CONSTRAINTS IN PEARL MILLET MARKETING IN TANZANIA:

THE VALUE CHAIN APPROACH

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ABSTRACT

Pearl millet marketing in Dodoma Region is constrained by various factors most of them are empirically unknown. In order to effectively invest in value addition and marketing the society needs to look at the value chain and spot and lessen constraints that hamper growth of a sustainable market. This study aimed at unlocking the constraints facing pearl millet marketing in Tanzania. Specifically the study aimed at examining pearl millet production and marketing challenges, to assess factors influencing its production and marketing and establish factors for improving pearl millet market performance along the value chain. The cross - sectional research design was conducted by interviewing a total of 166 respondents. Primary data were collected through observation, focus group discussion and the use of structured questionnaires. The data were analysed by using Statistical Package for Social Sciences computer software. Gross margin and Post hoc LSD tests were employed to determine production and marketing challenges of pearl millet; The results showed significant ($p<0.05$) influence in value addition of pearl millet at different node in the chain, this suggest that, an increase in value attached to the produce/product have emanated from different marketing functions performed by value chain actors. Furthermore, linear regression model was used to assess factors influencing production and marketing of pearl millet, the results indicated that pearl millet profit in the chain was significantly ($p<0.05$) associated with grain quality, level of processing, promotion activities, market distance and access of market information. This suggests that, marketing factors were important in influencing pearl millet value addition and marketing along the chain. Based on econometric analysis results, it is recommended that Pearl millet marketing problems can be alleviated through linking farmers to the market and improvement of: road infrastructures, production and processing, credit provision, farmers' motivation and promotion of pearl millet products.

DECLARATION

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

_____   _____

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(Supervisor)

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DEDICATION

This work is dedicated to my beloved wife Mrs. Yasintha Charles, my daughter Elizabeth Gabriel and my son Laurent Gabriel for their true heartfelt love and care they shown to me throughout my study period.

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LIST OF ABBREVIATIONS AND SYMBOLS

ACT	Agriculture Council of Tanzania
APP	Average Purchasing Price
ASP	Average Selling Price
ATC	Average Total Costs
ATPC	Average Total Production Costs
BTC	Belgium Technical Cooperation
CI	Concentration Index
CTAHR	College of Tropical Agriculture and Human Resources
DFID	Dependent for International Development
DSM	Dar es Salaam
ECA	East and Central Africa
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statistics
FGM	Farmers' Gross Margin
GDP	Gross Domestic Product
GM	Gross Margin
ICRISAT	International Crops Research Institute for the Semi-Arid Tropical
IFPRI	International Food Policy Research Institute
IIRR	International Institute of Rural Reconstruction
KIT	Royal Tropical Institute
MAC	Ministry of Agriculture and Cooperatives
MGM	Middle Man Gross Margin
MM	Marketing Margin

MAFC	Ministry of Agriculture, Food Security and Cooperatives
MPP	Middleman Average Purchasing Price
MSP	Middleman Average Selling Price
NSGRP	National Strategy for Growth and Reduction of Poverty
PGM	Processor Gross Margin
PPP	Processor Average Purchasing Price
PSP	Processor Average Selling Price
RGM	Retailer Gross Margin
RPP	Retailer Average Purchasing Price
RSP	Retailer Average Selling Price
SACCOS	Saving and Credit Cooperative Societies
SGR	Strategic Grain Reserve
SPSS	Statistical Package for Social Sciences
SSE	Error Sum of Square
TAIP	Tanzania Agriculture Input Partnership
TC	Total Cost
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
URT	United Republic of Tanzania
USAID	United States Agency International Development
VC	Variable Cost
VIF	Variable Inflation Factor
WGM	Whole Seller Gross Margin
WPP	Wholesaler Average Purchasing Price
WSP	Wholesaler Average Selling Price

CHAPTER ONE

1.0   INTRODUCTION

1.1   Background Information

Millet is a cereal crop belonging to the grass family Graminae. Pearl millet (*Pennisetum glaucum*) is the most widely grown type of millet, in Africa and the India subcontinent since prehistoric time (FAO, 2010). Pearl millet is the seventh most important cereal crop globally, and an important coarse grain food crop in Africa and South Asia (ICRISAT, 2005). The crop in particular, is critically important for food security in some of the world's hottest, driest cultivated areas (FAO, 1996). Thus it is a staple grain for about 90 million people living in the Semi-Arid Tropical Regions of Africa and the Indian sub-continent (Gulia *et al.*, 2007). The market for food staples remains central to many agricultural-based economies because staple foods constitute such a major share of household food expenditures (IFPRI, 2008).

India, Niger, Nigeria, Sudan, Mali, Burkina Faso and Senegal are the major countries contributing to world pearl millet value chain which account for 28 million ha of area production with an output of 21.8 million tonnes (Murty *et al.,* 2007). The United State of America pearl millet value chain has been historically centred for forage and cattle grazing (FAO, 2000). On the other hand, Sub-Saharan Africa annually produces about 13 million tons to the world millet value chain (FAO, 2003). But the important area that contribute to pearl millet value addition in East and Central Africa (ECA) falls within low agricultural potential, low market access, and low population density (Omamo *et al.,* 2006).

In Tanzania particularly in areas where rainfall is scarce, small household farmers are engaged in pearl millet value chain. They produces over 200 000 tons of pearl millet per year. The crop is the fourth most widely grown cereal grain crops in the agricultural economy (Rohrback and Kiriwaggulu, 2007). Pearl millet is important for food security in the central high plateau comprising Singida and Dodoma regions of Tanzania (Monyo *et al.,* 2002). Lack of a major well developed cash crop for the region is at the root cause of region's poverty (URT, 2003).

The main challenges that limiting wide scale pearl millet production and marketing along the chain include: poor production systems, weak management practices, inadequate equipment availability, low developed marketing channels, lack of base price for pearl millet and poor grain storage infrastructure (Gulia *et al.,* 2007; Janick and Whipkey, 2007). In addition, poor infrastructures lead to small amount of grain enters the market, and most of sales occur between neighbouring households in the value chain (Minde and Mbiha, 1993). Furthermore, the main factors which appear to limit value addition of pearl millet at milling industry level are uncertain demand, non-availability of grain, thin markets and poor grain quality (Rohrbach and Kiriwaggulu, 2007). The problems of grain availability, cleaning and processing, along with uncertainty regarding consumer demand place pearl millet at a distinct disadvantage relative to maize (Rohrbach, 2004).

In addition the processing of millet is complicated by the necessity of removing the outer skin (or hull), of the grain before milling can take place. Entrepreneurs in the rural areas are not only unaware that this technology exists but also lack the knowledge to utilize it (Acquah, 1997). Therefore access to processing technology could help to provide new market opportunities by increasing shelf life and/or adding value (Kindness and Gordon, 2001). The crop is seen to be an excellent feed for swine and other birds including dove,

turkey, song-birds and ducks. Being gluten-free, marketing opportunities for the crop exists in the health-food outlets (Gulia *et al.,* 2007).

Pabuayon and Medina (2007) argued that linking farmers to markets and supporting value adding activities can raise their income and thus provide incentives for improving their management practices toward greater farm productivity. However by examining the market chain, it is possible to determine how value adding and marketing activities take place, who performs and benefits from these, and what are the constraints that need to be over come by those who desire to benefit from value addition (Pabuayon *et al.,* 2009).

The value chain approach ensures that rather than one problem, a whole range of inter-connected problems from production to consumption is addressed (ACT, 2007). This include identifying critical constraints to improved market performance, alleviation of constraints, smallholder commercialization and its contribution to growth level of market participation, policy choices and identification of innovative ways to link public funding with private sector resources (Moldova, 2010). This study examines the various impediments to pearl millet marketing and provides the window of opportunity on how to alleviate the pearl millet marketing constraints through the concept of value chain that pearl millet value addition can increase the market performance and facilitate farmers to capture high value markets in the pearl millet chain.

1.2   Problem Statement and Justification of Study

In Tanzania most of pearl millet grain trade is between neighbouring households. Small quantities of grain move from few farmers with a surplus to the majority of farmers experiencing production deficits. There is relatively little long-distance trade in pearl millet (Rohrbach and Kiriwaggulu, 2007). Although pearl millet is the staple food crop in

Dodoma, its commercial utilization is limited to very few uses, the main uses are porridge, stiff porridge and local brew. On other developments, pearl millet grains are also used to make pancake and vitumbua (Mwanga, 2002). According to Monyo *et al.* (1998), the vegetative part of pearl millet is used for livestock feed. But the potential of feed industry has not yet been exploited probably because maize is readily available. Laswai *et al.* (1999) reported that Pearl millet milling industry is growing very slowly because the crop cannot compete with other cereal crop such as maize which is a commercial food product.

Previous study found that, Tanzania produces over 200,000 tons of pearl millet per year (Rohrback and Kiriwaggulu, 2007) but less than 2% of pearl millet annual harvest enters the formal market and the remainder is consumed on the farm, yet it is difficult to explain why limited quantities of pearl millet are marketed in Tanzania (Rohrbach *et al.*, 2007). For example in the year 2000, other African country like Zimbabwe utilized 75 tons of pearl millet as animal feeds and 30 tons of the produce in brewing (Rohrbach, 2004). On the other hand the second National Strategy for Growth and Reduction of poverty (NSGRP II, 2010) shows that, an increasing food demand from the neighbouring countries indicates an increased opportunity for Tanzania to exports food to these countries.

Various studies have been conducted on pearl millet such as increasing utilization of sorghum and millet based food in Tanzania (DFID, 2010), adoption of improved technologies for sorghum and pearl millet production in Dodoma central part of Tanzania (Mwanga, 2002) and commercialization prospects for sorghum and pearl millet in Tanzania (Rohrbach and Kiriwaggulu, 2007). But none of these concentrated on pearl millet value chain approach. Here little is known about pearl millet value chain in

Tanzania. Value chain analysis provides an opportunity for improving or adjusting activities undertaken within a particular link, in addition value chain analysis enhances the effective interactions between actors through the identified points of intervention in order to bring about increased market efficiency and thereby increase total general value (Kaplinsky and Moris, 2000).

1.3   Objective of the Study

1.3.1   General objective

The main objective of the study is to evaluate the constraints in marketing of pearl millet in the value chain.

1.3.2   Specific objectives

Specifically the study is intended to

i.   Identify pearl millet production and marketing challenges along the value chain.

ii.   Asses factors influencing production and marketing of pearl millet in the value chain.

iii.   Establish factors for improving market performance of the pearl millet in the area of study.

1.4   Hypothesis

$H_{01.}$ Pearl millet marketing functions performed by various chain actors has no significant influence on pearl millet value addition and marketing.

1.5   Description of Study Area

The study was conducted in Dodoma Region. The region, lies between latitude $4^o7'$ and $7^o21'$ South of the equator and also between longitudes $36^o43'$ and $35^o5'$ East of Greenwich (URT, 2003). It has an area of 41 311 km^2, most part of the region is semi-arid due to low and erratic rainfall this lead to adoption of drought resistant crop such as pearl millet. According to MOAFS (2007), Dodoma Region take the lead in production of pearl millet (111.9 tonnes) followed by Singida (37.0 tonnes) in the year 2001.

Bahi District Council is predominantly rural with about 98.6% residing in the rural areas. The major economic activities in the District are subsistence farming and livestock keeping which altogether contribute 88.5% to the district council Gross Domestic Product (GDP). Agriculture alone contributes 41% of district GDP. The district has an area of 378 207 square kilometres, which is suitable for agricultural activities. But out of 542 844 hectares of arable land, only about 164 637 hectares are used for crop production. Crops such as sorghum and millet (drought resistant crops) are grown all over the district.

The majority of the people still use poor and primitive farming methods and implements, such as the use of traditional hand hoes to till the land. Agriculture is characterized by low productivity due to unfavourable weather; low and erratic rainfall, high rate of evapo-transpiration and low moisture holding capacity of the soils. These conditions coupled by poor farming methods, poor technology, overstocking and overgrazing, create favourable conditions for soil erosion, land degradation and hence poor productivity and poverty situation prevails.

1.6 Organization of the Dissertation

This dissertation is organized into five chapters. Chapter one presents introduction, background information, general objective and problem statement and justification of study. Chapter two present literature reviews where pearl millet production trend, production challenges, marketing challenges, factors influencing marketing and value addition and econometric models are presented. In chapter three, research methodology is explained. Chapter four, results and discussion and testing of hypothesis is presented. The last chapter present conclusion and recommendation.

CHAPTER TWO

2.0   LITERATURE REVIEW

2.1   Definition of Terms

The concept of value chain analysis is essential in providing the valuable information to improve market efficiency and thus increase total generated value. According to Porter (1985), the value chain is defined as "the amount buyers are willing to pay for what a firm provides". The author visualizes the value chain as the combination of nine generic value added activities operated within affirm that work together to provide value to customers." The nine generic value added activities are divided into two main areas; the primary and the support activities. The primary activities are five which are: inbound logistics, operating activities, outbound logistics, marketing and sales activities and service activities. The support activities are four which are firm infrastructure, human resource management, technology development and procurement (Porter, 1985).

In addition Mackay *et al*. (1997), defined value chain analysis as the study of a full range of activities which are required to bring the product or services through intermediates' phases from production to final consumers. Moreover value-addition is simply the act of adding value to a product, whether you have grown the initial product or not, it involves taking any product from one level to the next (CTAHR, 2005). But according to Sturgeon (2001), value chains have three dimensions, namely organizational, spatial and the type of actors involved. From the organization aspect, value chains are both complex and dynamic or simple depending on their sustained supply of a variety of critical inputs that is, human resource requirements, capital equipment and services. The second dimension is spatial which involve some value chains that are global and are sometimes referred to as 'global commodity chains' (Daviron and Gibbon, 2002), because they operate at

international levels. The third dimension is the production actors in the value chain; these involve the firms that participate in the chain. This actor can either be producers (in the case of agricultural production value chain), supplies, retailers/wholesalers or lead firms (Sturgeon, 2001). Market efficiency is defined as the measure of the availability of the information to all participants in a market, which provides maximum opportunities to buyers and sellers to effect transactions with minimum transaction costs (Wiley and Booth, 2007). Moreover, Fama (1970) defined an efficient market as one in which prices always 'fully reflect' available information.

2.2   Pearl Millet Production Trend

India, Niger, Nigeria, Sudan, Mali, Burkina Faso and Senegal are the major countries contributing to world pearl millet value chain which account for 28 million ha of area production with an output of 21.8 million tonnes (Murty *et al.,* 2007). Pearl millet value chain in the United State of America has been historically centred for forage and cattle grazing (FAO, 2000). In Brazil, it is estimated that over 2 million ha are committed into pearl millet value chain under "no till systems" (Murty *et al.,* 2007), moreover Pearl millet is an important alternative crop in the Cerrado areas of the Central part of Brazil (Reddy *et al.,* 2000). Recent statistics reveal a decline in millet area, production and consumption in the primary millet growing regions of India during the rainy season, largely due to competition from other high-value crops such as maize, cotton and soybean (Nagarajan *et al.,* 2006).

Sub-Saharan Africa annually produces about 13 million tons to the world millet value chain (FAO, 2003). But less than 5% of Africa annual production of pearl millet is commercially processed by industry (Rohrback, 2004). The area where pearl millet is important in East and Central Africa (ECA) falls within low agricultural potential, low

market access, and low population density (Omamo *et al.,* 2006). But the precise figures on pearl millet production in African developing countries are normally not easy to obtain, because few statistics distinguish pearl millet from other millet botanical species while some countries combine millet figures with (FAO and ICRISAT, 1996).

In addition Pearl millet is the second most important cereal crop in Eritrea cereal crop value chain, which is practiced mainly by small farmers in low lands and mid lands (Paul *et al.,* 2006). Pearl millet is grown commercially in South Africa as a forage grass but none of this grain is commercially processed while in Zimbabwe annually produces about 45 000 tons of pearl millet but only small quantities of it is used for beer malt and animal feed (Rohrbach, 2004).
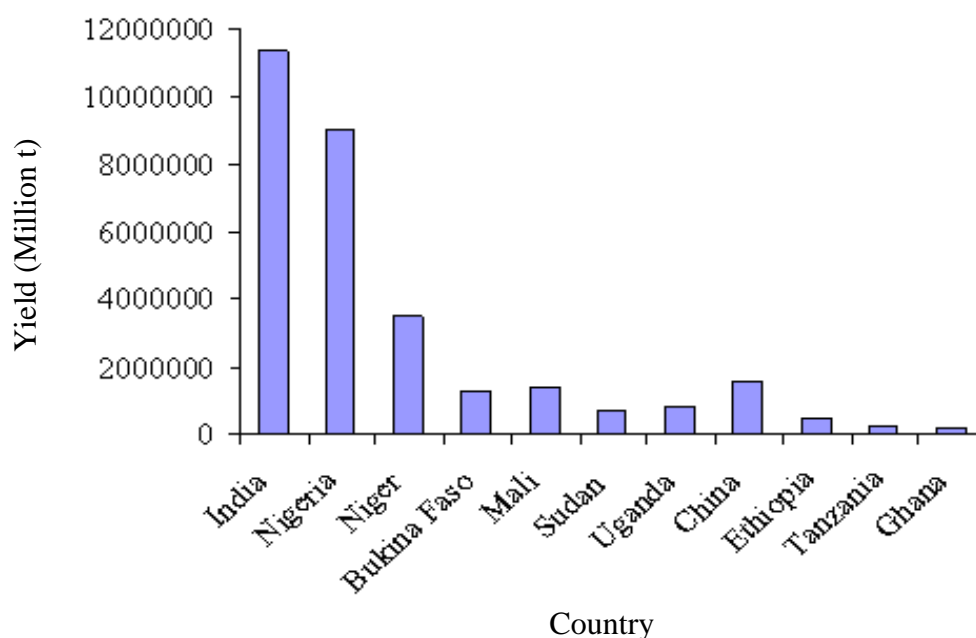
Figure 1: Production of millet in different countries during 2008
Source: Hays (2011).

In Tanzania particularly in areas where rainfall is scarce, small household farmers are engaged in pearl millet value chain, they produce over 200 000 tons of pearl millet per year (Rohrback and Kiriwaggulu, 2007). The crop is the fourth most widely grown cereal grain crops after sorghum in the agricultural economy (URT, 2012). However the United Republic of Tanzania (URT, 2009) reported that production of millet and sorghum decreased substantially by 80.9 percent in the year 2009 compared to an increase of 8.7 % in the last year of 2008.
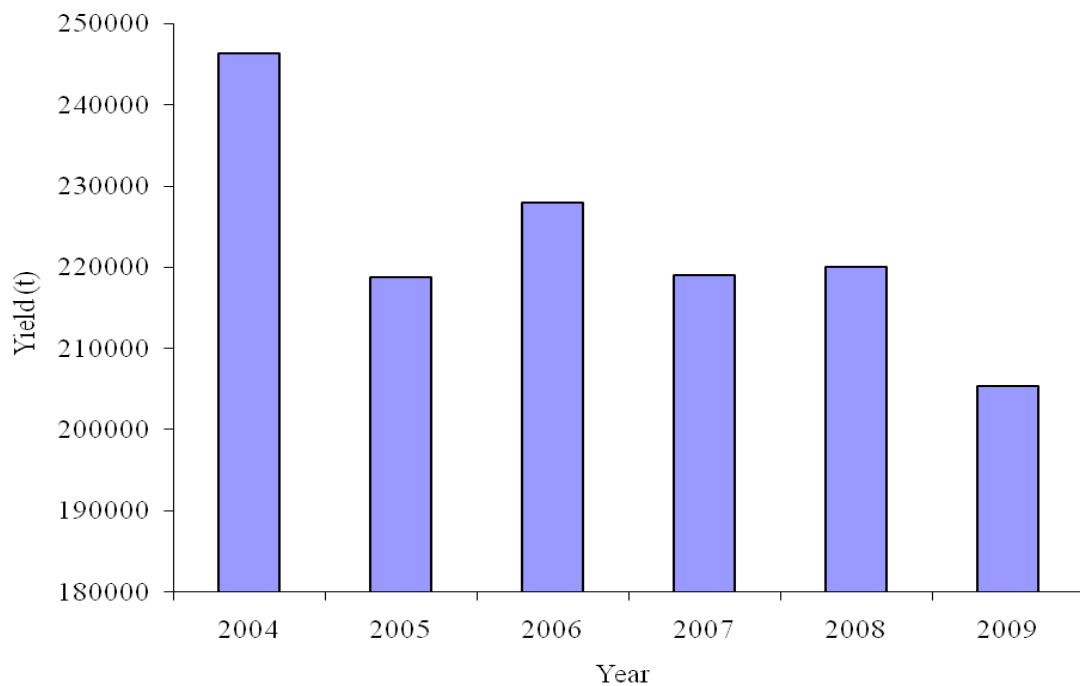
Figure 2: Millet production trend in Tanzania
Source: FAOSTAT (2009).

According to URT (2012), Dodoma Region take the lead in production of pearl millet among other regions in Tanzania during the year 2007/8 of the production season. In general however, the level of commercial utilization of pearl millet appears to depend more on the size of the commercial food and feed economy than the level of crop production (Rohrbach, 2004).
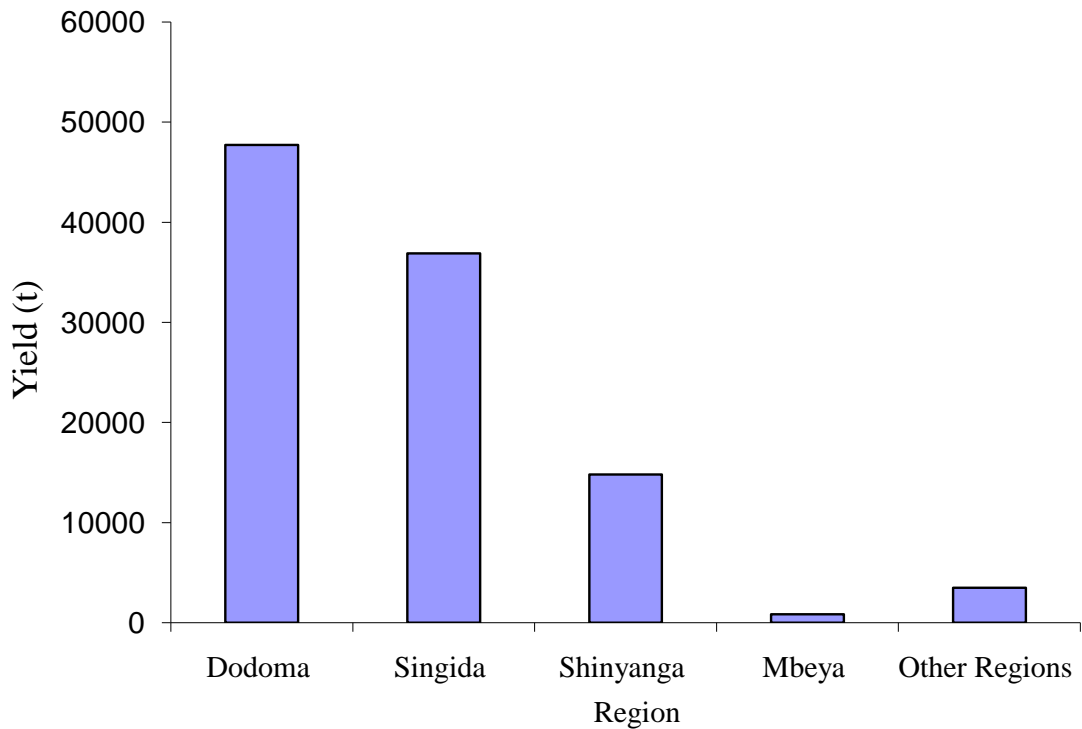
Figure 3: Pearl millet production by regions in Tanzania - 2007/8
Source: URT (2012).

2.3 Pearl Millet Price

The millet market is very difficult to plan because of its small size, the unknown volume of unrecorded trade and uncertainties regarding supply and demand. (Kajuna, 2001), this is because the market of millet has not been fully established (UOG, 2012). However continuous price data for millets is missing in most of African countries in the region (FAO, 2004). In addition the published data do not distinguish between various species of millet (Rohrbach, 2004). People in villages are not directly sensitive to pearl millet market prices, since most of them imagine they have pearl millet for free (Leporrier *et al.*, 2002). Moreover, prices received for the product can vary according to the value perceived by the consumer (UOG, 2012).

For example, the opaque beer industry of Zambia tends to offer intake prices for pearl millet that are marginally lower than those for maize (FAO and ICRISAT, 1996). Generally; prices are usually lowest immediately after good harvests and increases as stocks get depleted (FAO, 2004). The average producer price of pearl millet in Namibia has been around N$1.70 per kg to the grower, which is comparable to farm level prices of pearl millet in Sahelian West African Countries (Sattar *et al.,* 2003).

2.4   Pearl Millet Production Challenges

Producing a value-added produce as well as providing related services along value chain follows a sequence of activities (Pauw and Thurrlow, 2011) such as production, processing, marketing and distribution (Cowan, 2002). This creates a challenge in each step of a production network (Pauw and Thurrlow, 2011). The main challenges that limiting wide scale pearl millet cultivation along the chain include:

2.4.1   Thin market

The pearl millet marketing channels in the value chain are fragmented and poorly developed (Janick and Whipkey, 2007) such that prices of pearl millet in the market chain decline as newly harvest starts to supply the markets (FAO, 2011) this can be attributed by the fact that, producer of pearl millet in the chain is also the consumer (Gill and Turton, 2001). Furthermore stover of the crop is sometime not having a market to an extent that farmers had to burn their stover in the field due to lack of marketing facilities (Kumar *et al.,* 2010). In addition marketing uncertainty, faced especially by smallholders, dampens production incentives, and contributes to stagnation of the crop output in the chain (Coulter and Onumah, 2002). Therefore thin market is the main dis-incentive, which enforces farmers to produce at subsistence level along the value chain (Mwanga, 2002).

2.4.2   Drought

Climate change resulting mostly from global warming has been among the major causes of reduced agricultural production and productivity in many parts of Africa, including East Africa (Salami *et al.,* 2010). Pearl millet is mostly grown in drought region where rainfall is low and erratic (Murty *et al.,* 2007). The low and sporadic rains during early season significantly interfere with the crop establishment while at the end of the season will adversely affect grain formation all of which lead to low value addition in the chain (CAC, 2010). Moreover, drought lower production of grain yields of unimproved cultivars of pearl millet in the chain (Rai *et al*., 1999).

2.4.3   Inadequate agricultural inputs

Pearl millet farming is mainly practised by resource-poor smallholder farmers (FAO, 2008; Erbaugh *et al.,* 2010). Due to that reason there are several inefficiencies that exist in the production, supply, marketing and utilization of machines and equipment, these inefficiencies distort the production process and limit their chances of maximizing value addition along the chain (Oni, 2011). The scope of area cultivated is limited to type of equipment used in cultivation (Acquah, 1997; Kumar *et al*., 2010). Such that farm operations from land clearing to crop harvesting and processing are carried out by simple hand tools such as hoe, cutlass, axe, sickle and other local farm implements which are inefficient in creating value along the chain (Ismaila *et al.,* 2010; Oni, 2011). Pearl millet input demand by farmers in the value chain is very low, this is because farmers have got no culture of buying inputs for these crops, most farmers cannot afford to buy inputs instead they rely on local technology and seed recycling (Mwanga, 2002). Therefore the traditional implements and tools used in production process adds less value in the pearl millet chain (Kumar *et al.,* 2010).

2.4.4   Hybrid varieties availability

Most seed value chain actors play multiple roles including varieties development, inspection and certification, seed production, processing, marketing and provision of extension services along the chain (Erbaugh, 2010). But the quantities of new varieties released remain small relative to farmers requirements, few farmers have access to these varieties and the distribution networks required to get this improved seed into the hands of most farmers remain extremely limited (Rohrbach and Kiriwaggulu, 2007; Kumar *et al.,* 2010). However, in most of Africa countries there is no commercial seed market (Gill and Turton, 2001). Yet little agricultural research is performed on products (Mwanga, 2002; Kremer and Zwane, 2003). As a results the use of certified improved seeds for this crop appears to be low which leads to low value addition and marketing of pearl millet in the chain (Muliokela, 2005 and Larson *et al.,* 2006 cited by Erbaugh *et al.,* 2010).

2.4.5   Inadequate extension services

A prosperous production system requires that the entire value chain functions well, a weak or missing link can reduce the intended benefits or undermine the viability of the whole crop value chain (Dararath, 2011). The accessibility of information and the sources of such information have been one of the essential factors affecting adoption of important innovations among farmers in the chain (IFOAM, 2003). The linkages between research, extension and training within the value chain are weak and there is limited collaboration between public and private partners (Salami *et al.,* 2010). On the other hand, several studies have shown that in many developing countries, Sub-Saharan Africa in particular, there is persistent under investment in research and development and weak research capacity, both of which continue to undermine the crop marketing and value addition in the chain (Ragasa *et al.,* 2010). Therefore varied extension services are needed to help

farmers remain competitive and profitable, diversify production, produce for niche markets, and move to higher-value products and more value-added production (Oladele and Tekena, 2010).

2.4.6 Lack of capital

Most traditional farms have inadequate capital for the purchase of costly inputs such as farm machinery, fertilizer, herbicide and pesticide which contribute to low production in the value chain (Ismaila *et al.,* 2010; Kumar *et al.,* 2010). Less than one per cent of commercial lending in Africa goes to agriculture, moreover, most of the loans to the sector go to large scale farmers, leaving smallholder farmers underserved in the value chain (Keeler, 2009). The main reason for the lack of interest of commercial banks to lend to agriculture is the risky nature of agriculture activities (Salami *et al.,* 2010). However, government inefficiencies in supporting the agriculture sector and the tendency of microfinance institutions to charge high interest rate some times up to 100 % interest on trading activities lead to insignificant allocation of credit to smallholder farmers (Keeler, 2009).

2.4.7   Inadequate knowledge and skills in production

The small scale pearl millet producers lack appropriate production knowledge and skills which is required to add value in pearl millet value chain (Reddy *et al.,* 2008; Tijani, 2009). For example pearl millet farmers do not follow optimum sowing time due to lack of knowledge and experience this practice has a negative effect in the pearl millet value addition and marketing (Kumar *et al.,* 2010). In addition farmers select pearl millet panicles after harvest which they use as seeds in the next season, this practice lead to low value addition in the chain (Roden *et al*., 2007). Moreover Traditional implements and

tools used in production process add less value in the pearl millet chain (Kumar *et al.,* 2010).

2.4.8   Pests and diseases

Pests and diseases prevalent can cause considerable yield losses of pearl millet along the production chain (Janick and Whipkey 2007). For example, moulds, rice moth, triboliumconfusum and rodents are the main pests that have been observed to deteriorate the quality of pearl millet grains (Thomas and Mpofu, 2013). In addition biotic constraints, such as downy mildew are among the most destructive disease causing severe economic losses; other minor diseases affecting pearl millet are smut, ergot and rust (ICRISAT,   2002a). Moreover, at household level the pearl millet grains are commonly stored in traditional granaries, where pests' infestations normally occur (Thomas and Mpofu, 2013). This reduces the quality of yield of pearl millet in the chain (RSA, 2011). Hence fetches low price in the market (NAAS, 2012). On the other hand Crop risk management options such as pesticides and crop insurance in the value chain are limited (Janick and Whipkey, 2007).

2.5 Pearl Millet Marketing Challenges

For most products, relatively simple value chains focus on getting a product to market (whether that market is domestic or international), from this perspective, the challenges are to achieve low transaction costs, push volumes of product to the market and sell them, and reduce losses from waste; One typical competitiveness goal is to increase quality and service within the value chain and to offer customers a desirable, higher-value product or service (Webber and Labaste, 2010). Moreover Constraints to the commercialization of pearl millet include: low levels of productivity relative to commercial grain substitutes, high grain assembly and marketing costs, high processing costs, and the lack of familiarity of

commercial food and feed processors with these crops (Rohrback, 2004). Bellows are the challenges facing pearl millet marketing:

2.5.1 Low demand of pearl millet

In low-income, low-growth, agriculture-dependent countries of Africa, urban food demand is marked by the low purchasing power of most consumers, and by a strong proximity of the consumers with their traditional foods, related to their diverse social and ethnic backgrounds (Bienabe *et al.,* 2006). Problems among others include poor prices and inadequacy of market demand for the processed products, as a result, the small-scale agribusiness entrepreneurs are compelled to sell on loan, a debt which later turns-out as bad debt (Ja'afar-furo *et al.,* 2011). The limited quantities of pearl millet currently used by Tanzania's food and feed industries reflect both a lack of familiarity with these crops and uncertainty about consumer demand (Rohrbach and Kiriwaggulu, 2007).

2.5.2 Lack of market

Pearl millet tends to be grown in outlying areas, far from urban-based agro-industry this contribute to underdevelopment of pearl millet market which is shown by reduced trading volumes and high trading costs (Gulia *et al.,* 2007). The transactions take place mainly in rural markets near areas of production and between neighbouring households with very little traded beyond these areas (Minde and Mbiha, 1993; FAO, 2008). This is because there is no formal market for pearl millet grain (Keyler, 1995 cited by Matanyaire, 1998). Farmers are not well connected to markets, so their production is not well tailored to what the market needs (KIT *et al.,* 2006). This lead to unstable market for pearl millet in the chain, this is because chain actors are not making money in the process of production, storage and utilization (Gulia *et al.,* 2007).

2.5.3   Low consistency of quality

Processors usually complain about contamination of pearl millet grain with sand, stones and other cereal grains (ICRISAT and FAO, 1996). This is because pearl millet produce are not properly cleaned, graded and dried before they are brought to the markets, (NAAS, 2012). This emanate from farmers' common practice of threshing the grain on the ground, and then sweeping the threshed produce into grain bags ready for marketing (ICRISAT and FAO, 1996). Though greater efforts have been geared towards improving the grain yields but very little attention has been taken to improve the grain quality this is probably because the grain quality criteria for millet are less well known (Thomas and Mpofu, 2013). Such that some farmers select pearl millet panicles after harvest which they use as seeds in the next season, this is a poor practice because most farmers are unable to identify the best performing plants (Roden *et al.,* 2007). This practice leads to low quality of grain in the chain (Rai *et al.,* 1999)

2.6   Factors Influencing Pearl Millet Marketing

According to Jari and Fraser (2009), Marketing of agricultural produce in the value chain is influenced by number of factors, these factors has been described as poor infrastructure, lack of market transport, lack of market information, insufficient expertise, use of grades and standards, inability to conclude contractual agreements and poor organizational. The following are factors among others which influence pearl millet marketing along the value chain.

2.6.1   Poor infrastructures

Market infrastructure, including the process of grain assembly and transport, is not well developed in many pearl millet production zones, though in some areas were roads are in good shape, farmers and traders are not oriented toward delivering large quantities of

grain to the national market which leads to low value addition; Market deliveries are also constrained by nationwide flooding and poor road infrastructure which impaired value addition (Rohrbach and Kiriwaggulu, 2007). Therefore poor infrastructures causes little grain to enter the market, as a result most of sales occur between neighbouring households in the value chain (Minde and Mbiha, 1993).

2.6.2 Market information

Smallholder farmers face enormous constraints in physically accessing markets in the chain, they lack information about markets, business, negotiating experience and a collective organization to give them the power they need to interact on equal terms with other larger, stronger market intermediaries in the value chain, this lead to poor terms of exchange and little influence over what they are offered in the market (Heinemann, 2007). Furthermore value chain actors are often poorly informed, Buyers have limited information about inventories held by rural farmers who also lack access to price information from local or regional markets, and are often unable to process complex price-sensitive information when it is available (Fafchamps, 1996).

2.6.3 Price of the pearl millet produce/products in the chain

The market for agricultural commodities has shown a pattern of long-term price falls and short-term price instability (DFID and ODI, 2004). Producers and traders in most developing countries lack the means to mitigate price risk, they also faces difficulty in enforcing contracts and uncertainty concerning government policy, in addition they lack institutions and instruments to manage price and other risks, this affects their income and ability to repay loans (Coulter and Onumah, 2002). The major constraint limiting industrial use of pearl millet grain is the lack of a consistent supply of good quality pearl millet grains at a competitive price (INTSORMIL, 1996). Therefore the market prospects

for pearl millet in the chain are less favorable given the generally higher price for this grain and lower average yields (Rohrbach and Kiriwaggulu, 2007).

2.6.4 Weak policy

Pearl millet production trend is declining due to government policies which have increasingly favoured maize; Common interventions involved massive campaigns to grow maize, guarantee prices and provide market infrastructure, this policy bias has made maize popular even in areas where the soil and climate favours pearl millet (Hamukwala, 2010). The lack of pearl millet market is facilitated by high taxes imposed on pearl millet produce through village levies and city tax, including low Government effort to seek external markets for pearl millet; In addition there is unnecessary bureaucracy of Strategic Grain Reserve (SGR) and other buyer for purchase of grain for National reserves (Mwanga, 2002). On the other hand Small-scale farmers, may have difficulties in making the transition to a more commercial food system because of quality and safety standards set by food processors, large retailers, wholesale buyers and exporters, and at the same time they are constrained by limited support services provided by government due to policy reforms, market liberalisation and governance problems (Estelle *et al.,* 2004).

2.6.5 Taste and preferences of the consumers in the value chain.

The decline in per capita consumption of pearl millet both in rural and urban areas is due to several factors but the most important ones are: an increase in per capita income, growing urbanization, changing tastes and preferences (Radhakrishan, 2005). The stagnation in consumption trend of pearl millet is affecting all pearl millet growing countries (Basavaraj *et al.,* 2010). However in lower-income urban areas, surveys reveal that consumers are concerned about the social stigma attached to the purchase of pearl millet as an inferior cereal grains (Rohrbach and Kiriwaggulu, 2007). Furthermore, urban

consumers want food products that deliver convenience, taste, texture, colour and shelf-stability at an economical cost; upscale millet products that meet these requirements are usually not available in urban areas (Reddy, 2013).

2.7 Factors Influencing Pearl Millet Value Addition

The value added to pearl millet from the variety development to commercial seed distribution includes yield potential, drought tolerance, shorter growing period, performance under poor soils, grain size, grain colour which is the most preferred one by the consumers (Erbaugh *et al.,* 2010). There are four main factors which appear to limit value addition of pearl millet at milling industry level; these factors are uncertain demand, non-availability of grain, thin markets and poor grain quality (Rohrbach and Kiriwaggulu, 2007). On the other hand, Otieno and Mwangola (2006) noted that, the constraints inhibiting the growth of Africa's food industry include: inadequate agricultural, industrial and economic policy, weak integration between agriculture, manufacturing and trade, poor demand stimulation, inability to adapt to the increasing sophistication of international markets including the development of new packing materials, lack of inter-sect oral integration between large and small enterprises, low level of domestic sub-contracting, inadequate infrastructure, debt service burden, inflation budget deficits and import dependence of industry. The discussed below are some of the factors influencing pearl millet value addition along the value chain:

2.7.1 Low technology

The agriculture production process include bush clearing, land preparation, sowing of seeds, and other post-planting operations all of which the farmer's present hand tools can do little to add value along the chain; This is because hand tool has low work rate efficiency and it is tedious work and can barely produce enough to feed the family;

With hand tool technology, farming has remained an occupation untouched by Chain actors (Asoegwu and Asoegwu, 2007).

Processing of pearl millet along the value chain involves threshing, dehulling and grain grinding (Mwanga, 2002). But threshing and winnowing of pearl millet which is carried out manually is a laborious and time consuming chore, this lead to low value addition in the chain (Rohrbach and Kiriwaggulu, 2007; Paul *et al.,* 2006). According to Lazaro (1999) less effort is employed in processing and utilization of the crop. As a result Less than 5% of annual production of pearl millet is commercially processed by industry (Rohrback, 2004).

Furthermore post − harvest technology storage, processing and distribution is in a poor state and the number of processed products is very limited, Farmers are forced to sell their produce when prices are lowest because of a combination of problems of processing and financial leverage (UNIDO *et al.,* 2010). For example, Zimbabwe annually produces about 45 000 tons of pearl millet but only small quantities of it is processed to make beer malt and animal feed (Rohrbach, 2004).

2.7.2   Inadequate capital

Lack of financial institutions to offer substantial amount of loans to the food industry processing sector in the country still remains as one of the big obstacle; while lack of advanced technologies to support production processes require huge initial capital investment of which farmers has limited access (Ruteri and Xu, 2009). This is because the marketing system has little capacity to channel credit to farmers (Jones, 1996 cited by Kindness and Gordon, 2001). Local financial institutions also provide small loans at high interest rate between 20% and 30% for banks and sometime high in savings and credit

cooperative societies (SACCOS) which cannot be feasible for food processors (Ruteri and Xu, 2009). Moreover, in rural areas, capital markets are often incomplete, with virtually no possibilities to save money with interest and borrowing money usually comes at a high cost, this limiting the opportunity of rural households to borrow money for investments in processing agriculture commodity (Meijerink and Roza, 2007).

2.7.3 Low level of production

Recent statistics reveal a decline in millet area production and consumption in the primary millet growing regions; this could be largely due to competition from other high-value crops such as maize (Nagarajan *et al.,* 2006). In addition the growing of millets without using agrochemicals and lack of proper control of birds has resulted in low yields (Laswai *et al.,* 2000). The relative underdevelopment of the pearl millet market translates into reduced trading volumes and high trading costs, which is facilitated by the fact that pearl millet tend to be grown in outlying areas, distant from urban-based agro-industry (Janick and Whipkey, 2007). Therefore weak managerial expertise, lack of product differentiation, including poor marketing practices and strategies has limited the potential contribution of the farmers to realizing the objectives of value addition (UNCTAD, 2010).

2.7.4 Low accessibility of land by farmers

The uncertainties regarding land tenure, land distribution and the inadequate access to land have been a critical challenge to smallholder farming (Salami *et al.,* 2010), low inherent soil fertility and low nutrient input due to high rainfall variability is another constraint hindering pearl millet farming practices along value chain (ICRISAT, 2002b). On the other hand, low yield of pearl millet at farmers level in the value chain is attributed by farm small size, improper sowing time and sowing depth, inadequate soil moisture at sowing time results in poor germination and thereby poor crop stand, use of

inadequate, imbalance dose of fertilizers specially the phosphatic fertilizes by farmers does not make possible to fetch potential yield along the chain (Kumar *et al.,* 2010).

2.7.5 Market functions

Market functions is a term that involve the institutions, organizations and enterprises participating in a market and their functions performed by those participants in the chain (Crawford, 2006). The activities performed in the chain are the exchange functions (buying, selling, wholesaling and retailing), physical functions (transportation, storage, processing, packaging), and facilitating functions (sorting and grading, financing, market intelligence, and various forms of market promotion). These functions add value to the product as indicated by the increasing prices when products move from lower to higher stages of the market chain; in addition the marketing functions create place, time, form and possession utilities that provide satisfaction to consumers; performance of these activities involves costs for the use of intermediate inputs and investment goods and payment of return to those who perform those activities (Anderson and Hall, 1914). If chain actors are not satisfied with the reward relative to the value they have contributed in the value chain they are unlikely to stay committed (Billings *et al.,* 2004). Moreover Omole (2009) noted that, market functionality is found to be influenced by mode of transport, consumers' income, markets distance, location and item(s) on sales among others.

Many farmers have little bargaining power vis-a-vis traders; They often lack market information, they do not know who the other players in the market are, what happens to their produce after they sell it, or what types of products consumers want, so they may not know how much their produce is really worth, and how much more they might earn if they were to transport it to the nearby town rather than sell to the trader who arrives at the

farm gate, instead they are often involved only in producing the crop, and not in processing it to add value (KIT *et al.,* 2006).

The combination of problems pertaining to pearl millet marketing function such as grain assembly and its availability, cleaning and processing, along with uncertainty regarding consumer demand place pearl millet at a distinct disadvantage relative to maize in cereal value chain (Rohrbach, 2004). In addition, threshing of pearl millet is a tedious job, and the way how is carried out it encourages contamination with sand (Laswai *et al.,* 2000)**.** Though there are multiple markets for pearl millet in the value chain, coordinated market activities are still lacking, farmers are independently identifying and protecting their "personal" markets, with limited opportunity for expansion (Janick and Whipkey, 2007). In Namibia for example, millet is a major crop, but no formal marketing system is in place, there are few milling services; customer's own grain for home use on the one hand and the processing, packaging and marketing of any local surplus on the other; The milled grain may either be bought by the processor or accepted as payment in kind for service milling; the marketing of any surplus is constrained by access to packaging materials, the delivery of the product to the market, and the securing of payment; (Acquah, 1997). Therefore Farmers in the chain not only lack an understanding of the market functions but also do not control the terms on which they participate in the value chain (KIT *et al.,* 2006).

2.8 The Empirical Model

Regression analysis is the determination of a statistical relationship between two or more variables; in simple regression for example, independent variable is the cause of the behaviour of another dependent variable (Kothari, 2004). According to Alma (2011), regression is one of the most commonly used statistical techniques in research studies.

Joshua (2008) used regression analysis to asses factors that affect small-scale wheat production in Karatu District, the result found that total wheat yield at farm level was associated with farm size and amount of working capital. Moreover, Philip (2001) used regression analysis to examine factors (farm size, education level and access to credit and extension services) which affect farms' profitability; his result showed that, size of the firm and access to credit has positive effect on profitability of enterprises. This study also involved many variables (Pearl millet grain quality, processing, market distance, market information access and promotion) that influence pearl millet production, processing and marketing hence linear regression model was employed to examine the factors influencing pearl millet value addition and marketing.

According to Greene (2002), the generic form of the linear regression model is

$$Y = f(x_1, x_2 \ldots x_n) + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$= \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + \varepsilon$$

Where:

Y = dependent or explained variable (regressand)

$x_1, \ldots, x_n$ = are the independent or explanatory variables (regressors or covariates)

ε = error term

Drawbacks of regression analysis include multicollinearity, heteroscedasticity and autocorrelation (Gujarati, 1988; Maddala, 1988). However Cross-sectional data and production data that have been used in the study are likely to suffer from heteroscedasticity and multicollinearity problems (Joshua, 2008). To contend with this situation in the study, relevant tests were performed to ascertain that the basic assumptions governing linear regression procedure were not seriously violated (Rweyemamu *et al.,* 2003).

2.8.1 Problems of multicollinearity

Multicollinearity is a term that refers to correlation among the independent variables in a multiple regression model; it is usually invoked when some correlations are "large," but an actual magnitude is not well-defined (Wooldridge, 2000). Mendenhall *et al.* (2005) noted that when two or more of the independent variables are correlated, it is difficult to assess their respective individual contributions to the reduction in error sum of square (SSE), the sum of square of deviations between the observed and the predicted values of Y. Wissmann *et al.* (2007) observed that, the presence of dummy variable and the choice of reference category causes multicollinearity problem in research study. However, Joshua (2008) noted that, the commonly used diagnostic statistics for multicollinearity are the Variable Inflation Factor (VIF) and tolerance measures, the latter are based on the multiple correlation approach, variables that have a low tolerance indicate presence of multicollinearity.

In addition, as a general rule of thumb a VIF value of 10 is held as a 'threshold' beyond which presence of multicollinearity can be considered as a problem (Nair *et al,.* 2009). On the other hand Makindara (2012) noted that, the problems of multicollinearity encountered during his study of sorghum chain analysis in Tanzania, was solved by running the data under robust mode, the findings showed that, farm size and seed variety used are statistically significant at one percent level of significant influencing the probability of sorghum producing farmers to attain a GM of 30% or more.

2.8.2 Problems of heteroscedasticity

Regression disturbances whose variances are not constant across observations are heteroscedastic; Heteroscedasticity arises in numerous applications, including the use of

cross-section data (Greene, 2002). In addition, heteroscedasticity problem occurs when the error variance is not constant; this dilemma obscures analysis because many methods in regression analysis are based on an assumption of equal variance (Baharuddin *et al.,* 2011). Moreover the presence of heteroscedasticity leads to one main problem that the ordinary least square estimators can not provide minimum variance though still linear and unbiased; Which makes the ordinary least squares estimators unreliable, this means that the variance will be large leading to small t-values; the small values associated with large variance leads to frequent rejection of explanatory variable parameters than necessary (Gujarati, 1995). According to Joshua, 2008 the problem of heteroscedasticity in data analysis arouse through the use of regression analysis when regressed socio-economic factors that affected small-scale wheat production versus farmers' yield of wheat in Tanzania, the problem was contended by adoption of natural logarithm transformation of the variables, the results revealed that there was positive relationship between amount of working capital and farmers' wheat yield.

CHAPTER THREE

3.0   MATERIAL AND METHODS

3.1   Conceptual Framework

Conceptual framework is defined as a network of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena of study (Jabareen, 2009). According to Scarborough and Kydd (1992), the frame work has to show the most important area to focus limited resources and to ensure that data collected are relevant to the objective of the research. In General the process of conceptual frame work development was guided by objectives of study. The general objective of the study was to evaluate the constraints of pearl millet marketing in the value chain. The specific objective of the study were to identify pearl millet production and marketing challenges along the value chain, to asses factors influencing production and marketing of pearl millet in the value chain and to establish factors for improving market performance of the pearl millet in the area of study. Chimilila (2006) noted that, the conceptual framework illustrates market access gap and mechanisms required to bridge the market access gap to enable value chain actors to access the market. Thus the conceptual framework of this research is centred on constraints in pearl millet marketing in view of value chain perspective.

Fig. 3 shows the relationships of variables under study. The two pertinent variables (factors influencing value addition and marketing and production and marketing challenges) influence the chain participants in term of input supply, level of production, transportation, processing, consumption and market performance of pearl millet in the value chain. For example low level of technology hinders the development of pearl millet value addition and marketing in terms of poor and inadequate equipments/machines

required in production and processing of produce. In addition construction of infrastructures, such as roads, railway lines, air port and other communications infrastructures are negatively affected by low level of technology as a result weakening the market performance of pearl millet and value addition

The low level of market information access by value chain actors reduces the rate at which chain participants get markets information about price of inputs and outputs. Pearl millet farmers in rural areas lack the access of market information which include price of pearl millet produce or products and other agricultural inputs such as improved pearl millet seeds which discourages farmers to produce more as a results processors, consumers and the market as a whole are affected by low level of production.

Poor infrastructure impede pearl millet value addition and marketing in terms of high cost in accessing information, increased transportation cost of produce/products to the market while good infrastructures enable farmers and other value chain players to access on time the market particularly on purchase of inputs and sales of produce/products at low cost therefore well developed infrastructures facilitate the pearl millet value addition and marketing in the chain.

Lack of capital causes failure of most of farmers in paying for the costs of cultivating and managing a farm, this lead to low production of pearl millet in the chain. As a result the efficiency of the market decline due to low supply of pearl millet in the market. However, persistent of severe drought during production season causes most of the crops in the field to dry out hence low supply of pearl millet produce/products in the market which affect negatively the market performance of the crop. In addition, an outbreak of pests and

diseases in a farm also causes low production of pearl millet due to infestation of the crops by pests and diseases.

Moreover, well developed infrastructures, good government policy setup, high level of technological development, availability of capital and on time market access enhances the intensity of the process of value addition and market performance. However, the well developed market performance stimulates or fuels the input supply, raise production, improve processing and transportation system and encourage consumption of pearl millet produce/products.

Furthermore, the above two mentioned related variables have a forward and backward relationship which imply that, well developed marketing functions such as good packaging and adequate promotion of pearl millet produce and products help to solve the production and marketing challenges through addition of value which is positively perceived by the consumers hence increasing market demand of pearl millet produce/products. But if the marketing functions are less developed, it can cause a challenge on production and marketing of pearl millet because there is a less amount of value addition on produce/products than the actual amount required by the market demand. As a result farmers produce less because there is low demand of pearl millet produce/products in the market.

On the other hand, the theory of value chain acknowledges that value created at each step of the production process correspond with valuable activities/functions existing in the value chain, in addition the gains (value) emanating from activities/functions at different node in the value chain is captured by chain actors along the value chain (Porter, 1985). Therefore through applying the process of a conceptual framework analysis, described

above, to the phenomenon of pearl millet marketing constraints in the value chain leads to

theoretical framework building.

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┌─────────────────────┐                      ┌──────────────────────┐
│ Production and      │                      │    Consumption       │
│ marketing challenges:│                     │   -product forms     │
│ -lack of market     │                      │   -satisfaction      │
│ -lack of capital    │                      └──────────────────────┘
│ -drought            │                                 ↕
│ -agricultural inputs│                      ┌──────────────────────┐
│ -hybrid varieties   │                      │    Processing        │
│ -extension services │                      │   -Dehulling         │
│ -knowledge and skills│                     │   -Milling           │
│ -low consistency of │                      └──────────────────────┘
│  quality            │                                 ↕
│ -pests and diseases │                      ┌──────────────────────┐
└─────────────────────┘                      │  Transportation      │
                                             │  -place utility      │       ┌────────────────┐
                                             │  -reduced costs      │       │    Market      │
                                             └──────────────────────┘       │  performance   │
                                                      ↕                      └────────────────┘
                                             ┌──────────────────────┐
                                             │  Threshing and       │
                                             │  storage             │
                                             └──────────────────────┘
┌─────────────────────┐                               ↕
│ Factors influencing │                      ┌──────────────────────┐
│  value addition and │                      │    Production        │
│  marketing:         │                      │  -grain quality and  │
│ -Production factors │                      │  volume              │
│  (farm size, farm   │                      └──────────────────────┘
│  household size,    │                               ↕
│  farmers' income)   │                      ┌──────────────────────┐
│ - Infrastructures   │                      │   Input supply       │
│ - Technology        │                      │  -seeds, fertilizer  │
│ - Market information │                     │  and Pesticides      │
│ - Level of production│                     └──────────────────────┘
│ - Price             │
│ - Policy            │
│ - Taste and         │
│  preferences        │
│ - Marketing functions│
└─────────────────────┘
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Figure 4: Conceptual framework of pearl millet study

3.2   Research Design

The cross - sectional research design was adopted since it allows collection of data on various variables one point of time.

3.2.1   Sampling and sample size

A multistage sampling technique was adopted in the process of obtaining a sample. In the first stage two regions were purposively selected on the basis that Dodoma Region produces more pearl millet in the country (URT, 2012) and Dar es Salaam was chosen because is the main consumer market in the country (FEWS NET, 2013). Secondly, Bahi District was purposively selected based on the fact that pearl millet farmers in this area face various market constraints that impede them from participating in lucrative markets. The third stage was to select the potential pearl millet producing village which is Chiguluka village.

The population of the study included all farmers, processors, traders and consumers of pearl millet in the area of study. A sample size of eight four (84) pearl millet farmers was selected in the study. This number of farmers was calculated based on the formula given by Kothari (2004). Proportionate stratified sampling technique was used to obtain representative from farmers, processors and traders. Then farmers, processors and traders' respondents were obtained by simple random sampling from sampling frame, while random sampling was used to select consumer respondents. Therefore sampled groups and their total number of respondents in each in brackets were: Farmers (84), Processors (14), Whole sellers (5), Traders (29) and consumers (34). The entire sample size from which information was gathered amounted at 166 respondents.

Table 1: Distribution of respondents

Region	District	Group Category	Name of Village/ Market	Number of Respondents
Dodoma	Bahi	Farmers	Chiguluka village	84
	Dodoma municipal	Processors	Majengo	11
		Wholesalers	Mwembeni	2
		Traders	Majengo	7
			mwembeni	4
			Chang'ombe	3
			Chamwino	3
		Consumers	Majengo	7
			mwembeni	4
			Chang'ombe	3
			Chamwino	3
Dar es salaam	Ilala	Processors	Kariakoo	1
		Traders	Kariakoo	6
		Consumer	Kariakoo	6
	Temeke	Processors	Tandika	1
		Wholesaler	Tandika	2
		Traders	Tandika	3
		Consumer	Tandika	6
	Kinondoni	Processors	Tandale	1
		Wholesaler	Tandale	1
		Traders	Tandale	3
		consumer	Tandale	5
Total				**166**

3.2.2 Data collection

Structured questionnaire consisting both open and close ended questions were used by the researcher as a tool in interviewing for primary data collection from farmers, traders, processors and consumers in the pearl millet value chain. While a check list was used as guidance in discussion with farmers during data collection. The questions were designed to capture in depth information about pearl millet marketing constraints in the value chain. Moreover focus group discussion was used to assess the marketing constraints faced by pearl millet farmers. Other secondary data such as pearl millet yield in Africa countries and Location for Bahi District were collected from the internet and Sokoine National Agricultural Library (SNAL). These secondary data were used to supplement primary data.

3.2.3 Data analysis

The data were coded and analysed by using Statistical Package for Social Sciences (SPSS) computer software. Descriptive statistics was used to obtain means, percentages, frequencies, distribution tables, charts and graphs for analyzing social economic characteristics of respondents. Moreover quantitative and qualitative data were analysed using market concentration index, gross margin analysis, market margin analysis and linear regression model.

3.3 Analytical Model

Model refers to the mathematical expressions that, describe in some sense the behaviour of a random variable of interest (Rawlings *et al.,* 1998). A model by itself is not the real world but simply a human construct which help us to understand better the systems of the real world and predict the future outcome. The following are type of model / analytical tool used in the study:

Concentration index (CI), Gross margin, Marketing margin, Market shares, Post hoc LSD and linear regression model were used for testing the hypothesis which asserted that, Pearl millet marketing functions performed by various actors has no significant influence on pearl millet value addition and marketing.

3.3.1 Concentration index (CI)

Market concentration refers to the number and size of distribution of sellers and /buyers in the market (Pomeroy and Trinidad, 1995). The market concentration Index of sellers (as a measure of market structure) was used to determine the degree of concentration of sellers in area of study. According to Mgaya (2008) concentration ratio was applied in value chain analysis of rice marketing in Kilosa to asses the rice stockholding market

structure which influences market structure, He found that the rice stockholding enterprises exhibited the typical characteristics of an oligopolistic structure (67.67% CR). Thus in this study CI was used to describes the pearl millet market structures. Kohls and Uhl (1990) suggests that a four firms concentration ratio (CR4), that is, the market share of the larger four firms, of less than or equal to 33% is generally an indicator of a competitive market structure, while a concentration ratio of 33% to 50% and above 50% indicate a weak and strongly oligopolistic market structure, respectively. Therefore distribution of sellers in the market was measured by concentration index formula shown below:

$$CI= R/TRx100 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

Where CI= seller index of concentration.

R=Revenue accrued to all sampled farmers who sold pearl millet to the market.

TR= Total revenue accrued to all sampled farmers in the area of study.

3.3.2   Gross margin analysis

Gross margin analysis was used in this study to assess the market performance of the pearl millet in the area of study. Gross Margin (Gross Profit) is an important measure in retailing, as it give the retailer a measure of how much profit its making on merchandise sales without considering the expenses associated with operating the store (Weitz and Levy, 2001). However Gross margin profit is the difference between the annual gross income for that enterprise and the variable costs directly associated with the enterprise. Thus GM is useful for comparing profit across different enterprises and different segments along the value chain (Mendoza, 1995).

The formula used for calculating Gross margin (GM) was:

GM=TR – TVC………………………………………………………………………… (3)

Where GM = Gross margin (Tshs/kg)

TR = Total Revenue (Tshs/kg)

TVC = Total Variable Cost (Tshs/kg)

3.3.3 Marketing margin analysis

The marketing performance of pearl millet was assessed by computation of marketing margins. Market margins are the difference between prices at two market levels. Marketing margin measure the share of the final selling price that is captured by particular argent in the marketing chain (Scott, 1995). However, the term also refers to the difference between producer and consumer prices of an equivalent quantity and quality of a commodity or it may also describe price differences between other points in the marketing chain (Scarborough and Kydd, 1992). The analysis of marketing margin was computed by comparing the difference between pearl millet selling and buying prices at different trade levels. The computation employed the following formula:

$MM = P_1 - P_2$, …………………………………………………………………………… (4)

Where: MM = market margin between level 1 and 2 in Tshs per kg;

P_1 = price at market level 1, in Tshs per kg;

P_2 = price at market level 2, in Tshs per kg.

3.3.4   Market shares analysis

According to Cooper and Nakanishi (1996), defined Market share as the amount that a firm sells of its products or services in a given period and a given geographical area compared with other firms selling the same things. Agricultural producers receive a much smaller portion of the consumer's dollar than do food processors, especially those who produce brand name items. Capturing those additional dollars or adding value to farm products is a goal of many producers (Anderson and Hall, 1914). If chain members are not satisfied with their share of the rewards, they are unlikely to stay committed (Billings *et al.,* 2004).

Shares for pearl millet participants were computed using the following mathematical formulae:

Farmers' shares

$$FS = [(Fx / Rx) / \Sigma] = [(1 - MM/Rx) * 100] / \Sigma \dots\dots\dots\dots\dots(5)$$

Where FS = Farmers' share

Fx = Farmers' price of pearl millet

Rx = Retail price of pearl millet

MM = Market margin.

Σ = Sum of average shares

Middlemans' share

$$MS = [(Mx / Rx) / \Sigma] = [(1 - MM/Rx) * 100] / \Sigma \dots\dots\dots\dots\dots(6)$$

Where MS = Middlemans' share

Mx = Middlemans' price of pearl millet

Rx = Retail price of pearl millet,

MM = Market margin.

Σ = Sum of average shares

Processors' share

$$PS = [(Px /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(7)$$

Where PS = Processors' share

     Px = Processors' price of pearl millet

    Rx = Retail price of pearl millet,

    MM = Market margin.

    Σ = Sum of average shares

Wholesalers' share

$$WS = [(Wx /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(8)$$

Where WS = Wholesalers' share

    Wx = Wholesalers' price of pearl millet

    Rx = Retail price of pearl millet,

    MM = Market margin.

    Σ = Sum of average shares

Retailers' share

$$RS = [(Cx /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(9)$$

Where RS = Retailers' share

    Rx = Retailers' price of pearl millet

    Cx = Consumers' price of pearl millet,

    MM = Market margin.

    Σ = Sum of average shares

3.3.5   Linear regression analysis

Regression analysis was also used to test the same hypothesis because the study involved many variables to be examined which influences pearl millet value addition and marketing along the value chain, in order to achieve the objective, the profit of pearl millet farmers attained in the production season of the year 2009 was regressed on five independent market variables to assess the effect of the independent variables on dependent variable. The following regression equation was employed:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \tag{10}$$

Where Y = profit of pearl millet in Tshs obtained in the year 2009

β_s = Parameter to be investigated

X_1 = Grain Quality of pearl millet (X_1=1 if yes, X_1= 0 if No)

X_2 = Pearl millet processing (X_2=1 if yes, X_2= 0 if No)

X_3 = Distance from market (X_3= near, X_3= Far)

X_4 = Promotion (X_4= yes, X_4 = No)

X_5 = Market information access (X_5=1If yes, X_5=0 if No)

ε_i = Error term.

3.3.6 Expected signs of coefficient for linear regression model:

(a) Dependent variable

Profit of pearl millet in Tshs was the dependent variable. This is the value of all income generated by pearl millet farmers in the year 2009. Pearl millet yield and its respective income was presented as profit of pearl millet in Tshs/Kg. the aim was to determine factors which have influence on pearl millet household.

(b) Independent variable

Grain quality of pearl millet was expected to influence positively or negatively the profit of farmers depending on whether the quality of pearl millet grain was good or poor because good pearl millet grain fetches higher price in the market than low quality grain of pearl millet therefore the coefficient for grain quality (β_1) was expected to be either positive or negative

The coefficient for pearl millet processing (β_2) was anticipated to be positive because the pearl millet processing activities was expected to offer wide range of high quality products which fetches higher price in the market leading to more profit than selling unprocessed pearl millet produce.

Coefficient β_3 stand for distance from the market. It is expected that, market distance influences farmers' pearl millet profit negatively because when the market is located in a long distant, chain actors will spent more time in transporting pearl millet produce/products and more amount of fuel will be consumed as a result will reduce the profit due to increased costs of transportation

The coefficient for pearl millet promotion ($\beta4$) is anticipated to be positive because high level of pearl millet promotion creates more awareness of consumers about produce/products which facilitate further purchase of produce/products in the market.

Coefficient β_5 in the model stands for Market information access. It is expected that market information access influences profit of pearl millet positively or negatively because high access of market information by farmers increases the awareness of farmers about which market of higher price to sell their pearl millet which leads to more profit the

expected sign will be positive while farmers of low access to market information are expected to have less chances of selling their produce to higher price market thus the sign is also expected to be negative

CHAPTER FOUR

4.0   RESULTS AND DISCUSSION

4.1   Farmers' Household Characteristics

The characteristics of the interviewed respondents have crucial socio and economic implications concerning factors affecting pearl millet marketing performances in the value chain. Moreover, the characteristics have essential influence on decision making pertaining to issues such as production, processing, marketing and consumption trends. This section describes the farmers' household characteristics (Table 2), problems hindering production, processing and marketing of pearl millet in the value chain.

Table 2: Farmers' household characteristics (n=84)

Variables	Category	Frequency	Percentage
Age	18-35	26	31.0
	36-54	37	44.0
	>55	21	25.0
	Total	84	100.0
Gender	Male	66	78.6
	Female	18	21.4
	Total	84	100.0
Education level	Primary school	65	77.4
	Ordinary school	5	6.0
	None	14	16.7
	Total	84	100.0
Income	<200000	56	66.
	200000-399999	20	23.8
	400000-599999	3	3.5
	>599999	5	6.0
	Total	84	100.0
Market information access	Yes	9	37.0
	No	75	63.0
	Total	84	100.0

4.1.1 Age of farmers

Table 2 presents Socio-economic characteristics of farmers. The results shows that 31% of age distribution in the surveyed villages ranged between 18-35 years and majority of the respondents (44%) are aged between 34 and 54 years, this indicate that old people are the ones who own resources that are expected to influence pearl millet value addition and marketing, while young people are likely to migrate to urban areas in search for better life. Moreover 75% of respondents are aged between 18 and 54 years this also indicates that most of the interviewed respondents fall into economically active ages which are important key player in production, processing and marketing of pearl millet this is supported by Mahega (2008) who found that the interviewed cowpea farmer's respondent's fall into economically productive age group. Furthermore participation of peoples over 55 years was few (25%) this indicates that they are not strong enough to work in pearl millet field. Hence these findings suggest that age has an influence in production, processing and marketing activities of pearl millet.

4.1.2 Gender

Table 2 shows the distribution of pearl millet farmers' household head by sex indicating that 78.6% are male household headed family and 21.4% are female household headed family. A household being headed by male or female can influence pearl millet value addition and marketing. This study indicates that male headed households in Bahi District were mostly married couples of which has a greater chance of assisting each other in various agricultural activities which enhance value addition and marketing of pearl millet. On the other hand most of female headed household heads were widows who have lost their spouses and have less chance in supervising the pearl millet production and marketing, as a result they have a less chance of capturing enough shares along the value chain.

4.1.3 Level of education

Table 2 indicate the distribution of education level of pearl millet farmers. The majority of sampled farmers (77.4%) have acquired primary education; 6% attained secondary education and 16.7% didn't attain formal education. The data imply that primary education was an important factor in pearl millet production, processing and marketing however the little percentage of illiteracy (16.7%) could have a negative impact towards success in pearl millet production, processing and marketing.

4.1.4 Income

The result from Table 2 shows that majority of farmers income (66.7%) were less than 200 000 Tshs per year while 23.8% were earning an income of between 200 000 and 399 999 Tshs; 3.5% earned between 400 000 and 599 999 Tshs. However, 6% were having income of greater than 599 999 Tshs. The results suggest that low farm income led to inadequate capital required by farmers to invest in production and marketing of pearl millet along the chain.

4.1.5 Market information

The significance of market information in terms of economic performance is widely recognized. According to Helmberger *et al.* (1981), accurate and timely market information enhances market performance by improving their understanding about market actors. The information on the accessibility of price of pearl millet to market was collected by asking farmers if they were accessible to pearl millet market price. The results in Table 2 showed that 63% of farmers were not accessible to market information which was ought to facilitate trading of pearl millet. This suggest that low rate of access to market information by farmers has hindered pearl millet value addition

and marketing. Kulindwa (2008) found the same result, that the overall participation of farm households to agricultural market in Tanzania has remained very low.

4.2 The Influence of Farmer's Household Characteristics on Value Addition and Marketing of Pearl Millet Produce

The positive correlation coefficient (r = 0.41, 0.535 and 0.637) between household characteristics and volume of pearl millet sold in the year 2009, showed that as farmers were less accessible to education and market information along the chain, there were also less amount of pearl millet sold in the market and vice versa (Table 3). This suggests that there is a close relationship between infrastructures and the farmer's ability to increase its volume sells and integrate their income into the National economy. Moreover the positive correlation between age of farmers and volume of pearl millet sold in the year 2009 showed that, as age of farmer increases the amount of pearl millet sold also increased, this result suggest that old farmers were more accessible to land than young farmers. On the other hand the negative correlation coefficient (-0.250) between farmers income and amount of pearl millet sold in the year 2009 indicate that as farmers income increased there were less amount of pearl millet sold in the market, this propose that as farmers earn more income they reallocate it to others enterprises that generate more profit, this imply that pearl millet crop is primarily for home consumption and not for business purposes.

Table 3: Correlation between variables and amount of pearl millet sold in 2009 (n=84)

Variable	Amount sold in 2009		Significant
Education	Pearson correlation	0.410**	0.000
Access to market information	Pearson correlation	0.535**	0.000
Income	Pearson correlation	-0.250*	0.022
Age	Pearson correlation	0.637*	0.000

* Significant at 0.05; ******significant at 0.01

4.3 Value Chain Performance of Pearl Millet

Movement of pearl millet produce from farmers to consumers follows commodity chain, within this chain there are numbers of functions/activities such as harvesting, threshing, cleaning, transportation, dehulling, milling, packaging, storage and distribution all of which adds value (utility) to the produce along the value chain. These activities/functions performed by different value chain actors' aim at adding value to his/her share which will be captured along the chain. The pearl millet value chain in the study area was observed to follow two main categories, namely the major and the minor value chain (Fig. 4).

```
┌─────────────────────────────────────┐
│ Consumers (Rural & Urban)           │
│                                     │
│  -   Stiff porridge, Porridge       │
│  -   Local brews, bird feed         │
│      (grain), animal feed (stalk)   │
└─────────────────────────────────────┘
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┌──────────────┐        ┌──────────────┐
│  Retailers   │◄───────│              │
└──────────────┘        │  Processors  │
                        │              │
┌──────────────┐        └──────────────┘
│ Wholesaler   │
└──────────────┘
┌──────────────┐
│  Middlemen   │
└──────────────┘
┌──────────────┐
│   Farmers    │
└──────────────┘
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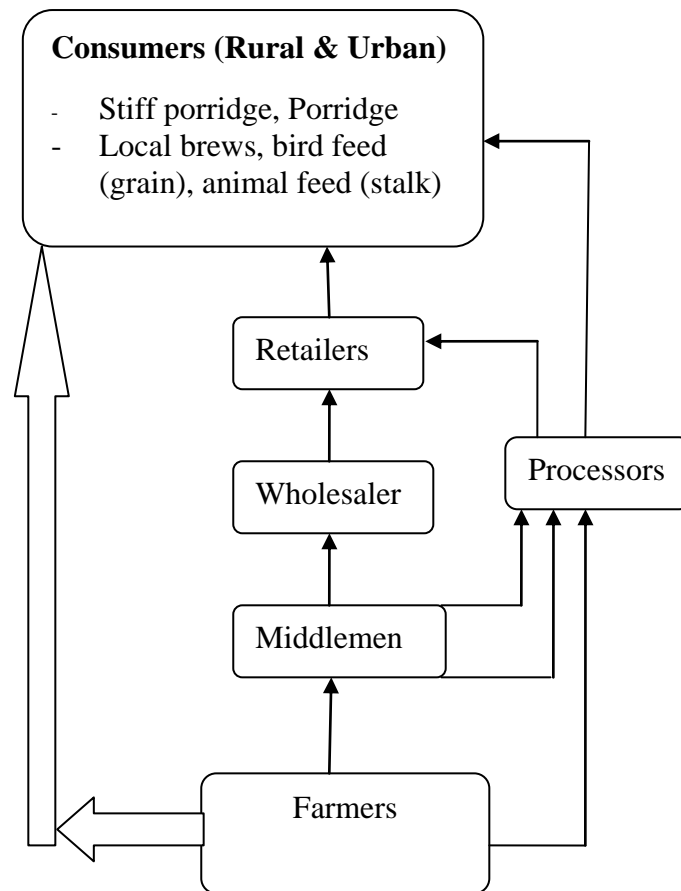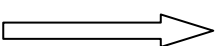
Figure 5: Value chain for pearl millet in the study area

Note: ══════════⇒   Main channel

────────────►   Minor channel

The major value chain for pearl millet was:

- Farmers – Consumers

Other minor value chains were:

- Farmers – Middleman – Wholesalers – Retailers – Consumers

- Farmers – Middleman – Wholesalers – Processors – Retailers – Consumers

- Farmers – Middlemen – Processors – Retailers – Consumers

- Farmers – Processor – Consumers

In the first category (Table 4), 45.2% of farmers sold their produce directly to ultimate consumers (farmers experiencing food deficit) within the village, the main form of pearl millet passed through this channel were grain, flour and local brew while packaging, carrying and storage materials used included polythene bags, barn, buckets, crock and cups. The means of transport used included bicycles, cart, and push-cart, carrying on their shoulder or head this results imply poor development of pearl millet marketing channels along the value chain which are caused by poor market infrastructures in Chiguluka village.

Table 4: Percentages of farmers who sold pearl millet in 2009 (n=84)

Variable	Frequencies	Percentages
Sold direct to consumer	38	45.2
Sold to other traders	7	8.3
No surplus to sell	39	46.4
Total	84	100.0

Second category involved farmers (8.3%) selling their produce through middlemen, wholesaler, retailers/processors, and ultimately consumers. Form of pearl millet sold in this second minor channel included grain, flour and local brew. Packaging materials used included polythene bags, sisal bags, paper bags while the means of transport included bicycles and trucks. However the majority of farmers (46.4%) didn't have surplus to sell, this suggests low pearl millet production along the value chain.

4.4   Problems Hindering Production, Processing and Marketing of Pearl Millet along the Value Chain

The results finding below describes the constraints faced by different actors undertaking their marketing functions along the pearl millet value chain:

4.4.1 Farmers

Result findings shown in Table 5 indicate marketing problems farmers are facing. Lack of market was the major setback (79.8%) experienced by farmers who complained about low selling price and lack of proper market for pearl millet. Second major constraints were low level of mechanization and technology used in pearl millet production, processing and marketing (51.2%). Further constraints that pearl millet farmers encountered in according to their importance were inadequacy of government effort to support pearl millet farmers (48.8%), high cost of production and transportation (46.4%), shortage of capital (40.5%), inadequate of knowledge and qualified agriculture extension officers (34.5%) and lack of morale and incentives to farmers (30.9%) was also observed to be a dilemma which need to be addressed.

Table 5: Marketing constraints facing pearl millet farmers (n = 84)

Constraints	Explanation	Frequencies (%)	% respond
Shortage of capital	Yes	34(40.5)	12.2
Lack of market	Yes	67(79.8)	24.0
High costs of production and transportation	Yes	39(46.4)	14.0
Low level of mechanization and technology	Yes	43(51.2)	15.4
Inadequate knowledge and qualified agriculture extension officers	Yes	29(34.5)	10.4
Lack of morale and incentives to farmers	Yes	26(30.9)	9.3
Others[1] (specify)	Yes	41(48.8)	14.7
Total		279(332.1)	100.0

[1]. Inadequate of Government effort to support pearl millet farmers.

4.4.2 Traders

The results from Table 6 indicate that shortage of market demand (61.8%) was the most serious problem facing pearl millet traders with 64.7% of respondents from Dodoma and 58.8% from Dar es salaam; While shortage of capital (52.9%) was the second severe constraints, with majority of respondents from Dodoma (70.6%) experiencing the problem while 35.3% of respondents from Dar es Salaam acknowledged it. Other market problems faced by pearl millet traders were inadequacy of infrastructures (44.1%), inaccessibility of credit (41.2%), high transportation cost (38.2%), inadequate of business knowledge, skills and shortage of promotion programs (38.2%). Nevertheless small pearl millet volume and inconsistent in production were observed to be the least problem (23.5%). This suggests that pearl millet marketing performance is linked to physical market access in terms of good infrastructures and capital availability.

Table 6: Marketing constraints facing pearl millet traders

Constraints	Response	Region				Overall N=34	
		Dom (n=17)	% of Resp	DSM (n=17)	% of Resp	% of Respondents	
High transportation costs	Yes	7(41.2)	10.2	6(35.3)	11.1	13(38.2)	21.3
Shortage of capital	Yes	12(70.6)	17.4	6(35.3)	11.1	18(52.9)	28.5
Shortage of market demand	Yes	11(64.7)	15.9	10(58.8)	18.5	21(61.8)	34.5
Access to credit	No	9(52.9)	13.0	5(35.7)	9.3	14(41.2)	22.3
Inadequacy of infrastructures	Yes	8(47.1)	11.6	7(41.2)	13.0	15(44.1)	24.6
Inadequate of business knowledge and skills	Yes	8(47.1)	11.6	5(29.4)	9.3	13(38.2)	20.9
Market price information accessibility	No	7(41.2)	10.2	4(23.5)	7.4	11(32.4)	17.6
Small volume and inconsistent production/supply	Yes	3(17.6)	4.3	5(29.4)	9.3	8(23.5)	13.6
Shortage of promotion programs	Yes	4(23.5)	5.8	6(35.3)	11.1	10(29.4)	16.9
Total		69(405.8)	100.0	54(323.9)	100.0	123(729.9)	200.0

4.4.3 Processors

Pearl millet processors were asked to point out the constraints hindering pearl millet processing which in turn influences value addition and marketing of the products. The responses are summarized in Table 7. The most critical problem named by processors in Dodoma Region was shortage of capital (64.0%) while in Dar es Salaam city the most leading constraints for pearl millet processors were lack of market, high cost of energy and small volume and inconsistence production (66.7%). However, the overall results for both Dodoma Region and Dar es Salaam city show that lack of market and shortage of capital (57.1%) was the key problem hindering pearl millet processing while high cost in packaging material (14.3%) was observed to be the least problem among the processors of the two regions. This finding suggests that low capital and market opportunity has influence on pearl millet value addition and marketing. This finding concurs with Mashimba (2007) who found that low household income affects cassava processing and marketing.

Table 7: Constraints facing pearl millet processors (n=14)

Variable	Explanation	Region					
		Dom (n=11)	%of Resp	DSM (n=3)	% of Resp	Overall (N=14)	% of Resp
Shortage of capital	Yes	7(64.0)	24.1	1(33.3)	9.1	8(57.1)	33.2
Shortage of appropriate processing machines	Yes	5(45.5)	17.2	1(33.3)	9.1	6(42.9)	26.3
Lack of market	Yes	6(54.5)	20.7	2(66.7)	18.2	8(57.1)	38.9
High cost of energy (fuel/electricity)	Yes	3(27.3)	10.3	2(66.7)	18.2	5(35.7)	28.5
High tax rate	Yes	3(27.3)	10.3	1(33.3)	9.1	4(28.6)	19.4
Competition from other cereal products	Yes	2(18.2)	6.9	1(33.3)	9.1	3(21.4)	16.0
High costs in packaging materials	Yes	1(9.1)	3.5	1(33.3)	9.1	2(14.3)	12.5
Small volume and inconsistent production	Yes	2(18.2)	6.9	2(66.7)	18.2	4(28.6)	25.1
Total		29(264.1)	100.0	11(366.7)	100.0	40(285.7)	200.0

4.4.4 Consumers

Pearl millet consumers were asked to indicate constraints that reduce their ability to purchase the produce/products. Table 8 shows respondents' view in brief. The highest ranked problem faced by Consumers residing in Dar es salaam city was high purchasing price in addition to that low product quality, packaging and presentation of product where noted as very important in influencing pearl millet produce/product purchase (64.7%). On the other hand consumers in Dodoma Region ranked poor infrastructures (64.7%) as the highest problem hindering access to market information. However among the five constraints mentioned the most prominent problems named by consumers of both regions was product quality, packaging and presentation which was noted as very important in influencing consumer purchase (58.8%) followed by high purchasing price (55.9%). The results suggest that consumers were more conscious of quality and presentation during pearl millet purchases. The findings are related to those reported by Hawassi (2006) who found that Households were more conscious of quality products when purchasing processed fruits and vegetables.

Table 8: Constraints facing pearl millet consumers

Variable	Explanation	Region					
		Dodoma (n=17)	% Resp.	DSM (n=17)	% Resp.	Overall (n=34)	% Resp.
Purchasing price	High	8(47.1)	11.3	11(64.7)	16.9	19(55.9)	28.0
	Medium	7(41.2)	9.9	5(29.4)	7.7	12(35.3)	17.7
	Low	2(11.8)	2.8	1(5.9)	1.5	3(8.8)	4.4
Location influence buying	Important	9(52.9)	12.7	6(35.3)	9.2	15(44.1)	21.9
	Very important	6(35.3)	8.5	5(29.4)	7.7	11(32.4)	16.1
	Extremely important	2(11.8)	2.8	6(35.3)	9.2	8(23.5)	12.0
Product quality, form, packaging and presentation influences purchasing	Important	2(11.8)	2.8	0(0)	0.0	2(5.9)	2.8
	Very important	9(52.9)	12.7	11(64.7)	16.9	20(58.8)	29.6
	Extremely important	6(35.3)	8.5	6(35.3)	9.2	12(35.3)	17.7
Market price information access	Not accessible	9(52.9)	12.7	7(41.1)	10.8	16(47.1)	23.4
Infrastructure enables market access?	No	11(64.7)	15.5	7(41.1)	10.8	18(52.9)	26.3
Total		71	100.0	65	100.0	136	200.0

Figures in bracket indicate percentages of firms while those not in parentheses indicate number of firms.

Farmers' gross margin analysis results (Table 9) indicate that pearl millet is a profitable agricultural activity with a profit margin of Tshs 97 943.1 per ha (133.2/kg). This finding suggests that farmers contribute in pearl millet value addition along the chain.

Table 9: Farmers' gross margin for pearl millet in 2009

Item	Amount
Average yield (kg/ha)	735.3
Average price (Tshs/ kg)	320.2
Gross return (Tshs/ha)	235443.1
Labour (man day/ha)	
Land preparation (man day)	15
Sowing (man day)	5
Weeding (man day)	10
Harvesting (man day)	7
Threshing (man day)	13
Winnowing (man day)	5
Total man day	55
Average payment per day 2500 Tshs = 2500 * 55	137500.0
GM = TR-TC	
GM/ha = 235443.1 − 137500	97943.1
GM/kg = 97943.1/735.3	133.2

Moreover pearl millet marketing constraints associated with value addition is discussed with the help of GM along the value chain. Table 9 and Table 10 indicate the average GM per Kg across different segments of the pearl millet value chain. The findings reveal large average GM /kg for farmers (133.2) followed by wholesalers (82.2), processors (69.0) and retailer (41.6) while middleman earning the lowest GM (27.1). Although farmers are getting large GM compared to other actors, but the amount can be small relative to other actors who are likely to make three trips of income earning depending on market performance through out the year. On the other hand middleman earns the lowest GM

among all actors this could be attributed to inadequate capital and high transportation costs which emanate from poor infrastructures. This suggests small participation of middlemen in pearl millet marketing functions/activities along the value chain since return per their effort is low.

Table 10: GM for chain actors in Dodoma and Dar es Salaam

Mean GM among traders in Dodoma	Middleman	Wholesaler	Processor	Retailer
Average Purchasing Price(Tshs/kg)	295	307	329	364
Average Selling Price(Tshs/kg)	318	332	700	486
Average Gross Return(Tshs/kg)	318	332	700	486
Average Transport Cost(Tshs/kg)	35.53	42.6	80	20.7
Average Packaging Cost(Tshs/kg)	15.3	18	120	50
Average Storage Costs (Tshs/kg)	20.17	20	75	18.5
Average Labour Charge (Tshs/kg)	158.5	30	140	24.7
Average Local Levies (Tshs/kg)	19.9	60	80	40
Other VC (Tshs/kg)	45	90	157	295
Total VC (Tshs/kg)	294.4	260.6	652	448.9
GM = TR − TC	23.6	71.4	48	37.1
Mean gross margin among traders in DSM				
Average Purchasing Price(Tshs/kg)	372	410	513	520
Average Selling Price(Tshs/kg)	410	518	1050	602
Average Gross Return(Tshs/kg)	410	518	1050	602
Average Transport Cost(Tshs/kg)	46.5	60.7	64.5	14.7
Average Packaging Cost(Tshs/kg)	24	38.63	125.5	50
Average Storage Costs (Tshs/kg)	30	73.85	95	16.5
Average Labour Charge (Tshs/kg)	149	75.37	280	24.7
Average Local Levies (Tshs/kg)	34	6.08	20	40
Other VC (Tshs/kg)	96	171	375	410
Total VC (Tshs/kg)	379.5	425	960	555.9
GM = TR − TC	30.5	93	90	46.1
Average GM/kg for Both Region	27.1	82.2	69	41.6

In addition the results showed that, there was variation of GM among pearl millet value chain players of DSM city (GM for Middleman: 30.5, wholesaler: 93.0, Processor: 90.0 and Retailer: 46.1) and Dodoma Region (GM for Middleman: 23.6, wholesaler: 71.4, Processor 48.0 and Retailer: 37.1), with chain actors of DSM city capturing high GM compared to those of Dodoma Region, this suggest that, Traders in DSM city have good access to capital, infrastructures and market information which facilitate the process of pearl millet value addition and marketing than traders living in Dodoma Region.

4.5 Market Performance of Pearl Millet in the Value Chain

Analysis of market performance was done by computing the marketing margin at different market levels of pearl millet in the value chain. Marketing margin was calculated by finding the price difference at different market levels. Consumer price was considered as the base or denominator for every marketing margin. Pearl millet traders usually handle more than one produce/product so it was difficult to get accurate market costs for each pearl millet traders in the chain. On other hand gross margin was considered rather than net marketing margin to avoid sharing of indirect costs among various produce/products sold by a retailer during computation of cost associated in selling one kg of pearl millet. Table 11 summarises the marketing margin of pearl millet in the study area.

The findings from Table 11 showed that marketing margin (MM) for Middleman, wholesaler, Processor and Retailer were 23, 38; 25, 108; 371, 537 and 122, 82 for Dodoma and Dar es Salaam respectively. Processors in DSM were leading for higher MM followed by those in Dodoma Region. However middlemen were receiving the lowest MM in the value chain, These results imply that middlemen are somehow deprived in the process of pearl millet value addition and marketing in terms of marketing margins, the

results suggest that the small marketing margin captured by the middlemen along the chain led middlemen dropping from the pearl millet value chain and marketing process. The findings support Billings *et al.* (2004) who noted that, if chain members are not satisfied with their shares of the rewards, they will not stay committed in the business. Moreover the research findings indicated that retailers in Dar es Salaam city were getting low MM compared to Retailers in Dodoma Region this suggest that pearl millet is consumed more in Dodoma Region than in Dar es Salaam city.

Table 11: Marketing margin for traders in Dodoma and Dar es Salaam

Type of trader	Average Prices in Tshs/kg	Dodoma	DSM
Middleman	Average Purchasing Price (MPP) in Tshs/kg	295	372
	Average Selling Price (MSP) in Tshs/kg	318	410
	Marketing Margin (MSP-MPP) Tshs/kg	23	38
Wholesaler	Average Purchasing Price (WPP) Tshs/kg	307	410
	Average Selling Price (WSP) Tshs/kg	332	518
	Marketing Margin (WSP-WPP) Tshs/kg	25	108
Processor	Average Purchasing Price (PPP)Tshs/kg	329	513
	Average Selling Price (PSP) Tshs/kg	700	1050
	Marketing Margin (PSP-PPP) Tshs/kg	371	537
Retailer	Average Purchasing Price (RPP) Tshs/kg	364	520
	Average Selling Price (RSP) Tshs/kg	486	602
	Marketing Margin (RSP-RPP) Tshs/kg	122	82

4.6   Market Shares for Different Pearl Millet Traders

Individual traders' performance relative to other group of traders in the pearl millet value chain can be compared by the proportion of the market share that the traders are able to capture. Table 12 shows average market shares received by different pearl millet market participants in the study areas. Generally, farmers received an average of 11.0% of the retail price, wholesaler obtained 15% and retailer received 18% of consumer price.

On the other hand processors obtained largest market share (48%) than other chain players in the pearl millet value chain this imply that processors were a threat to other chain actors. However, middleman obtained the least market share (8%), this result reveal that middleman is underprivileged in the whole process of pearl millet value addition and marketing this could be attributed by the poor infrastructure which lead to higher cost in transportation. Moreover, the results showed that, farmers are the second deprived chain actors in the whole process of pearl millet value addition and marketing along the chain, this imply that farmers lack awareness about where, when and how to add value in the chain. This finding suggests that, farmers should sales their produce/products direct to consumers if they want to remain competitive in the chain.

Farmers' shares

$FS = [(Fx /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma = [1-(280/320.2)*100]/110.58 = 11.35$

Middlemans' share

$MS = [(Mx /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma = [1-(333.5/364)*100]/110.58 = 7.58$

Processors' share

$PS = [(Px /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma = [1-(421/896)*100]/110.58 = 47.94$

Wholesalers' share

$WS = [(Wx /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma = [1-(363/435)*100]/110.58 = 14.97$

Retailers' share

$RS = [(Cx /Rx)/ \Sigma] = [(1-MM/Rx)*100]/\Sigma = [1-(442/549)*100]/110.58=17.63$

Table 12: **Average market shares and market margin achieved by various market actors**

Market actors	ATPC/ APP	ASP	ATC	MM (ASP-APP)	Average Share	Percent
Farmers	280	320.2	246	40.2	12	11
Middleman	333.5	364	253.43	30.5	7	8
Processor	421	896	1160	475	27	48
Wholesaler	363	435	402.19	72	39	15
Retailer	442	549	527.9	107	14	18
Total	**1971**	**2694.8**	**2589.52**	**724.7**	**99**	**100**

Note: ATPC, APP, ASP, ATC and MM stand for Average Total Production Costs, Average Purchasing Price, Average Selling Price, Average Total costs and Marketing Margin.

4.7 Sellers' Market Concentration

Pearl millet sellers' concentration was computed from revenue farmers obtained after selling their produce to the wholesalers/traders divided by the revenue of equal number of farmers sold to different buyers. The CI obtained help to comprehend the concentration of sellers in the market using Khols and Uhl rule of thumb market concentration indicative indices. The indices obtained in Table 13 for pearl millet wholesalers (38.3%, 34.9%) and retailers (34.5%, 33.2%) for DSM and Dodoma respectively indicate oligopolistic type of market structure. This finding suggests that farmers and traders are selling in the lower segments of the domestic market this could be due to small number of consumers' preference in purchasing the commodity.

Table 13: Market concentration index of pearl millet traders

Market	(a)Total amount traded (kg)	(b)Total amount traded by big traders (kg)	Concentration index (b/a)*100
Wholesaler			
Dsm	20180.0	7720.0	38.3
Dom	15490.0	5400.0	34.9
Total	35670.0	13120.0	73.2
Retailers			
Dsm	11070.0	3820.0	34.5
Dom	10900.0	3620.0	33.2
Total	21970.0	7440.0	67.7

* Big trader- a trader who sold an amount of pear millet produce/products between 3500 – 8000 kg.

In order to test the hypothesis that, pearl millet marketing functions performed by various chain actors has no significant influence on pearl millet value addition and marketing, comparison of GM between Farmers (Table 9) and other pearl millet value chain actors (Table 10) was executed. The results of multiple comparison of GM (Table 14) showed significant ($p<0.05$) influence on value addition and marketing of pearl millet at different node in the value chain. This is probably due to the fact that traders have high chance of access to market information (such as pearl millet price) relative to farmers, as many traders usually reside in or near the cities while majority of farmers normally stay in remote areas where there is poor market infrastructures thus why there was significance difference in GM. The result imply that an increase in value attached to the produce/product have emanated from different marketing functions performed by value chain actors. For that reason there is insufficient evidence to support the hypothesis that pearl millet marketing functions performed by various actors in the value chain has no significant influence on pearl millet value addition and marketing. Instead we support the alternative hypothesis that pearl millet marketing functions performed by various actors in

the value chain has significant influence on pearl millet value addition and marketing. Similar result were reported by Omole (2009) who found that, market functionality is influenced by mode of transport, consumers' income, markets distance, location and item(s) on sales among others.

Table 14: Multiple comparison of GM between farmers and other value chain actors

of pearl millet using Post hoc LSD (protected LSD) test:

Variable (a)	Variable (b)	Mean difference (a-b)	Std. Error	Sig.
FGM	MGM	180.94	43.49	0.000
	WGM	125.79	62.86	0.047
	RGM	166.37	38.20	0.000
	PGM	138.97	54.25	0.011

The mean difference is significance at the 0.05 level

In addition the hypothesis (pearl millet marketing functions performed by various chain actors has no significant influence on pearl millet value addition and marketing), was tested again using regression analysis through establishing the relationship between farmers' profit obtained from pearl millet yield of the year 2009 vis-à-vis the Marketing variables (processing, grain quality, market information access, market distance and Promotion). The regression output obtained was as follows:

Y= -115826.358 -109882.169 PROC + 116877.472 QTY + 124744.746 INF+
     (-2.061)   (-2.196)   (2.343)   (2.778)

   83654.958 DIST + 281376.584 PROM
       (1.691)   (6.306)

R square = 0.541

Adjusted R square = 0.512

F value = 18.394

Table 15: Marketing variables output results (n=84)

Variable	Unstandardized Coefficient				
	B	Std error	t	Sign.	VIF
Processing	-109882.169	50041.698	-2.196	0.031*	2.814
Grain quality	116877.472	49865.987	2.343	0.022*	2.794
Market information	124744.746	44910.527	2.778	0.007*	2.282
Market distance	83654.958	49471.029	1.691	0.095**	2.081
Promotion	281376.584	44620.441	6.306	0.000*	1.795
(Constant)	-115826.358	56203.37	-2.061	0.043	

*Significant at ($p<0.05$); ** Significant at ($p<0.10$)

The study findings from Table 15 show that, the factors affecting pearl millet marketing in the study area account for 51.2% of the observed output variations, the rest 48.8% of the variation is explained by other variables which are not included in the regression model. The positive sign of parameter estimates for pearl millet grain quality, market information, market distance and promotion activities indicate that profit from pearl millet enterprise along the value chain can increase if pearl millet grain quality, Farmers' access to market information and promotion activities of pearl millet produce/products is increased; Moreover, reduced distance between farmers and point of market can accelerate pearl millet marketing and hence profit increases. However the negative sign of the coefficient for pearl millet processing imply that profit emanating from pearl millet marketing in the value chain decreases if pearl millet grain are processed this is because processor were unable to produce enough good quality to meet customer requirements this could be due to high costs of processing which is associated with inadequate of processing machines and equipments. Similar observation were reported by Mashimba (2007) who noted that farmers who processed cassava have a low possibility of accessing markets, this is because processors can not produce enough and good quality products to meet market requirement.

Furthermore the findings show that, grain quality of pearl millet, processing, market information and promotion activities are statistically significant at 0.05 level of significant because the p-value is smaller than alpha ($\alpha=5\%$). In addition the regression results showed the following summary: The profit of pearl millet in the value chain is significantly associated with grain quality of pearl millet, level of processing, promotion activities, market distance and market information access. The results showed VIF 0f 2.814 (processing), 2.794 (grain quality), 2.282 (market information access), 2.081 (market distance) and 1.795 (promotion) which are far below the rule of thumb of 10, implying that market variables were significantly independent at $p<0.05$ and $p<0.10$ level of significance.

From the regression equation result, the null hypothesis that pearl millet marketing functions have no influence on pearl millet marketing along the value chain was rejected in favour of the alternative hypothesis that pearl millet marketing functions performed by various chain actors has significant influence on pearl millet value addition and marketing along the value chain. Because none of the coefficients in the equation was equal to zero, this implies that, the marketing functions were important in influencing pearl millet value addition and marketing along the value chain. A similar observation was reported by; Mutakubwa (2007) who found that Marketability of cassava were influenced by quality (root tuber size, colour, free from damage and variety); Jari and Fraser (2009) observed that market information, market infrastructure, contractual agreements, among others significantly influences household market participation and Mwakaje (2010) noted that rural farmers who were accessible to market information sold more their produces and received relatively better prices.

CHAPTER FIVE

5.0   CONCLUSIONS AND RECOMMENDATIONS

5.1   Conclusions

In order to effectively invest in value addition and marketing of pearl millet the society needs to look at the pearl millet value chain and spot and lessen constraints that hamper the growth of a sustainable market. Marketing of the crop was held back by many factors as a result few crop forms were marketed which included grain, flour and local brew. The summary presented in this section give some insight on the pearl millet production and marketing challenges, factors influencing pearl millet production and marketing and factors for improving pearl millet market performance in the study area.

(i)   Pearl millet production and marketing challenges

Analysis of descriptive statistics revealed that, there was low access to market information by pearl millet farmers (63%) which were ought to facilitate trading of pearl millet in the chain. This suggests that, low access of market information by farmers has hindered pearl millet value addition and marketing along the chain. In addition the positive correlation coefficient ($r = 0.41$ and 0.535) between household characteristics and volume of pearl millet sold in the year 2009, implies that as farmers were less accessible to education and market information along the chain, there were also less amount of pearl millet sold in the market and vice versa. This proposes that, there is a close relationship between infrastructures and the farmer's ability to increase its volume sells and integrate their income into the National economy.

On the other hand, lack of market was the major setback (79.8%) experienced by farmers who complained about low selling price and lack of proper market for pearl millet,

followed by low level of mechanization and technology used in pearl millet production, processing and marketing (51.2%). However, the results indicated that shortage of market demand (61.8%) was the most serious problem facing pearl millet traders with 64.7% of respondents from Dodoma and 58.8% from Dar es salaam; While shortage of capital (52.9%) was the second severe constraints, with majority of traders from Dodoma (70.6%) experiencing the problem and 35.3% from Dar es salaam acknowledged it.

Another constraint mentioned by processors of both Dodoma Region and Dar es Salaam city was lack of market and shortage of capital as the major factor affecting processors (57.1%). This finding suggests that low capital and market opportunity has influence on pearl millet value addition and marketing. In addition, pearl millet consumers of both regions mentioned product quality, form, packaging and presentation as the most prominent factor (58.8%) that influenced purchases of produce/products of pearl millet. This finding suggested that consumers were more conscious about quality and presentation of pearl millet during the process of purchases.

Further analysis indicated that, MM for Middleman, wholesaler, Processor and Retailer were 23, 38; 25, 108; 371, 537 and 122, 82 for Dodoma and Dar es Salaam respectively. Processors in DSM were leading for higher MM followed by those in Dodoma Region. However middlemen were receiving the lowest MM in the value chain, these results imply that middlemen are somehow deprived in the process of pearl millet value addition and marketing in terms of marketing margins, this result suggest that the small marketing margin captured by the middlemen along the chain led middlemen dropping from the pearl millet value chain.

On the other hand individual trader's performance relative to other group of traders in the pearl millet value chain was compared by the proportion of the market share that the traders were able to capture. Generally, farmers received an average of 11.0% of the retail price, wholesaler obtained 15% and retailer received 18% of consumer price. However, processors obtained largest market share (48%) than other chain players in the pearl millet value chain this imply that processors were a threat to other chain actors.

Results from market structure-conduct-performance analysis, found concentration indices of wholesalers (38.3%, 34.9%) and retailers (34.5%, 33.2%) for DSM and Dodoma respectively. This finding indicates oligopolistic type of market structure. The findings suggests that farmers and traders are selling in the lower segments of the domestic market this could be due to small number of consumers' preference in purchasing the commodity.

Moreover, multiple comparison of GM between farmers and other pearl millet value chain actors showed significant ($p<0.05$) influence on value addition and marketing of pearl millet at different node in the value chain. This is probably due to the fact that traders have high chance of access to market information (such as pearl millet price) relative to farmers, as many traders usually reside in or near the cities while majority of farmers normally live in remote areas where there is poor market infrastructures. The results imply that there is insufficient evidence to support the hypothesis that pearl millet marketing functions performed by various chain actors has no significant influence on pearl millet value addition and marketing. Therefore, the alternative hypothesis which ascertains that pearl millet marketing functions performed by various actors in the value chain has significant influence on pearl millet value addition and marketing was supported.

(ii)   Factors influencing pearl millet production and marketing

Econometric analysis of factors influencing pearl millet production and marketing along the value chain, revealed that, pearl millet grain quality, processing, market information and promotion activities are statistically significant at 0.05 level of significant because the p-value is smaller than alpha (α=5%). Moreover the factors affecting pearl millet production and marketing in the study area account for 51.2% of the observed output variations, the rest 48.8% of the variation is explained by other variables which were not included in the regression model.

The positive sign of parameter estimates for pearl millet grain quality, market information, market distance and promotion activities indicate that profit from pearl millet enterprise along the value chain can increase if pearl millet grain quality, access to market information and promotion activities of pearl millet is increased; furthermore, reduced distance between farmers and point of market can prompt pearl millet marketing and raise profit through decreased costs of transportation and increasing place utility.

In addition, farmers pointed out that drought was another obstacle towards pearl millet value addition and marketing as it has something to do with quality and volume to be supplied in the market. However, poor linkage between farmers and market was observed to be a key issue that slowed down value addition and marketing of pearl millet in the value chain.

(iii)   Factors for improving pearl millet market performances

Well developed marketing system enables pearl millet value chain actors to provide marketable produce/products of high quality standard in the market. From the research results, to unlock the obstacles to pearl millet value addition and market performance the

following factors for improvement were established: Linking farmers and other chain actors to the market, improvement of technology used in pearl millet processing, increasing production yield of the crop, provision of credit/financial support to chain actors, encouragement of private sector to participate in the crop chain, provision of motivation and morale to chain players and promotion of the crop products.

5.2   Recommendations

Based on the results findings, the following factors are recommended for improving pearl millet market performances in the study area:

(i)   Pearl millet production improvement

It is known that semi arid dessert countries in Africa are much confronted with shortage of food to feed their citizen this is an indication of growing market of pearl millet in Africa. Given much effort by Government and policy makers to insist farmers in improving and enhancing production and productivity of pearl millet could ensure continuous supply of the produce in the market which in turn will trigger the process of value addition and improve marketing of pearl millet products along the chain. On the other hand factors contributing to low production, processing and marketing should be addressed.

(ii)   Reducing production and transportation cost

Government and other influential stake holder have to create a favourable environment that will lower the cost of production and transportation. This could be achieved through rehabilitation/improvement of roads infrastructures, lowering fuel prices, and ensuring accessibility of farm implements at affordable prices. This factor is crucial in enhancing creation of place and time utility of the crop produce/products along the value chain.

(iii) Encouraging pearl millet processing at village level

Generally there was no threshing and dehulling machine at Chiguluka village which could fasten the process of value addition. Instead farmers' household were using local methods (such as long rod for beating pearl millet head and mortar and pestle in dehulling process) which is a tedious work and take longer time. Therefore there should be a plan which could enable villagers to be accessible to threshing and dehulling machines that could facilitate consumption and marketing of pearl millet. However products design should be convenient suiting the customer preference and provide satisfaction. In addition the different pearl millet products have to target one or more of available market segments (such as Diabetes patients) aiming at capturing a certain market segment which in future may lead to market niche.

(iv) Improvement of agriculture financial support

Another crucial problems pointed out by the interviewee is the lack of capital to run their enterprises, the problem which affected greater percentage of respondents. Most of production and marketing functions/activities such as production, processing, storage and transportation need capital. The development of pearl millet sub-sector should not be left in the Government hand alone; other key influential partners including private sectors such as microfinance institution and agriculture credit provision institution should invest to accelerate the growth and development of the sub-sector in order to improve pearl millet value addition and marketing. Nevertheless sellers of pearl millet must set the price in relation to the value perceived by the consumers. If price is higher than the value perceived, sellers will loose the earning.

(v)   Empowerment of agricultural development institutions

Furthermore institution dealing with pearl millet research and development of new technology, including processing machines, packaging, storage, products markets, accessibility of information and finance should be highly supported in order to influence growth of local industries and market. On the other hand society should encourage the development of private sector institutions which could be integrated in technological and business know-how providing knowledge, information, experiences and applied research to farmers and society as a whole.

(vi)   Provision of motivation and morale to farmers

Tanzania depends heavily on agriculture sector for its development. There is a need to co-ordinate well, the government and donor supported projects and programs on agriculture in order to redirect the national income and donor support into pearl millet sub- sector that will trigger production, processing and marketing of pearl millet. This will provides motivation and morale to farmers.

(vii)   Promotion of pearl millet products

There should be effective progressive market strategies concern telling people about the pearl millet products, including Government agencies and Non-government agencies who will direct messages to the target public. Other methods that can be used to achieve customers in the target market include advertising, public relation, sales promotion, personal selling and sponsorship. All of which aim at acquiring new customers and retaining current buyers. Society has to change pattern of thinking, feeling and behaving about the crop being consumed by poor families instead should be more concerned with the nutrients availability relative to their health status

(viii)   Linking pearl millet farmers to market

There are should be a continuous strategic plan which will link pearl millet farmers to markets within and outside the country. Moreover linkages between pearl millet farmers and processors/traders on the one hand and between processors/traders and credit provider on the other should also be addressed.

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APPENDICES

Appendix 1: Farmers' Questionnaire

Questionnaire number………….Enumerator's name ……………………………..
Name of respondent……………………...............Date of interview…………………

Village / street	Ward	Division	District

Background information

1. Fill the following table indicating house hold composition/Characteristics

	Characteristics	Household member characteristics							
I	Status in the HH								
II	Age (years)								
III	Sex: [01]male[02] female								
IV	Work on HH farm								
V	Education level								
VI	Main occupation								
VII	Marital status								

Characteristics key:

I. Status in the HH:

      [01] head of HH…,   [02] First wife of HH….,

      [03] Second wife of HH…,[04] Daughter of HH…,

      [05] Son of HH…,[06] Relative…., [07] Employee….

      [08]Other (Specify)

III. Sex: [01] Male…… [02] Female……

IV. Worker on HH farm: [01] full time, [02] Part time, [03] don't work on farm

V. Education level [01] primary school… [02] Ordinary school..

    [03] Advanced secondary school…   [04] Diploma… [05] Degree… [06] None……

VI. Main occupation: [01] farming…, [02] charcoal making…,

      [03] petty trade….,[04] schooling

      [05] Hired labour…., [06] masonry…., [07] carpentry…,

      [08] Others (specify)………………

VII. Marital status: [01] single…, [02] Married…., [03] widow….,

[04] Divorced/separated…...

2. Asset endowment of the household

Type	Asset	Quantity available	Bought/acquired in 2009	Sold/given out in 2009
House	1.Iron sheet roof			
	2.Flat-roofed house			
	3.Grass thatched roof			
Livestock	Cow(cross-breed)			
	Cow(local)			
	Oxen			
	Goat			
	Sheep			
	Pigs			
	Donkey			
	Chicken(local)			
	Broiler chicken			
	Layer chicken			
	Others(specify)…			
Machinery, Equipment and transport	Tractor			
	Oxen plough			
	Motor cycle			
	Power tiller			
	Wheel barrow			
	Donkey/ox cart			
	Hoe			
	Spade			
	Bicycles			
	Others(specify)….			
Household goods	Radio			
	Television			
	Telephone			

3. Farm production activities in the year 2009

s/no	Crop	Area		Production			Livestock		livestock production status	
		Amount (acreage)	Harvest (Kg)	Intercrop	Food/sale (↵) (x)	Rank (1-5)	Type of Livestock	quantity	Food/sale (↵) (x)	Rank (1-5)
1	sorghum						Cattle			
2	Maize						Milking cow			
3	Pearl millet						Other cow			
4	Rice						Oxen			
5	sunflower						Heifer			
6	Finger millet						Bull			
7	Bambara nuts						Calf			
8	Sweet potatoes						Goat			
9	Simsim						Does			
10	Ground nuts						Buck			
11	Beans						Kid			
12	Cassava						Sheep			
13	Paddy						Ewe			
14	Grape						Ram			
15	Cowpea						Lamb			
16	Castor						Equines			
17	Others (specify)						Horse			
18							Mule			
19							donkey			
20							Chicken			
21							Local chicken			
22							Broiler chicken			
23							Layer chicken			
24							Ducks			
25							Beehives			
26							Others Specify…			

4. Which crop do you consume most in the dry season?

CROP	Consume regularly? 1= No 2= Yes	If yes why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify)	If no why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify	Buy? 1= no 2= Yes	Produce 1= No 2= Yes	Rank HH 1-5 (1= most)
Sorghum						
Maize						
Pearl millet						
Rice						
sunflower						
Finger millet						
Bambara nuts						
Sweet potatoes						
Simsim						
Ground nuts						
Beans						
Cassava						
Paddy						
Grape						
Cowpea						
Others (specify)						

5. Which crop do you consume most in the wet season?

CROP	Consume regularly? 1= No 2= Yes	If yes why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify)	If no why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify	Buy? 1= no 2= Yes	Produce? 1= No 2= Yes	Rank HH 1-5 (1= most)
Sorghum						
Maize						
Pearl millet						
Rice						
Sunflower						
Finger millet						
Bambara nuts						
Sweet potatoes						
Simsim						
Ground nuts						
Beans						
Cassava						
Paddy						
Grape						
Cowpea						
Others(specify)						

6. Consumption trend of pearl millet:

Do you consume pearl millet food?	Yes……. No…….
If yes how often do you consume pearl millet in the rain season?	[01].Never [02].one per week [03].Every day one per day [04].Every day twice per day [05].Every day three times per day [06].Every day more than three times per day
If yes how often do you consume pearl millet in the dry season?	[01].Never [02].one per week [03].Every day one per day [04].Every day twice per day [05].Every day three times per day [06].Every day more than three times per day

Nature or kind of value addition:

1. Fill the following gapes about farm size in 2009

  a) Land owned……acre. b) Land rented out….acre. c) Land rented in……acre

  d) Land borrowed…..acre. e) Land share cropped….f) total available land……acre

2. Fill the following gapes about land use in 2009

  a) Cultivated land ….acre. b) Fallow land ……acre. c) Pasture land ….acre

  d) Land under tree…..acre.

3. What is the main reason for growing pearl millet on your farm? ....

  [01]. Family consumption... [02] Selling / business…. [03] Others (specify)……..

4.What are your future plan for pearl millet production?[01]To reduce production…[02] to expand production…[03]To continue producing the same amount [04] Others (specify)……

5. Do you follow the recommended agronomic practices (e.g. Planting seed on time, proper spacing, weeding on time) If [01] Yes..or [02] No.. Why?.......

6. Do you process (e.g. cleaning, sorting, dehulling, milling) the pearl millet before selling?

  [01] Yes….[02] No….

7. If yes what are the process that are carried out?

8. If no (from equation 7) why?

9. Do you store your pearl millet? If [01] Yes or [02] No…. why? ………………………

10. Do you mix the pearl millet flour with other flour to add value if yes or no why? ....

11. How these pearl millet produce are transported to the market place?......................................

Weight of pearl millet in Kg	Means of transport	Cost (Tshs)

12. What are the criteria for market place selection?

  [01] Transport availability… [02] Short distance…. [03] Good prices….

  [04] Others (Specify)…..

13. Have you tried to make drink from pearl millet? [01] Yes [02] No…

14. If yes what is it? …………………………………………………….

15. Is it preferred by the consumer? [01] Yes…. [02] No…..

16. If yes or no why?...

17. Have you tried to make food from pearl millet? [01] Yes… [02] No…

18. If yes what is it?...

19. Is it preferred by the consumer? [01] Yes…. [02] No……

20. If yes or No why?..

21. Is pearl millet crop useful in medicinal purpose? [01] Yes.. [02] No…

22. If yes how is it used?...

23. Have you used the crop as an animal/poultry feed? If [01] Yes or [02] No...why?

24. If yes in which form do you use the pearl millet? Do you mix with other things?

25. Which other ways are used to add value to pearl millet produce?

26. What do you think need to be done in order to increase pearl millet value addition?

Marketing performance

1. Do you sell any of your harvest during the year? [01] Yes… [02] No………

2. If yes, fill the following table

Year	Amount produced(kg)	Quantity consumed at HH Level(Kg)	Quantity sold (Kg)	Price per Kg (Tshs)	Total in Tshs.
2009					

3. If no (question 2 above) why? ....

4. After how long do you sell your grain? (Specify months) ....

5. Which period (month) do you get higher price?...

6. Who are the major buyers of pearl millet produce? ……………………………

    [01] Local assembler… [02] Retailers… [03] Middle men…..

    [04] Industrial processors…. [05] Others (specify)……

7. Are you satisfied with the price of pearl millet? [01] Yes……….. [02] No………

8. If no, what do you think is the favourable price per kg……………………………

9. What do you think are the causes of low price? ....

10. Have you ever harvested pearl millet stalk? [01] Yes …….. [02] No……………

11. If yes for what purpose? [01] For livestock feeding… [02] For firewood… [03] For

    construction…. [04] Others (specify)……………

12. If sold as source of income, how much did you earn per acre? ....

13. Where do you normally contact buyers?

    [01] At home…… [02] At the field…… [03] At the market… [04] Others (specify)

14. Variable cost

Activity	Size of the field	Tshs.
Land preparation		
Seeds		
Planting		
Weeding		
Harvesting		
Transportation		
Storage		
Market fee		
Labour charges		
Tax		
Empty bags		
String/threads		
Loading /unloading		

15. Other crop selling activities:

s/n	Crop sold	Quantity sold					
		Qty	unit	Price/unit	Income	Month sold	Where/to whom sold
1	Sorghum						
2	Maize						
3	Rice						
4	Sunflower						
5	Finger millet						
6	Bambara nuts						
7	Sweet potatoes						
8	Simsim						
9	Ground nuts						
10	Beans						
11	Cassava						
12	Paddy						
13	Grape						
14	Cowpea						
15	Castor						
16	Others (specify)						

16. Livestock selling activities:

s/n	Livestock sold	Quantity sold					
		Qty	unit	Price/unit	Income	Month sold	Where/to whom sold
1	Cattle						
2	Milking cow						
3	Oxen						
4	Heifer						
5	Bull						
6	Calf						
7	Other cow						
8	Goat						
9	Does						
10	Buck						
11	Kid						
12	Sheep						
13	Ewe						
14	Ram						
15	Lamb						
16	Equines						
17	Horse						
18	Mule						
19	donkey						
20	Chicken						
21	Local chicken						
22	Broiler chicken						
23	Layer chicken						
24	Ducks						
25	Beehives						
26	Others Specify….						

17. Other sources of income in 2009

Sources	Quantity	unit	Price/unit	Income	Which month	Rank(1-5)
Rented out land						
Employment						
Remittance						
Hired out labour						
Hired out oxen						
Sale of handicraft						
Sale of beverage						
Sale of firewood						
Others business(specify)						

18. What have to be done to improve the market of pearl millet? ....

Factors that hinder marketing of pearl millet

1. Which are the most serious problems in your pearl millet marketing?

(a) Problem related to government policy?

   [01]Lack of government effort to support pearl millet farmers

   [02]Unnecessary bylaws formulated by local government

   [03]Others (specify)…………………………………………

(b) Problem related to marketing system

   [01] Lack of sales promotion and advertisement

   [02]Poor infrastructure [03] Lack of market [04] poor quality of pearl millet

   [05]Others specify………………………………………………

(c) Personal problem [01] lack of business knowledge [02] lack of capital

   [03] Others (specify)………………………………………………

2. Suggest solution for solving problem in question 1

   (a) Government policy problem………………..

   (b) Marketing system problem…………………..

   (c) Personal problem………………………….

3. Are you accessible to agricultural extension services? [01] Yes… [02] No……

4. If yes, choose the correct answer by putting a tick [01] Adequate…… [02] Inadequate…

5. If inadequate what would you like to be done? ....

6. If no (fromQ3 above) why?...

7. Do you have access to credit facilities? [01] Yes… [02] No…..

8. If no what do you think is the main cause for you not to access credit facilities?

   [01] High interest rate… [02] Not available…. [03] Return from pearl millet are too low for loan repayment….[04] Too risky ……………………………………

9. If yes fill the table below

Source	Amount	Interest rate	Terms of payment [1] In cash,… [02] in kind…[03]Both…
Friend			
Bank			
Traders			
Others(specify)			

10. Factors influencing pearl millet buying decision

	Not important	A little important	Important	Very important	Extremely important	Don't know	Description of the preferred attribute of each trait
	1	2	3	4	5	6	
Form							1.Grain.2.Dehulled .3.Flour
Origin of product							1. Local.2. From another region within the country. 3.Imported
Presentation							1.sisal/plastic bags.2.loose
Point of sale							1.local market.2.Street
Others (specify)							

11. Do you get any training/advice about business? [01]Yes…

[02]No…………………………

12. a) If yes, what is it?..

    b).How does training/advice help you in your business? ....

    c) If no [from 12 above] why? ....

13. What are the barriers to the market entry? [01] Capital… [02] Knowledge…… [03]

    Institution [04] others (specify)…………………………………………………

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Appendix 2: Traders' Questionnaire

Questionnaire number…………**…**Interviewer's name…………………

Trader's name………………………………………Date………………

Region	Division	Ward	Village/street

Background information

1. What type of business are you operating?...

2. When did you start this business?..

3. Why did you decide to establish this business?...

4. What type of food stuff do your customer prefer most?..................................

5. Do you sell pearl millet?...

6. Which variety(s) of pearl millet is preferred in the market?.............................

Variety(s) preferred most;	Reason

7. Who supply to you the pearl millet produce/product?...

8. How many times are you supplied with pearl millet in one season?...................................

9. Apart from pearl millet are there other agricultural products, which are among of your trading activities? (If yes list them)………………………………………………………………

Market performances

1. Are you accessible to relevant market information such as price of pearl millet?

2. If yes what is the price of   one Tin of pearl millet? ....

3. Which degree of standardization measures do you use in trading pearl millet?................

4. Which factors do you consider when buying or selling your pearl millet?........................

5. Mention the type of costs that you normally incur during marketing of pearl millet produce/products.

6. Factors influencing pearl millet buying decision

	Not important	A little important	Important	Very important	Extremely important	Don't know	Description of the preferred attribute of each trait
	1	2	3	4	5	6	
Product form							1.Grain.2.Dehulled.3.Flour
Origin of product							1. Local.2. From another region within the country. 3.Imported
Presentation							1.sisal/plastic bags.2.loose
Point of sale							1.local market.2.Street
Others (specify)							

Nature or kind of value addition

1**.** In which form of pearl millet do you buy?...

2. In which form of pearl millet do you sell?...

3. Is the pearl millet graded before buying / selling?..

4. If yes which criteria is considered during grading? ....

5. Do you process your pearl millet produce? ………………………………..…………

6. If yes, which machine/equipment do you use in processing? ....

7. If no, what are the reasons and what have to be done in order to process the pearl millet?

S/N	Reason	Possible solutions
1		
2		
3		
4		

8. Do you do any packing before selling?...

9. (a)If no why?..

   (b)If yes which kind of packing are you doing? ....

10. Do you usually know price in advance before taking your produce to the market?

11. At what price do you purchase pearl millet from farmers?

Buying price Tshs /kg	Selling price Tshs /kg

12. Where do you sell the pearl millet?...

Factors that hinder marketing

1. Do you have access to credit facilities?

2. If yes what are the main sources of capital?

3. a) Did you apply for credit from any agency in the recent years?

   b) If no, what could be the reason?

4. Do you get any training/advice about business?

5. a) If yes, what is it?............

    b) If no why? ....

6. What are the barriers to the market entry?

7. What other pearl millet marketing constraints do you face?

8. High transportation cost [01]Yes,…. [02] No…..

9. Shortage of capital [01]Yes,…. [02] No…..

10. Shortage of market demand [01]Yes,…. [02] No…..

11. Access to credit [01]Yes,…. [02] No…..

12. Inadequacy of infrastructures [01]Yes,…. [02] No…..

13. Inadequate of business knowledge and skills [01]Yes,…. [02] No…..

14. Access to market information [01]Yes,…. [02] No…..

15. Small volume and inconsistent production/supply [01]Yes,…. [02] No…..

16. Shortage of promotion programmes [01]Yes,…. [02] No…..

THANK YOU FOR YOUR COORPORATION

Appendix 3: **Processors' Questionnaire**

Questionnaire   number……………Interviewer's
name……………………………………….
Processor's   name…………………………………………………
Date………………

Region	Division	Ward	Village/street

Background information

1. When did you start this business?...

2. Why did you decide to establish this business?..

3. What type of grain do your customer prefer most?...

4. Who supply to you the pearl millet produce/product?...

5. Apart from pearl millet are there other agricultural products, which are among of your trading activities? (If yes list them)……………

Choose Yes or No from the following constraints facing pearl millet processors:

Q	Constraints	Yes	No
6	Shortage of capital in processing pearl millet		
7	Shortage of appropriate pearl millet processing machines		
8	Lack of market for pearl millet produce/products		
9	High cost of energy (fuel/electricity) in processing pearl millet		
10	High tax rate		
11	Competetion from other cereal products		
12	High costs in packaging materials		
13	Small volume and inconsistence production of pearl millet		

14. Is there other problems that you face in pearl millet processing and marketing?

THANK YOU FOR YOUR COORPORATION

Appendix 4: Consumers' Questionnaire

Questionnaire number……
   A. **Back ground information**
    1. Enumerator's name …………………2. Name of respondent………………
    3. Date of interview…………………   4. Fill the following table:

Village / street	Ward	Division	District

Market performances

1. Have you ever used pearl millet/pearl millet product?

2. How many times do you consume pearl millet/pearl millet product per week?

3. Would you recommend the use of pearl millet to your relative or fried? Why?

4. Do you think that this commodity (pearl millet) is easily accessible in the market?

5. Does the commodity (pearl millet) satisfy the need for which you buy it for?

6. To what extent do you know the pearl millet prices prevailing at the market?

7. At what price do you purchase the above commodity (question 3 above) ……..Tshs per kg?

8. Which factors do you consider when buying or selling your pearl millet?

9. Who facilitate purchasing of pearl millet to customers?

Nature or kind of value addition

1. Which form of pearl millet do you prefer most to purchase and why?

2. What type of value would you like to be added to pearl millet?

3. What are the uses of pearl millet?

Factors that hinder marketing

1. Does the infrastructure enable you to access the pearl millet in the market?

2. Does the availability to information help you to access the pearl millet in the market?

3. if your income increase will you buy more pearl millet produce/products?

4. Purchasing price of pearl millet (a) high (b) medium (c) low

5. How does the price of substitute affect the price of pearl millet?

6. Does the taste of pearl millet encourage you to continue buying/consuming the commodity?

7. Pearl millet consumption trend

How often do you consume pearl millet in the rain season?	1.Never ………………………………… ..[ ] 2.one per week…………………………..[ ] 3.Every day one per day………………...[ ] 4.Every day twice per day………………..[ ] 5.Every three times per day……… …….[ ] 6.Every day more than four times per day.[ ]
How often do you consume pearl millet in the dry season?	1.Never …………………………………[ ] 2.one per week………………………...[ ] 3.Every day one per day……………….[ ] 4.Every day twice per day………… ….[ ] 5.Every three times per day…………....[ ] 6.Every day more than four times per day.[ ]

8. Which crop do you consume most in the dry season?

CROP	Consume regularly? 1= No 2= Yes	If yes why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify)	If no why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify	Buy? 1= no 2= Yes	Produce 1= No 2= Yes	Rank HH 1-5 (1= most)
Sorghum						
Maize						
Pearl millet						
Rice						
Sunflower						
Finger millet						
Bambara nuts						
Sweet potatoes						
Simsim						
Ground nuts						
Beans						
Cassava						
Paddy						
Grape						
Cowpea						
Castor						

9. Which crop do you consume most in the wet season?

CROP	Consume regularly? 1= No 2= Yes	If yes why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify)	If no why? 1=Taste 2=Price 3=Availability 4=Improves health 5=tradition 6=other(specify	Buy? 1= no 2= Yes	Produce? 1= No 2= Yes	Rank HH 1-5 (1= most)
Sorghum						
Maize						
Pearl millet						
Rice						
Sunflower						
Finger millet						
Bambara nuts						
Sweet potatoes						
Simsim						
Ground nuts						
Beans						
Cassava						
Paddy						
Grape						
Cowpea						
Castor						

10. How does the available form of pearl millet produce encourage you to buy it?

11. Factors influencing pearl millet buying decision

	Not	A little	Important	Very important	Extremely important	Don't know	Description of the preferred attribute of each trait
	1	2	3	4	5	6	
Origin of product							1. Local.2. From another region within the country. 3.Imported
Product form							1.Grain.2.Dehulled.3.Flour
Product Quality, packaging and presentation							
Presentation							1.sisal/plastic bags.2.loose
Location of sale							1.local market.2.Street3.supermarket
Others (specify)							

11. If your income increases will you buy more the pearl millet/pearl millet product?

12. Is there any other constrain that you face in purchasing pearl millet produce/product?

13. What suggestion do you offer in order to solve the problem above (in question 4)?

Appendix 5: Focus Group Discussion Questions for Pearl Millet Farmers

Interviewer's

name……………………………………………………………………………….

Division…………………Ward……………………..Village……………………

1. Why do you grow pearl millet? (Rank in order of importance)

2. What are the problems associated in pearl millet production?

3. What need to be done in order to solve the above problem in Q2?

4. How do you process pearl millet?

5. In which form are pearl millet consumed?

6. Which form (from above) is the most preferred?

7. Where do you sell your pearl millet?

8. Are you satisfied with the price of pearl millet   you are getting?

9. If no why?

10. Suggest ways to solve the problem of low price of pearl millet

11. What value needs to be added to pearl millet in order to improve the market?

12. Mention other constrain you face in pearl millet marketing? (Rank them in order of importance).

13. What would you like to be done to solve the above (Q12) problem?

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