Condition

<b>4.9.1</b>	Is the market for your cattle readily available?	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>4.9.2</b>	Which market (NAME) do you mostly sell your cattle	
<b>4.9.3</b>	Did you sold cattle in the past 12 months in a primary market or secondary marke	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>4.9.4</b>	To whom do you sell your cattle? (Tick the correct one)	<input type="checkbox"/> Households <input type="checkbox"/> Hotels <input type="checkbox"/> Butcher dealers <input type="checkbox"/> traders/wholesalers <input type="checkbox"/> Other (specify)
<b>4.9.5</b>	What is your main source if marketing information	<input type="checkbox"/> middlemen <input type="checkbox"/> own searching <input type="checkbox"/> radio <input type="checkbox"/> television <input type="checkbox"/> others
<b>4.9.5</b>	Willingness to use advanced marketing systems	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>4.9.6</b>	At what age do you normally sell your cattle (why)	
<b>4.9.7</b>	Who determines the price at the market place?	<input type="checkbox"/> Seller <input type="checkbox"/> Buyer <input type="checkbox"/> Broker <input type="checkbox"/> Negotiation b/n seller and buyer <input type="checkbox"/> Other (specify) ----- -----
<b>4.9.8</b>	What number of live cattle do you sell per week/month/year	.....
<b>4.9.9</b>	What is your future opinion about fattening?	<input type="checkbox"/> I will do fattening <input type="checkbox"/> I won't do fattening
<b>4.9.10</b>	What problems do you face in beef cattle marketing? (Specify)....	
<b>4.9.11</b>	In your opinion, what needs to be done to improve beef cattle marketing?	

#### **4.10 COSTS IN BEEF CATTLE PRODUCTION AND MARKETING (weekly, month, biannual)**

##### **4.10.0 Production costs**

<b>No.</b>	<b>Item (period should be specified)</b>	<b>Costs</b>
<b>4.10.1</b>	Grazing	
<b>4.10.2</b>	Feeds per year 1.Pastures 2.Cotton seed cake 3.Rice Polish 4.Maize bran 5.Salt 6.Sunflower seed cake 7.other feeding costs	..... ..... ..... ..... ..... ..... .....
<b>4.10.3</b>	Transport/Trekking to markets	
<b>4.10.4</b>	Labor cost (by activity)	
<b>4.10.5</b>	Drugs/Injections	
<b>4.10.6</b>	Dipping/Spraying	
<b>4.10.7</b>	Other costs (specify)	..... .....

		.....
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**4.11.0 Marketing costs**

No.	Item (period should be specified)	Cost
4.11.1	Transport/Trekking to markets	
4.11.2	Other marketing costs	1. .... 2. .... 3. .... 4. ....

**4.12 OTHER SOURCES OF INCOME**

**4.12.1** Do the respondent engaged in crop farm. .... (1 =YES, 2 = NO)

**4. 12.2** If yes, what types of crops grown and for each crop mention down input used, output (both sold and consumed at home), and prices

Types of crops	Cost stream				Revenue (Output) stream
	Fixed cost: both Cash and non cash for machinery, equipments and building constructed as part of the crop enterprise	Year of purchased and purchasing price of equipments and buildings	Current price of those equipments and buildings	Variable Costs (on annual basis – preferably the last season). Include crop loss due to animal destruction, if any	Provide a summary of information on quantities and unit prices for the past season – use current market prices. Show total production, quantity sold, consumed and given in-kind to relatives or friend or other people – last season or for the past 12 months.

**4.13 LIVESTOCK ENTERPRISES**



Types of livestock	Cost stream		Revenue (Output) stream
	<b>Fixed or Overhead costs:</b> both Cash and Non-cash: - for machinery, equipments and building constructed as part of the ANIMAL enterprise provide additional information about year of purchased and purchasing price that year and current price	<b>Variable Costs</b> (on annual basis – preferably the last season). Include LIVESTOCK loss due to animal destruction, if any	For each LIVESTOCK product/good provide a summary on quantities produced, sold, consumed at home, given in kind and the unit prices for the past 12 months-use current market prices.
Cattle			
Goat			
Sheep			
Pig			
Poultry			

#### 4.14 OTHER ENTERPRISES NOT SPECIFIED ABOVE

4.14.1 Information on the cost and revenue stream for other enterprises not specified above, if any.

Types of enterprise	Cost stream		Revenue (Output) stream
	<b>Fixed or Overhead costs:</b> Provide information on both Cash and Non-cash for each enterprise-including investment /capital, years effected and cost of purchasing the different components of the enterprise	<b>Variable Costs</b> (on annual basis – preferably the last 12 months).	For each enterprise provide a summary of information on sales and the unit prices/rates for the past 12 months-use current market prices

**4.14.2 Allocation of family labour:** Gather information on family labour as used for enterprises above

Types of Enterprise	Allocation of family labour		Remarks
	Number of family member engaged per day	Number of family member engaged per month	

#### 4.15 SALARIES AND WAGES

4.15.1 If the respondent or member of his family is permanently or temporally employed by any firm/company/agency/organization provide information on monthly salary/wage and number of days or months worked for the past 12 months.

Type of work	Name of household member involved	Amount Earned Last Month (Tsh)*	Amount Earned Past Year (Tsh)**	Place of Work	Remarks
Wages – Seasonal					
Wages – Regular					
Salary					

\*Enter earnings for past month. For regular pay this should equal daily pay x number of days worked per month

\*\*Enter earnings for year up to date of interview. For regular earnings, this should equal monthly x 12

#### 4.15.2 What is the herd structure of your livestock?

(Give numbers in each category for cattle and its respective price per cattle)

	Mature cattle				Young cattle			
	Breeding females	Breeding males	Non Breeding males	Non Breeding females	Heifers	Bulls	Heifer calves	Bull calves
Total								
Price per cattle								

**4.15.3 Please indicate how many of each of the following assets does your household has?**

Asset	Number	Current value (TAS)
Total number of houses		
Houses with metal roofs, burnt bricks, and cement floor		
Houses with metal roofs and burnt bricks		
Houses with metal roofs only		
Radio		
Bicycle		
Ox ploughs		
Ox cart		
Pairs of oxen		
Improved dairy cows		
Goats		
Local non-oxen cattle		

4.15.4 Does anyone in your family owns a mobile phone (specify who?)

*Thank you for your time and cooperation*

## Appendix 2: Questionnaires for beef cattle traders

### SECTION 5.0: Beef marketing information and market condition

No.	Question	Answer
5.1.	What is the source of beef cattle you sell?	[ ] Livestock keeper [ ] Ranches [ ] Other (specify)
5.2	Who are your main customers?	[ ] Households [ ] Hotels [ ] Butcher dealers [ ] Other (specify)
5.3	What number of live cattle do you sell per week/month/year?	
5.4	What type of cattle do you prefer to buy for fattening?	
5.5	What problems do you face in beef cattle marketing? (specify)....	.....
5.6	In your opinion, what needs to be done to improve beef cattle marketing?.....	.....

### 5.7 Income source during last week/month /year

Activity/business line.	Quantity sold		Selling price per cattle		Total Revenue
	Fattened cattle	Non fattened	Fattened cattle	Non fattened	
Beef cattle (Live cattle)					
Other (specify)					

### 5.8 Cost in beef cattle marketing

Costs	Non fattened cattle	Cost for fattened
Cattle 300kg (purchasing price)		
Market fee		
Movement permit (buying)		
Transportation (Buying)		
Feeds		
Herders wages (labour)		
Treatments		
Food		
Movement permit (selling)		
Transportation (Selling) to Pugu		
Other costs (specify)		

**5.9 Cattle price (current value of your herd structure)**

	Mature cattle				Young cattle			
	Breeding females	Breeding males	Non Breeding males	Non Breeding females	Heifers	Bulls	Heifer calves	Bull calves
Fattened cattle								
Buying price								
Non fattened cattle buying price								
Fattened cattle selling price								
Non fattened cattle selling price								

**5.10 Other activity performed besides beef marketing**

5.10.1 In addition to beef cattle as a source of income what other important type of activity /activities do you perform to increase your income (specify).....

5.10.2 What is the average income from non-beef cattle marketing activities per week/month/year.....

**Thank you for your time and cooperation**

### Appendix 3: Questionnaires for butchery operators/meat shops

#### Section 6: Marketing information and market condition

6.1	Do you slough animals (cattle)?	1.Yes 2.No (Tick one)
6.2	What is the source of beef you sell/slough?	Mention source.....
6.3	What quantity of beef do you sell per week/month/year?	.....kgs
6.4	..How much do you pay to suppliers for this lot?.....	.....Sh/kg
6.5	Who are your main customers?.....	1.Households 2.Hotels 3.Tourist 4.Other (specify)
6.6	What price do you charge per unit? a. Steak .....Sh/kg b. Mixed.....Sh/kg. c. Liver.....Sh/kg d. Other(specify).....Sh/kg	Sh/kg
6.7	What problems do you face in beef marketing? (specify)....	..... ...
6.8	In your opinion, what needs to be done to improve beef and cattle marketing?.....	

#### 6.9 Income/Revenue sources

Beef and beef products sold last week	Number sold in kg	Unit price	Total revenue
Beef cuts			
Fillet steak			
Steak			
Mixed			
Other (specify)			

**6.10 Other activity performed beside beef marketing**

6.10.1 In addition to beef cattle as a source of income what other important type of activity/activities do you perform to increase your income (specify).....

6.10.2 What is the average income from non-beef marketing activities per  
Week/month/year.....

**6.11 Costs in beef marketing**

	Item	Cost
	Cost of purchasing cattle	
	Cost of purchasing beef in kg	
	Transport	
	Storage facilities	
	Electricity	
	Advertisement	
	Labour costs/salary	
	Rent	
	Market dues	
	Slaughter fee	
	Other costs 1.....	
	2.....	

*Thank you for your cooperation*