MARKET POTENTIAL FOR PROCESSED SWEET POTATO PRODUCTS IN TANZANIA: A CASE OF COAST, MWANZA AND SHINYANGA REGIONS

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ABSTRACT

Prices of sweet potato had drastically dropped due to its glut in the market during harvesting season. This lead to stumpy margin revenues to famers as compared to production costs. Hence solution to help farmers earn more is to add value to the produce in Tanzania. The objective of the study was to investigate and create awareness on the sweet potato processed products marketing potential in the smallholder production system. Specifically the study sought (i) to characterize and describe the sweet potato value chain (ii) to estimate market analysis for sweet potato processed products (iii) to analyse social economic factors affecting consumption of various processed sweet potato products and (iv) to analyses social economic factors influences farmer's profitability. The study used cross-sectional research design combining both qualitative and quantitative approaches. It employed Regression analysis, Analysis of Variance (ANOVA), Market Potential Analysis, Profit Margin Analysis and Market Margin Analysis. The findings revealed that overall chain for sweet potato was characterized by low value addition, informal marketing system and poor coordination. Likewise, nutritional value and packaging were among a factor that influences the decision of consumers towards purchasing the products. Furthermore, results found that there was significant mean different in profit margin among actors in the chain at $p < 0.01$. Similarly, farmer's profit margin was statistically significant different from the wholesaler's profit margin at $p < 0.01$. The empirical data also suggested that variables included in the model explained about 64% of the variations in the dependent variable, hence farm gate price, occupation of the household and education level were statistically significant at $p < 0.01$. The industry still faces a number of developmental challenges, the most serious are chronic shortage of improved vines (33.1%), lack of capital (26.8%) and unpredicted weather (20.6%). Value addition approach is now a systematic focus of

research and to support development of value chain for neglected crops like sweet potato. Hence, it is important to enforce of existing laws and regulations by creating enabling environment for the crop, to strengthen both vertical and horizontal coordination and build capacity to farmers in handling, preservation and processing.

DECLARATION

I, JOEL JOHNSON MMASA, 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 being concurrently submitted in any other institution.

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DEDICATION

This work is dedicated to my Lord Jesus Christ who has been my helper and a very trustful friend throughout my life when I am in need of his support. This dedication is also extended to my beloved son Johnson Joel Mmasa "Junior" and my would be wife Eliada Mpemba who made this work to be possible.

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LIST OF ABBREVIATIONS AND SYMBOLS

ABC   Activity Based Costing

ADPs   Area Development Programmes

AICT   Africa Inland Church of Tanzania

ANOVA   Analysis of Variance

ANRI   Agricultural National Resources Institute

ASARECA   Agricultural Research in Eastern and Central Africa

ASDP   Agriculture Sector Development Plan

AVRDC   Asian Vegetable Research Development Center

BEAF   GmbH–Beratungsgruppe Entwicklungsorientierte Agrarforschun

CIP   Centro International de la Papa

DALDO   District Agricultural and Livestock Development Officer

DW   Durbin–Watson

FAO   Food and Agriculture Organization

GDP   Gross Domestic Product

GTZ   Deutsche Gesellschaft für Technische Zusammenarbeit

GVC   Global Value Chain

IDRC   International Development Research Centre

IFAD   International Fund for Agricultural Development

IFPRI   International Food Policy Research Institute

IIRR   International Institute of Rural Reconstruction

ISTRC   International Society for Tropical Root Crops

ITC   International Trade Center

ITDG   Intermediate Technology Development Group

KIT   Koninklijk Instituut voor de Tropen

MATI	Ministry of Agriculture Training Institute
MAFS	Ministry of Agriculture Food Security
MAFSC	Ministry of Agriculture Food Security and Cooperatives
MDGs	Millennium Development Goals
MLE	Maximum Likelihood Estimator
MT	Metric Tonnes
NBS	National Bureau of Statistics
NCSPC	North Carolina Sweet Potato Commission
NGOs	Non-Governmental Organization
NSGPR	National Strategy for Growth and Poverty Reduction
OLS	Ordinary Least Square
NRI	Natural Resource Institute
PAAP	Policy Analysis and Advocacy Programme
PANITA	Partnership for Nutrition in Tanzania
PRA	Participatory Rural Appraisal
PSDA	Promotion of Private Sector in Agriculture
Rand D	Research and Development
RIU	Research Into Use
RATES	Regional Agricultural Trade Expansion Support Program
REPOA	Research and Poverty Alleviation
SACCOs	Saving and Credit Cooperative Societies
S-C-P	Structure Conduct Performance
SGR	Strategic Grain Reserve
SLE	Seminar für Ländliche Entwicklung
SNAL	Sokoine National Agricultural Library

SNV	Stichting Nederlandse Vrijwilligers
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
TAFSIP	Tanzania Agricultural Food Security Investment Plan
TAHEA	Tanzania Home Economics and Nutrition Association
Tsh	Tanzanian Shillings
UNIDO	United Nations Industrial Development Organization
URT	United Republic of Tanzania
USA	United State of America
VIF	Variance Inflation Factor
WFP	World Food Programme
WVT	World Vision Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Agriculture is the backbone of Tanzania's economy (URT, 2003b). It provides employment to more than three quarters of the population, it accounts for 15% of exports, and contributes almost 27.8% of Tanzania's Gross Domestic Product (GDP) (URT, 2011b). However, according to MAFS (2008) recently, mining, tourism and services industries have been playing an increasingly active role in GDP contribution. Approximately 3.5 million farm families cultivate about 4.5 million hectares of arable land. Crop yields are only 20% to 40% of their potential. However, fall in prices of traditional export crops reflected in a reduced contribution of export earnings by the agriculture sector from 60% in 1990s to 14.3 % in the year 2007 and this decline is expected to increase.

Agriculture produces raw materials for the agro-processing industries in the country (such as grain mills, plants which make fruit juices and jams, sugar factories, cashewnut factories, coffee hulling plants and coffee roasting and processing factories, textile mills, paper mills, furniture workshops, breweries, tobacco factories). In addition to processing agricultural products to add value to them and to make them more readily usable, these factories provide employment to a substantial number of people (MAFS, 2004).

More than half of the labor force in the agriculture sector is women and over 15 million smallholder farmers in the country, more than seven million of whom are women (Nyomora *et al*., 2012). Most farmers have small plots of between one and three hectares with limited access to modern technology, machinery and inputs. Similarly these farmers

work on subsistence basis and can be pushed easily onto poverty by weather fluctuations (drought or floods), biotic stress and other external shocks notably food price fluctuations this lead to insufficient returns as compared to production costs, poor access to information, innovations, value added initiatives, improved varieties and good quality seeds. These had caused stagnant growth of agriculture sector in the last decades (growth stood at 4% per year since 2006) (NBS, 2012).

Moreover, according to National Bureau of Statistics (NBS) (2012), the data revealed that in 2011, agriculture and fishing activities grew by 3.4 percent compared to 4.1 percent in 2010. The recorded growth rate was due to good weather in the agricultural production season (Fig. 1).
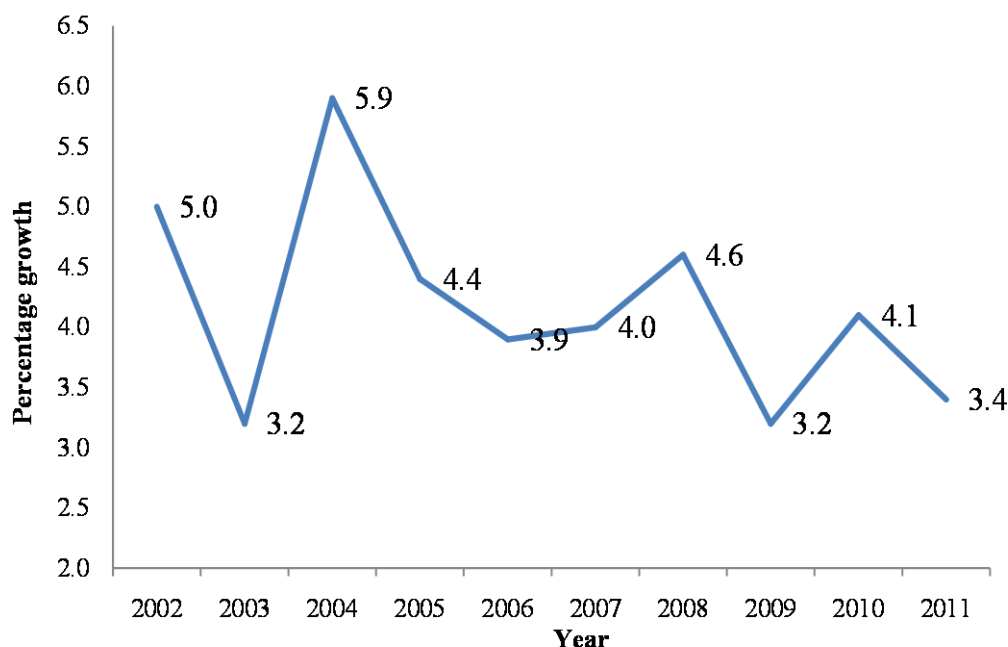
Figure 1:   Average annual growth rates of agriculture and fishing GDP at 2001 Prices

Source: National Bureau of Statistics (2012)

National Bureau of Statistics (NBS) (op.cit) survey data shows that in 2011, shares of GDP at current prices before adjustment for taxes and Financial Intermediation Services Indirectly Measured (FISIM) were: Agriculture (25.8 %), Fishing (1.6 %), Industry and Construction (24.8 percent) and Services (47.9 %).

The Government of United Republic of Tanzania strives to commercialize crops by demonstrating approaches to profitable agricultural production systems, increased market access and value-added activities in targeted rural communities (URT, 2008b). It is essential to focus on activities that focus on strengthening market access and expanding markets for valued added products, intensifying production; improving the quality and promoting engagement in post-harvest value addition (ibid). This would automatically promote the sector and hence contribute to GDP emanated from Agriculture sector. Import requirements included free from pesticide (hazardous), recommended species, tariffs and charges and standards.

Interestingly, Tanzania is still heavily dependent on traditional export crops, with cashew nut, coffee, cotton, sisal, tea, and tobacco (URT, 2007). The market potential for non-traditional export is somewhat brighter in the sector, where market opportunities offer prospects for significant growth. Newer, niche markets (fresh vegetables, cut flowers, and fish, roots and tubers for instance) may have the highest growth potential because they face fewer demand constraints in both the short and the medium term. Example, Sweet potato consumption in the USA appears to be concentrated during the fall months (October – December) where about 39% of production in consumed. Holiday occasions are also noted for increased demand. However, niche markets tend to be highly competitive and specialized, with laborious quality standards. In addition, they account for a small share of total agricultural export and agricultural GDP in most countries.

1.1.1 Sweet potato production

According to United Nation's Food and Agriculture Organization (FAO) (2010) reported that sweet potato is a very important crop in the developing world and a traditional, but less important crop in some parts of the developed world. According to the FAO statistics, 115 countries produced about 107 million tonnes of sweet potato in 2010. Majority of which came from Asia, with a production of about 81 million tonnes (FAO, 2012) which is 82.3% of global production. China alone produced 80% to 85% of the total sweet potato production in the world while the remaining countries in Asia have the next highest production, followed by Africa and Latin America (CIP, 2009).

Nearly half of the sweet potato produced in Asia is used for animal feed, with the remainder primarily used for human consumption, either as fresh or processed products. Because of its versatility and adaptability, sweet potato ranks as the world's seventh most important food crop after wheat, rice, maize, potato, barley, and cassava, as it constitutes a substantial source of carbohydrate and carotene (FAO, 2002; Nungo *et al.,* 2007 and FAO, 2010).

Sub-Saharan Africa produces more than seven million tonnes of sweet potatoes annually, which constitutes 5% of global production (FAO, 2012). Likewise, in 2012 the data showed that African's top producers of sweet potato were Tanzania (3.6 million tones), Nigeria (3.4 million tonnes), Uganda (2.6 million tonnes), Ethiopia (1.2 million tonnes) and Rwanda (1.0 million tonnes) (FAO, 2012). Unlike Asians countries, in sub-Saharan Africa, the crop is cultivated for human consumption. African yield levels are quite low, about one third (35.6 million tonnes) of Asian yields indicating huge potential for future growth.

Utilization of the crop is remarkably narrow in East Africa, the crop is most often consumed boiled or roasted in fresh form. In Tanzania vines are used as side food "*matembele*". Likewise in central Kenya vines are used to feed livestock particularly in areas where small-scale dairying in zero grazing management systems is well developed.

Vines are also being used as starter feed and partial milk replacer for young calves (Orodho *et al.,* 1995). The limited range of ways and availability of adapted processing technologies in which sweet potato is utilized in the region seriously undermine the potential benefits of the crop to farmers and consumers and other chain actors. Furthermore, sweet potatoes play an essential role for food security, especially in those regions prone to drought and with poor soils like Shinyanga and Kagera in Tanzania (FAO, 2004).

1.1.2 Sweet potato production and yield in Tanzania

The study by National Bureau of Statistics and Ministry of Agriculture, Food Security and Cooperatives (MAFS) (2007/08) agricultural sample censuses reported that from 2005/06 to 2009/10 a total of 2 424 000.20 tonnes of sweet potato were produced on 567 000.22 ha. However, it was estimated that the land area planted to sweet potato decreased from 635 000.40 ha in 2007/08 to 576 000.22ha in 2009/10 (Table 1).

Table 1: National Sample Census of Agriculture 2007/2008

Variables	2005/06	2006/07	2007/08	2008/09	2009/10
Area ('000'ha)	635.40	760.74	234.87	651.94	576.22
Production ('000'tons)	2 606.04	2 466.52	444.54	1 417.39	2 424.20
Yield (tons/ha)	4.10	3.24	1.89	2.17	4.21

Source: Statistics Unit-Ministry of Agriculture, Food Security and Cooperatives (2007/08)

In Tanzania sweet potatoes average yield is approximately 3- 4 metric tonnes per hectare on dry weight basis. This is low compared to more than 6 -8 tonnes per hectare in Zimbabwe (Mukunyadzi, 2009) and in Uganda, the orange fleshed varieties yield up to 20 tonnes per hectare (80 bags per acre) (FAO, 2012). The study conducted by Tewe *et al.*(2003) estimates of average sweet potato yield of 5 to 8 tonnes/ha in Nigeria. However, estimated yields in the research stations vary from 40 to 70 t/ha for improved varieties. Low production in Zimbabwe may be caused by many factors including susceptibility to pests and diseases, declining soil fertility, moisture stress, low level of crop husbandry management and poor accessibility to markets (Smith, 2004).

The crop commands both low domestic and international demand, a situation attributed to a poor marketing and distribution system (FAO, 2003). This in part can be attributed to limited consumption, processing and storage options for the crop (FAO, 2003). According to Gichuki *et al.* (2005) in Tanzania sweet potato is processed into two main products called "*michembe*" (the roots are withered, cut into slices and dried) and "*matobolwa*" (the root are boiled, sliced and dried) these products can last for 5 – 8 months. There are other products that are processed in Tanzania including cakes, *chapattis*, *doughnuts*, *kalimati*, flour, porridge and crisp.

Literature on the use of root and tubers like a processed sweet potatoes product is scanty. "*michembe*" and "*matobolwa*", traditional flour and crisp "*chips dume*" are the main locally processed products derived from sweet potato (Mpagalile *et al.,* 2007). However, there other products like "*matembele*" which is used as a side food/condiments. These products look promising in broadening market potential for wider transect of the Tanzanian community especially in per-urban and urban areas where traditional food is now becoming popular. However, there is need for food technologists to improve

processing technology, quality and sensory attributes to improve their acceptability. Furthermore, food attributes like sugar contents, colour, filing, appearance and taste should be taken into considerations.

1.1.3 Major sweet potato import and export countries in the world

Although the crop is cultivated all over the world, but only one percent of production enters world trade with Canada, the United Kingdom, France and the Netherlands being the major importing countries (Katan and De Roo, 2004). The USA is the largest exporter of sweet potato accounting for 35% of world trade. The other exporters are China (12%), Israel (9%), France (7%), Indonesia (6%) and Netherlands (5%). Most of the product is used for household consumption with a small percentage going into industrial uses and animal feed.

1.1.4 Sweet potato export potential in Tanzania

There is clearly high demand of sweet potato products from Australia, Netherlands, United Kingdom, France and Belgium and their preparedness to pay higher prices for high quality sweet potato products. Example by 2009, the EU had doubled its volume of imports from the US to 33 224 MTs valued at $24.8 million (FAO, 2012). Still Tanzania needs to compete with other countries like Ghana, United States of America, China, Netherlands, Spain, Viet Nam and Egypt who are the major sweet potato exporters (ITC, 2003).

Tanzania has been exporting small quantities of sweet potato as an average of net weight of 22 000kg of fresh or dried, chilled or frozen from year 2003 to 2013 with Free On Board (FOB) value of 7.3 million (URT, 2013). There is a potential export market which can create a huge demand pull effect. Many growers and processors are not

sufficiently aware of the export requirements and its implications for their sweet potato business. Export requirements in Tanzania included; Exporters required to obtain a valid trading/business license from the city/town council where the business will be conducted. The license is valid for one year. Some products require specific license/permit from the Government departments/institutions or a controlling body legally empowered to do so, exporters of sweet potato products have to contact Ministry of Agriculture for Food Security (MAFS) (staple) products (Tanzania Business Portal, 2006).

This is an empirical study on sweet potato value chain analysis, processing and marketing strategies by smallholder farmers. The study focuses on market potential of processed sweet potato products in the Shinyanga District, Mwanza City and Kibaha District. It is envisaged to come up with findings related to consumption demand and prices, quality, availability of the products, seasonality and potential substitutes notably cassava and other root and tuber crops. The potential impact of these study findings is to improve livelihood of small-scale sweet potato producers and foster household income.

1.2 Problem Statement and Justification

1.2.1 Problem Statement

Sweet potato is widely grown and consumed in many areas in the country (Ndunguru, 2003). The crop it is cultivated by majority of farmers for their own consumption (op.cit). The crop is drought tolerant and serves as important food security and income earner. The crop is grown by smallholders, especially youth and women and occupies approximately 14 % of total arable land (Kapinga *et al.,* 1995). Sweet potato production is mainly for home consumption including boiling, roasting and deep-frying of the roots, and the leaves are used as vegetable and are marketed.

According to Tewe *et al.* (2003), Sweet potato among the root and tuber crops that had a positive per capita annual rate of increase in production. Tewe (op.cit) suggested that the crop has a high yield potential that may be realized within a relatively short growing season and adaptability to a wide ecological range of 0 to 2000 meters above sea level and 300 N to 300 S.

In Tanzania, sweet potato is the third most important root and tuber crop after cassava and Irish potato. The crop is grown almost in all agro-ecological zones because of its hardy nature and broad adaptability, the crop is used to sustain food supply when other crops fail (Jana, 1982; Kapinga *et al.,* 1995; Ndunguru and Rajabu, 2000). In terms of volume produced, sweet potato is the most important tuber crop in the Lake Zone (330 600 tons/year), Southern Highlands Zone (271 000 tons/year), Eastern Zone (107 400 tons/year) and Southern Zone (37 400 tons/year) (URT, 2011b).

Promotion of root and tuber crops in most African countries is threatened by low prices of the crops and their products with the rising cost of labour and transportation, rural farmers can hardly sustain their farming systems considering the insufficient returns from their harvest (Tewe *et al*., 2003). It is, therefore, advantageous to diversify the use of root crops beyond those of the traditional food industry in African countries. However, the question of bulkiness and perishability affects post-harvest system of sweet potatoes as it has a shelf-life of little more than one week after harvesting undermine its utilization (Abidin, 2004).

Sweet potato has gained importance due to its adaptability to marginal conditions such as drought, low soil fertility, and is ranked highly as food security crop when local staple crops like maize and rice fail (Kapinga *et al.,* 2000). Sweet Potato Virus Disease (SPVD)

and sweet potato weevils are the most devastating disease affecting sweet potato production in Tanzania. But these can be easily controlled by farmers themselves (op.cit).

Hence it is both desirable and necessary to process sweet potato into storable products (Ndunguru, 2001). Value addition is necessary if Tanzania is to enjoy higher benefits from the crop. Conversely, production-side investments will improve both productivity and product quality and hence smallholder's competitiveness will increase and eventually will capitalize the market. The crop contains not only starch but there is other nutritional quality content such as β-Carotene (Sosinski *et al.,* 2001). Full potential of root and tubers has not been exploited due to a number of problems like poor access to information, innovations, improved varieties and good quality seeds and poor market (Ndunguru, 2003 and Nyamora *et al.,* 2012). This hinders the growth of the crop.

Poor horizontal and vertical coordination hinders chain development (Ndunguru, 2003). Measuring weight of products, grading of the produce and packaging sweet potato for marketing are still a major challenge to these farmers (op.cit). The careless post-harvest, which is common in the study area often leads to both quantitative and qualitative losses of sweet potato. However, what is not well known is the market potential of sweet potato processed products beyond traditional ones. In Tanzania there are products that have been prepared from sweet potato including cakes, *chapattis, doughnuts, kalimati,* flour, porridge and crisp. But in the study area two main traditional products are derived from sweet potatoes namely *"matobolwa"* and *"michembe"*. Artisanally, dried products are mostly used for home consumption with limited commercialization, probably because they are not competitive with dried cassava or irish potato crips/chips. Household usually slice manually and sundry the product. The exercise is labour intensive, hence difficulty in processing large quantities. Furthermore, key actors in the value chain are not aware of

the many value addition possibilities of sweet potatoes in Tanzania. Before investing in value addition of sweet potatoes, it is important to investigate market potential for sweet potato processed products.

1.2.2 Justification of the study

Sweet potato value addition is important intervention to embark in. This is due to the fact that urbanization, changing lifestyles, increasing middle income earners, market socializing and trade liberalization which have led to an extraordinary increase in demand for high value products. It is now crucial time in this business environment to invest in value addition hence creating competiveness in markets and thus expanding market opportunities (Msuya, 2009). However growth and diversification of high value products segment is confronted with low productivity, high cost of production, low quality. Products, inefficient supply chain and poor market intelligence. However, the crop is bulk and perishable. Hence, proper post-harvest techniques and value addition is necessary. Efficient value chains processes would translate into increased prices and margins to farmers.

A value chain analysis approach provides the means to crack the values, to improve and manage the value chain. This knowledge is acquired by studying the participants in the process i.e. those who perform physical marketing functions in order to obtain economic benefit. It is on this basis that the study sought to examine market potential of sweet potato processed products of smallholder production system. This study was guided by mean-end theory, cluster theory and value chain approaches in Tanzania. Similarly, the crop had essential global health objectives of the crop are to increase the availability of nutrients to a large population of the world. This goal can be achieved by increasing the nutritional content of highly consumed crops (Katan and De Roo, 2004).

This study is in line with Millennium Development first Goal (MDGs) to eradicate extreme poverty and hunger by 2015 and National Strategy for Growth and Poverty Reduction (NSGPR) programme in reducing the prevalence of income poverty in Tanzania of which according to the household budget survey of 2011/12 the proportion of population below the national basic needs such as food, shelter and water is 33.3 % (NBS, 2012). Moreover, this study is in line with Tanzania Agricultural Food Security Investment Plan (TAFSIP) that insist on value addition, Agriculture Sector Development Plan (ASDP) and "*Kilimo Kwanza*" ("Agriculture first") (2011) that promotes Agriculture and food security in the country as an attempt to reduce food insecurity hence alleviate poverty. The study endeavors in upgrading and promotion sweet potato value chain and hence upgrading, the findings will also be used by policy makers, academicians and development practitioners in formulating conducive and sustainable policies for the growth of the sweet potato industry for the national development.

1.3 Objectives

1.3.1 Overall objective

To investigate and create awareness on the sweet potato processed products marketing potential in the small holder production system in Tanzania.

1.3.2 Specific objectives

i. To characterize and describe the sweet potato value chain.

ii. To estimate market potential for sweet potato processed product.

iii. To evaluate social economic factors affecting demand of various processed sweet potato products.

iv. To analyses social economic factors influences farmer's profitability in the study areas.

1.3.3 Hypotheses of the study

In answering the above specific objectives the study is guided by the three basic hypotheses:

i. Sweet potato value chain in the study area is not well organized and coordinated

ii. Social economic factors have no impact in demand of various processed sweet potato products.

iii. The influence of social economic factors to farmer profitability is not significant

CHAPTER TWO

2.0 LITERATURE REVIEW

In this chapter the study consulted and reviewed several literatures in form of documents, books, magazine, journals and formal articles and published results from studies that have a bearing on the study being conducted. The literature reviewed creates, assesses and detects gaps in existing knowledge on sweet potato production, processing and marketing in developing countries in general and Tanzania in particular. The review also sharpens and deepens the general and theoretical foundation of the research, empirical literature review, critical literature review and conceptual framework.

2.1 Definition of Terms and Concepts

2.1.1 Value chain

The studies conducted by KIT *et al*. (2006), defined a value chain are specific supply chain where actors actively seek to support each other so that they can increase their efficiency and competitiveness. They invest time, effort and money and build relationships with other actors to reach a common objective of satisfying consumers' needs. Generally, value chain consists of input suppliers, producers, processors, traders, wholesalers, exporters, retailers and consumers of the product or service. Value chain also includes Research and Development (R and D). The producer who the key primary actors that feed the chain combines the resources from research and development and input suppliers with land, labor and capital to produce commodities.

The study by Will (2008) described value chain development as a business-oriented approach that aims to capture the best value at all stages. A value chain is therefore characterized by a sequence of functions and linkages and coordination between the

various actors and supporters. Usually, value chain exist where operators share common vision and goals for managing the chain processes, thus allowing for mutual decision-making on how to link production with markets and sharing risks and benefits. The better all value chain partners cooperate, the greater will be the value generated for the individual operator at every stage of the chain (Will, 2008).

Furthermore, according to USAID (2009), taking a value chain approach requires understanding a market system in its totality. This includes all chain actors, supporters and the business environment in which the industry operates. The study (opt.cit) argued that, within many staple food value chains in Africa, relationships between actors at different levels of the value chain are weak, disconnected or even adversarial. Information flows are often asymmetrical. In addition, there is a widespread lack of objective standards and grades. Consequently, transaction costs and risks and costs are high, and lack of transparency means that value chain actors enter into negotiations with mistrust.

The study by Kaplinsky and Morris (2001), defined value chain is as the full range of activities/tasks that are required to bring a product or service from conception, through the different phases of production, delivery to final consumers and final disposal use. Similarly, IFAD (2010), explained that a value chain as a market-focused partnership among different stakeholders who produce and market value-added products to win a certain market niche.

The study by Pathania (2001) suggests that when the system is managed carefully, linkages can be a vital source of competitive advantage. Lynch (2003) found that value chain analysis entails linkage of two areas which are value of the organization's activities

with its main functional parts and assessment of the contribution of each part in the overall added value of the business is made in the process of adding value.

The study by Porter (1990) describes value chain as the full range of activities ranging from production to consumption or defined the value chain framework as "an interdependent system or network of activities, connected by linkages". These activities include input suppliers (varieties, processing facilities and vines) to farmers, traders and consumers. These activities can be contained within a single firm or divided among different actors (ibid). More broadly, value chain also includes: the institutions or regulatory framework which structures the way in which transactions occur in the chain and the service providers, including research and development organizations, which help to improve its functioning.

The study by International Food Policy Research Institute (IFPRI) (2003) defines commodity supply chain as a value addition process whereby a commodity is processed or manipulated in whatever way in an effort to add value to it as it goes along the commodity chain to the final user. However, Tallec (2006) defines value chain as the activities that take place in a business and relate them to the analysis of the competitive strength of the business and value chain analysis is one of the ways of identifying which activities are best undertaken by a business and which are best provided by others.

Similarly, Gibbon (2001) described a value chain as a chain of activities, where products pass through all activities of the chain in that order and at each activity, the product gains some value. The chain of activities gives the products more added value than the sum of added value of all activities. The author further observes that it is important not to mix the concept of value chain with the cost occurring throughout the activities. For example,

careful sweet potato production, harvesting, handling, preservation, processing and storage activities by avoiding pests, bruises, cuts may have a cost through the use of agronomical practices including use of pesticides, purchase of special processing and storage facilities but the activity relatively adds much of the value of the end products, since sweet potato affected by pests or bruises or broken pieces have lower value than the wholesome ones without damage or bruises.

According to Ssango (2006), a value chain is a specific type of supply chain, one where the actors actively seek to support each other so that they can increase their efficiency and competitiveness. They invest time, effort, money and build relationships with each other to reach a common goal of satisfying consumer needs so as to increase their profits. He defines actors as those involved in producing, processing, trading or consuming a particular agricultural product. The actors include direct actors who are commercially involved in the chain (producers, traders, retailers, consumers) and indirect actors who provide financial or non-financial support services, such as bankers and credit agencies, business service providers, government, researchers and extensions. Sweet potato value chain has additional actors namely village traders, processors and surprisingly, however no exporters yet are engaged in this subsector. The indirect actors are loosely coordinated and their roles are not significant. Like other crops, sweet potato value chain entails interventions at each node of the chain including production, preservation, storage, processing and transporting.

Therefore this study defines a value chain as systematic supply chains where by key actors create a strong relationship to support each other for the purposes of increasing effectiveness, efficiency and competiveness. Hence the ultimate goal is to upgrade the

chain and satisfy consumers' needs in relation to their customs and taboos on food eating habit.

2.2.2 Supply chain

In differentiating value chain from supply chain, Feller *et al.* (2006) define value chain as the integration of key business processes from end user through original suppliers that provide products, services and information that add value for customer and other stakeholders. Supply chain, however does not necessarily add value. The author further indicates that the key difference between value chain and supply chain lies on the fact that the two chains flow in opposite direction (Fig. 2).

Value chain

Product   Value chain   Customer

Different supply chains add up value chain

| Strategic component | Assembly storage, assembling | Finished products | Successful customer |
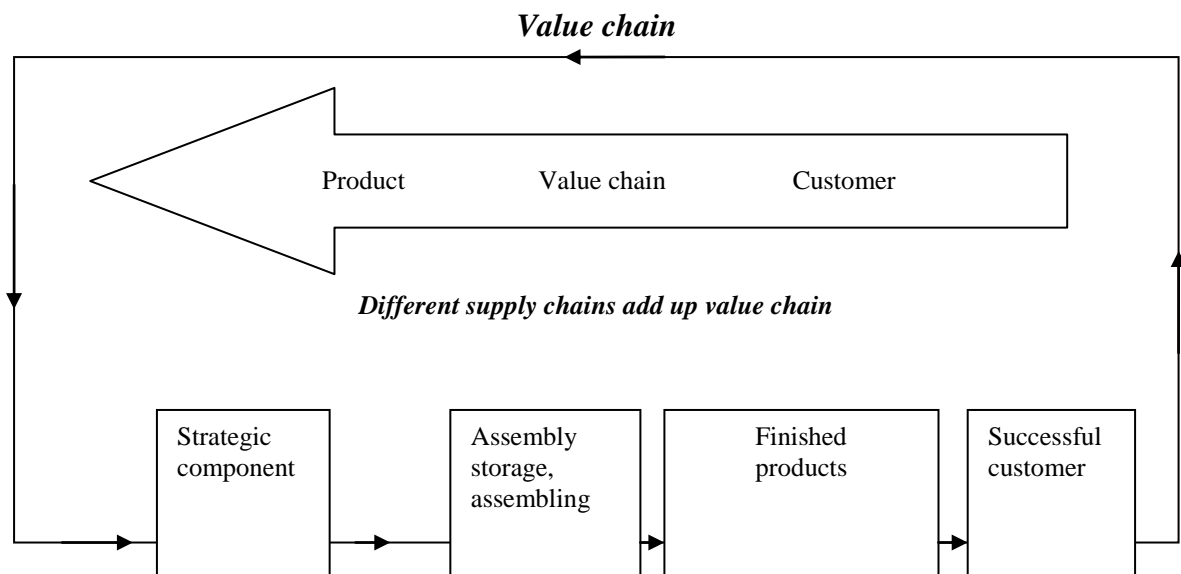
Figure 2: A comparison of a value chain with a supply chain
Source: Modified from Feller *et al.* (2006).

2.2.3 Managing various activities in the value chain

Lusby and Panlibuton (2004) argue that value chain analysis is used to show the dynamic flow of economic and organizational activities involving actors within different sectors (identifying distribution of benefits among the actors). The benefit from chain

participation and from increased support or organization of the chain actor is determined through margin and profit analysis. On other-hand, Kaplinsky and Morris (2001) argue that value chain provides an important process that facilitates the understanding of the distribution of returns from the different activities of the chain, when it is broken into its constituent parts of designing products, supply, production, and distribution of products, one can better understand its structure and functioning and assessing its scope for systemic competitiveness.

The study by Feller *et al.* (2006) revealed customers are the key factor if the company needs to understand its own capabilities. Managers should understand various activities in the value chain, like price that the customer is willing to pay for the company's products and services which affect the relative costs of the value chain activities. Furthermore, Anderson *et al.* (2006), Butz and Goodstein (1996), Parasuraman (1997), Rintamaki *et al.* (2007), Vargo and Lusch (2004) and Woodruff (1997) argue that the final consumers have exclusive rights to the definition of what constitutes value in a product or service and that firms can only create successful value propositions by understanding what it is that consumers value in the products and services they create and subsequently adapt to suit specific market niche. In other words to produce the products or services that suit the requirement of the consumer is necessary.

Moreover, Porter (1990) and Pearson (1999) concluded that the value chain framework is a handy tool for analysing the activities in which the firm can pursue its distinctive core competencies, in the form of both a low cost strategy and differentiation strategy and managers should make sure to use the value chain analysis to identify how each business activity contributes to a particular competitive strategy.

2.2.4 Sweet potato sub-sector

Sweet potato (*Ipomoea batatas Lam*) is among the world's most important, versatile, and underexploited food crops. The crop is bulky and perishable which affects the distance over which sweet potato can be economically transported unless processed into other products (GTZ, 1998). More than 90% of total production in the country is utilized as human food (Kapinga *et al.,* 1995). Likewise, to a large extent it is valued for its tubers which are boiled, fried and roasted. But its leaves are also edible and used as a condiments.

2.2.5 Sweet potato production in Tanzania

Sweet potato is a major staple food and source of income in several regions of Tanzania and elsewhere in East Africa and is under-exploited food crop (Ndunguru, 2003). Sweet potatoes are grown in most parts of the country, but the main production zones are found in Lake Zone, Southern Highlands and Eastern Zone (URT, 2007).

Food production dominates Tanzania's agriculture economy with over 5 million hectares cultivated per year of which 85 percent is food crops. Sweet potato in Tanzania ranks twelveth by value and sixth by quantity (FAO, 2007). The crop provides employment and is important in sustaining food security and livelihood for the rural poor. In Tanzania the crop is generally considered as a relatively minor traditional food crop and is grown as a subsistence crop for food security as well as cash crop (URT, 2005). Therefore it does not have systematic and organized marketing channels such as cooperatives or national marketing board and is still marketed in a spot marketing system.

Moreover according to Shinyanga District Agricultural and Development Plan (DADP) the District production records for 2005/06 to 2009/10 production records show an

increasing and decreasing trend (DADPS, 2010). In Tanzania sweet potato productions depends on rain and is therefore produced at the same time (after the rain season), leading to a surplus of sweet potatoes during the harvesting period and to a shortage in the dry season (Anon, 2003).

Production areas capable of making surpluses tend to be relatively localized and isolated, which leads to lack of market integration and limits market size of the product (Hall *et al.*, 1998). It was further found that in the Lake Zone of Tanzania farmers reported that marketing sweet potato is difficult, either markets are too distant using transport like bicycle while others use head loads and sometimes farmers are forced to accept price from of a sole trader serving the area (DADP, 2012). The risks of oversupply especially during harvesting season are greater in rural locations distant from significant urban populations.

Production is highly seasonal in most countries leading to marked variation in the quantity and quality of the roots in markets associated with price swings (GTZ, 1998). There is little commercial processing into flour or crisps, which could be stored for year round consumption for use in "*ugali*", bread and cakes, or processing into fermented and dried products. Sweet potato consumption sometimes tends to decline as incomes rises, a change often linked with urbanization, partly because it is perceived as a famine reserve crop when cereals, especially maize, fail. However, there is slow progression of sweet potato processing at small-scale level beyond traditional products that start production of high quality flour and crisp.

2.2.6 Sweet potato postharvest handling

Sweet potato postharvest handling involves several steps to maintain the quality good. Handling sweet potato involves some critical control points (Lunning *et al.,* 2006), that need to be watched carefully to avoid unnecessary losses. According to Dhliwayo-Chiunzi (2004) these critical control points include harvesting, curing, washing, environmental control in storage and transportation.

2.2.7 Pre – harvest conditions of sweet potato

Sweet potato tubers develop to marketable size in 90 to 150 days after transplanting (Stathers *et al.,* 2005). Maturity can also be assessed by cutting tubers in the field and observing the color of the latex exudation which turns black in immature tubers and remain creamy-white in mature tubers (Mutandwa and Gadzirai, 2006). Normally, harvest begins when most of the tubers have reached the desirable size to maximize on the market prices. Market grade differs with the market supplied; with most consumers preferring the medium (3-5cm diameter) grade, white sweet potatoes and red sweet potato. In harvest systems where the vines would be used for other purposes like animal feed or where the vines could disturb the harvesting process, the vines are cut immediately before harvest.

Sweet potatoes do not have a thick protective outer layer of cells such as that on Irish potato tubers. Any abrasion can lead to rots in storage. Skinning injury in dry soil can be avoided either by waiting for rain or by irrigating the field before harvest. Skinned areas can become dark and sunken and surrounded by a narrow brown border. These scars offer opportunities for storage rot pathogens such as *fusarium* to enter the tuber (Brooke, 2003). Curing tubers after harvest allows the periderm to reform, reducing subsequent storage damage. Skinning also takes place in packing and shipping to markets so packing lines should be designed to reduce injury.

2.2.8 Harvesting

According to Brooke *et al.* (2003) sweet potatoes can be harvested either manually or mechanically. Mechanical harvesting may result in high levels of mechanical damage, the level of which depends on the depth of the digger, the speed of the tractor and the soil conditions. Whether harvested mechanically or by hand, transport from the field to the packing facility is best carried out using field crates, as sacks result in rubbing of the surface skin and build-up of disease organisms. To harvest sweet potato; the field is usually ploughed with a modified disk or moldboard plough with a spiral attachment.

Tubers are then handpicked and graded in the field. Sweet potatoes can also be dug by a chain digger or a riding harvester which conveys the tubers to a sorting crew using a harvest aide. Harvesters are sometimes used to harvest sweet potatoes but damage is usually unacceptably high. Mechanical harvesting is mainly practiced in developed countries and is different for developing countries including Zimbabwe where the harvesting of sweet potato is done by digging using hoes or ox-drawn plough. Regardless of the method used to dig sweet potato, after digging the tubers are handpicked and graded in the field to remove damaged tubers. Mechanical damage during harvest can become a serious problem, as injuries predispose produce to decay, increased water loss and increased respiratory and ethylene production rates leading to quick deterioration (Katinoja and Kader, 2004).

The containers used for collecting the tubers after digging should be clean, have smooth inside surfaces and be free of rough edges. The tubers must also not be exposed to the sun for more than an hour or so after digging because of sunscald damage. Scalded areas turn purplish brown and are more susceptible to storage rots. If the field is big and there is no enough man power to quickly transport the sweet potato to the storage house before it is

affected by sun, it is recommended to put them under shed in the field. To prevent infection by disease-producing organisms, the tubers should be brought to storage immediately after harvesting and cured.

2.2.9 Picking

During picking sorting is done to separate injured tubers from the good ones to avoid damaged tubers entering into storage. The damaged tubers are more susceptible to pest and disease attack especially the soft rot fungal disease therefore, if left unsorted; the damaged tubers can be a source of infection to the adjacent undamaged tubers in storage. Tubers showing the signs of soft rot disease are screened out so that they do not enter into storage (Dhliwayo-Chiunze, 2004). During picking the bins should not be overloaded as this will expose the tubers to compression stress and injuries when the bins are loaded into the transport vehicles.

2.2.10 Curing

According to Brooke *et al.* (2003), curing sweet potatoes, by allowing the external layers of tissue to dry out, prior to handling and storage helps to protect the sweet potatoes from decay and further water loss. The idea of curing was supported by Katinoja and Kader (2004) who argued that curing root crops such as sweet potatoes is an important practice if these crops are to be stored for any length of time. Curing allows the periderm to thicken and to reform (wound healing). Curing is done to increase storage life thereby enhancing proper and profitable marketing. It should be done soon after harvesting before the disease organisms finds their way into the tubers. Curing should be done before washing because cured tubers are less injured at washing. Curing also converts some starches to sugars thus enhancing flavor. If the curing temperature and relative humidity

are lower than recommended, healing is slower and less effective in preventing subsequent decay in storage or marketing.

In Sub-Saharan Africa including Tanzania, many sweet potato farmers do not routinely store fresh sweet potato tubers, but leave them in the ground, until they are required, (Stathers *et al.,* 2005). The tubers become more prone to attack by insect pests, diseases and rodents as they stay long in the field. However, it is very possible to store fresh tubers successfully in specially constructed pits or mounds. Losses can be kept low in these storage structures by the use of pit liners like grass, sand and ashes (Mutandwa and Gadzirai, 2006). According to Mutandwa (2008), sweet potato can remain relatively fresh in these storage structures for three to six months. Storing sweet potato has many benefits to the farmers.

The farmers can harvest the tubers as soon as they mature for intensive land use. Storing the tubers enables the farmers' family to eat fresh sweet potato for a longer period after harvesting. Another advantage is that the stored sweet potato can be sold at higher price when the supply is low on the market. On the other hand, according to Stathers *et al.* (2005), there are some problems associated with storing sweet potato, the problems include the fact that the sweet potato tubers are tender and lose quality after harvest due to water and weight loss during storage. This will affect the texture and taste of the sweet potato. Some loses can occur due to pest and disease attack as well as the development of off-flavors in storage.

2.3 Theoretical Framework

This section seeks to clarify theories, concepts and empirical literature on which the analysis part of this study is based.

2.3.1 The means-end chain theory

Means-end chain theory postulates that 'product meaning' encompasses the physical attributes of products as well as abstract attributes and benefits that are perceived to fulfill important personal values that in turn inform purchase and consumption behaviours (Eugene and Cullen, 2006). Means-end chain method entails a laddering method of interview (Reynolds and Gutman, 1998). Soft laddering - through personal interviews was chosen for this study due to the low involvement nature of root and tubers. Soft laddering is based on a series of progressive and iterative questions that help the researcher understand the links or ladders between a product's attributes, benefits and values. Furthermore, shop-a-longs and observations, where the researcher accompanies the few consumers on their shopping, was also undertaken to understand the decision making process when purchasing sweet potatoes.

2.3.2 Cluster theory

In the cluster literature, as in Global Value Chain (GVC) analysis, the emphasis tends to be on 'industrial upgrading' and the rise of specialization (UNIDO, 2004). An important feature of Marshallian clusters is that joint action and strong institutional support improves competitiveness. Porter (1985) stated that value chain as activities within one company sometimes does not hold true. All those value chains including company value chain, supplier value chain, sales value chain and customer value chain were named by Porter as value system. Afterward, many appealing fruits were achieved so that people could make more and more sense of value creation and competitiveness rules. Some new

theories and concepts were derived from value chain such as value network, value cluster and value stream.

Helmsing (2002), Humphrey and Schmitz (2001) differentiate the value chain literature and the cluster literature views inter-firm co-operation within a single geographic area rather than within the chain as the source of competitive advantage. The cluster literature focuses on incremental upgrading and the spread of innovations through the clustering of local firms and collective action within the cluster. The cluster literature states that local level governance by networks of public and private sector institutions - facilitates upgrading strategies. In most cluster literature relations with the external world are not theorized.

According to Gilsing (2000) 'cluster governance' is about the intended, collective actions of cluster actors to upgrade a cluster; "Clusters can have very cohesive and integrated structures but may not be very inclined to be adapted when circumstances change". As a consequence, firms can lose competitive advantage because of emerging weaknesses in their environment. However, literature on cluster governance mainly refers to local networks of public and private sector institutions. The cluster literature suggests that local-level governance facilitates upgrading strategies (UNIDO, 2004).

Porter (1998c) argues that clustering does not automatically result in upgrading but requires an 'optimal balance' between competition and cooperation. It is interesting that in the context of a cluster it is assumed that there is something called a common goal while in value chain we need to meet competitive edge. A general critique on the clustering approach towards upgrading and competitiveness is that it fails in theory to explain the role of external agents that operate outside the cluster that (can) have a

considerable impact on local governance processes. This study links the value chain literature with the literature on clustering by looking at their interaction in improving upgrading strategies under a gradual process of free market economy.

2.3.3 Empirical studies on value chain

The review of previous methodologies and procedures for various studies is very crucial to enhance new findings and/or strengthen reliability of old one and is an essential activity in any scientific research. Value chains differ both within and between sectors. The study by McCormick and Schimtz (2001) on value chain points out that every stage of value chain analysis involved identification of the chain players/actors (primary, secondary and contemporary), their roles and functions, relationships, determination of the chain governance or leadership so as to facilitate chain formation and strengthening; identification of value adding activities in the value chain, as well as costs and added value being assigned to different activities.

Moreover, Porter (2000) distinguishes between primary activities and support activities of the value chain. He contends that primary activities are directly concerned with the creation or delivery of a product or service while support activities are to improve the effectiveness or efficiency of primary activities.

FAO (2003) examined factors preventing development of the mango supply chain in Kenya. The study used PRA methods to identify constraints that hinder development of mango supply chain and examined future development prospects. The study relied on a desk review and primary data collected that were analyzed by descriptive statistics. The study observed that despite the existence of the considered potential and a steady growth in yield over the last decade, development of the Kenyan mango supply chain

faced a number of structural problems that had a negative effect on the country, both in terms of foregone potential income and employment opportunities and reduced availability of locally produced high quality fruits.

Engoru *et al.* (2005) conducted a study on characterization of tuber utilisation among sweet potato producers in eastern Uganda. Their data were analyzed using SPSS. Results revealed that all farmers consumed part of their produce. About 46.1 % of the farmers processed their fresh sweet potato tubers.

The producer processing generated two primary products locally called *inginyo* and *amukeke*; it is from these processed secondary products that are *amukeke* flour and *inginyo* flour were derived Bashaasha and Scott (2001) reported that it was very likely that the over-riding motive for processing sweet potato is not profit but rather a mixture of objectives including household food security, emergency income security and the need to circumvent a limited and erratic fresh sweet potato market. The other 53.9% of the farmers who did not process any of their produce attributed it mostly to lack of the necessary processing knowledge. About half of the farmers (48.7%) stored their sweet potato produce. However about 52.9% of the farmers at least sold a portion of their produce.

In studying structures and patterns of cotton value chain in Mwanza, Itika (2005). The study examined the state and dynamics of actor's movement along the cotton value chain. Focus group discussions, in-depth interview of key informants and literature review were the main methods used to gather information. Since the study was explanatory and qualitative in nature, descriptive analysis was done in each case in the cotton value chain by sorting out issues that have to do with governance, entry and

movement of actors along the chain, diagramming the relationship, content analyses and cross case analysis for the purpose of comparison of the bases of power among the actors in the chain. The study found that powerful companies do support and work with weaker ones for mutual benefit; hence business relationship along the global value chain for cotton created forward and backward linkages. On the contrary, in seed cotton production section, the smallholder farmers remain weaker, disadvantaged and locked in the bottom section of the chain regardless of whether the value adding activities are increasing or decreasing at the domestic level. The author suggested that formation of strong farmers' association could be a solution to these problems. The methodology and analytical approach used in cotton value chain is also going to be adopted in studying sweet potato value chain as it gives an in-depth insight of the dynamics of sweet potatoes movement along the value chain and interaction between one actor and another.

Pascal *et al.* (2005) conducted a study on green beans supply chain in Arusha and Dar-Es Salaam. The study was conducted by carrying out a survey using structured questionnaire and checklist to collect primary data. Purposeful proportionate sampling was used to select the sample. The secondary data collected were used to determine the trend of green bean production and marketing. The study found that water scarcity for irrigation, dependency on rainfall, pest and diseases combined with limited access to marketing information were among the major problems limiting the capacity of different marketing agents.

In their study of spice industry in Tanzania, Akyoo and Lazaro (2008) characterized supply chain structure into two basic forms. In the first instance, the chain was characterized as segment whereby a sub-structure is made up of very closely coordinated chain with well-defined vertical stages from production to final consumer. The second

sub-structure is made up of numerous actors whose relationships are loosely coordinated through short or long-term business transactions. This chain is characterized by lack of well-defined roles and stages from production to consumption and is based upon conventional spice production. The rapid appraisal involving key informant interviews, focus group discussions and physical observation were the methodology used in the study.

Regional Agricultural Trade Expansion Support Program (RATES) (2003) carried out a market assessment for maize in Tanzania and used value chain analysis approach to develop strategic action to enhance the value and volume of maize trade. The methodology used for the study includes desk review, interview with stakeholders in the public and private sector together with field visits. The study reported four value chain strands, the first strand involves large/medium producers who sell maize directly to large-scale traders/exporters or processors.

The second strand involves large/medium producers who sell maize to Strategic Grain Reserve (SGR) or World Food Programme (WFP) while the third strand involves large/medium producers who through agents/brokers sell maize to large/medium size traders eventually reaching medium scale exporters and millers. The fourth strand encompasses small producers where village collectors or village millers buy maize and sell them to large/medium size traders or millers who eventually reach the consumer. The large traders integrate a number of functions in the value chain including trading, processing and exporting. Weak extension services, decline in soil fertility, high cost of agricultural inputs and poor status of rural roads were identified as the main problem affecting maize production. Small producers lacked information and knowledge on the market and the marketing system, making them the losers in the chain.

A study by Svensson (2003) contended that consumer is the one who determine the value of the product in question when looking from a theoretical context and not from practical perspectives. He further argued that the real value of the product is determined when the product reaches the final consumer hence any assessment of that value before that moment is only something that is true in theory. Another study by Ghamdi (2005) found that in Saudi Arabia, 56% of companies did not use the value chain tool at all. However, 22% of the companies in the study used value chain frequently while the rest 22% of the companies in the study used value chain occasionally.

Performing these function, value chain analysis can then be used to identify and strengthen those activities which most contribute to overall strategy while constraining resources allocated and consumed by tasks less critical. It is fair to say that Porter's initial framework adds tremendous value to our ability to understand relationships between buyers and suppliers, but as he admits it has its limitations (Porter, 1985). Porter (op.cit) advises against "applying value chain analysis at too high a level in an organization". He argues an industry will contain many different segments which imply the need for different processes and which involve different economic relationships and dynamics.

Therefore, Porter's value chain analysis works well to assess static relationships between participants, but falls short of letting us understand the dynamics associated with high clock speed industries that continuously redefine their value chain relationships (Porter, 1990). Understanding these limitations, we set out to analyze the sweet potato value chain and create a framework that will allow us to formulate these economic relationships and the dynamics that drive changes within both the device and infrastructure value chain.

Furthermore, according to Jeckonia *et al.* (2012) and Jiggins *et al.* (1997) reported that gender has been recognized as an essential variable for analyzing the roles, responsibilities, constraints, opportunities, incentives, costs and benefits in Agriculture Women are engaged in a multiplicity of farm activities some of which are hitherto exclusive preserve of men. Similarly FAO (1998) reported that the increased feminization of agriculture is as a result of men's rural-urban migration in search of paid employment leaving agriculture in the hands of women.

2.3.4 Value chain governance

According to Morris (2001), there are three key elements in value chain analysis which include chain governance, barrier to entry/rent and the different types of value chains. Value chain governance is one of the key elements of the value chain analysis. Governance ensures that interaction between firms along the value chain exhibits some reflections of the organization rather than being simply random. Value chains are governed when parameters requiring a product, a process and a logistic qualification are set such that they have consequences up or down the value chains encompassing bundles of activities, actors, roles and functions.

Gereffi *et al.* (2001) reported two types of chain governance, that is buyer driven and producer driven value chain. In the buyer driven value chain, the critical governing role is played by the buyer at the apex of the chain. This is characteristic of labour intensive industries. In the producer driven chains, on the other hand, it is the producers with critical technology that play the main role of coordinating the various links and take the responsibility of checking the efficiency of their suppliers and customers.

Producer driven chains often have significant foreign direct investment and are more often capital and technology intensive industries. The authors conclude that value chain analysis is an effective means of conceptualizing the forms that function integration takes in the production process and shifts the focus from production alone to the whole range of activities from design to marketing. It also highlights the problem of governance, which shows how chains are organized and managed. In the hides and skins value chain, the critical governing role is played by buyers and therefore being categorized as buyer driven value chain.

According to Kaplinsky and Morris (2001), there are three forms of value chain governance; the first is legislative governance which involves setting basic rules that define conditions for participation in the chain. The second is judicial governance, which has a role of setting audit performance and checking compliance with the rules set i.e. coordinating the conformity to the set parameters. The third is executive governance which assists the value chain participant's adhering the operating rules i.e. managing various subordinate links in the value chain. The executive governance may be direct (for example helping a supplier achieve quality standards) or indirect (forcing a first-tier supplier to assist a second- tier or introducing a supplier to a service sector firm in meeting the required standards). In the case of sweet potato value chain, no specific clear standards especially grades have been set to enforce actors to adhere to the set grading system.

The most fundamental insight on clustering goes back to the 1920s, when Marshall's "Principles of Economics" (1920) showed why clustering could help enterprises (especially small ones) to compete. Such advantages included "a pool of specialized workers, easy access to suppliers of specialised inputs and services and the quick

dissemination of new knowledge". The external economies of Marshall did not cover joint action, as a more "deliberate force at work" (Schmitz and Nadvi, 1999).

Schmitz and Nadvi (op.cit) introduced the concept of "collective efficiency" and defined is as the "competitive advantage derived from external economies and joint action". Joint action can be a way to overcome problems of size, dependence on buyers and lack of knowledge and capital. Different studies show that the existence of effective sanctions and trust (as well within clusters as with their trading connections) are conditions required for collective efficiency (Schmitz and Nadvi, 1999). Within this context a shared language, culture and norms can be important factors that contribute to trust. Another recognized condition for collective efficiency is the existence of trade networks.

Looking at the characteristics of rural enterprises (which are in this study of sweet potato farms) the 'Marshallian cluster' seems to be most adequate as a starting point. Producers of agricultural commodities are large in number but in general are small in scope. Individually they are often unable to capture market opportunities and to improve their products and processes. In this study we look at market potential for processed sweet potato products while research on clusters in developing countries grew out of the small-scale industry debate. Building upon experiences of how small-firm industrial Districts in Europe, especially Italy, "conquering international markets", clusters were translated into an agenda for research on developing countries (Schmitz, 1998 in Schmitz and Nadvi, 1999).

The study by Knorringa (2002) emphasizes that clusters in developing countries, in contrast to clusters in developed countries, "as a rule do not initiate radical innovations, they appear to differ significantly in the extent to which they depend on outside actors for implementing incremental (process) innovations".

2.3.5 Value chain coordination and organization

Cheung (1983) (cited in Hernandez-Espallardo and Arcas-Lario (2003) defined coordination as how well the transacting parties perform in accordance with their roles in the system. It is the extent to which the work activities of the parties are logically consistent and coherent, so that they are directed towards a common objective in such a way that they supplement and complement one another.

Other studies by Buvik and John (2000), granted the theoretical models of co-ordination. Coordination is the act of organizing, making different people or things work together for a goal or effect to fulfill desired goals in an organization. Moreover, Macbeth and Ferguson (1994) and Zuurbier (1994;1996) explain that in between these extremes are hybrid forms which share features of the two extreme types and they include joint ventures, alliances, shareholding and shared product life.

Coordination has become very essential because of the structural changes that emerge in the business environment. Collaborating in business is a strategic option for achieving and meeting these requirements.

Value chain organization means the institutional set up of the marketing agents in the value chain. Moreover, it examines the relationship between actors along the value chain and how the trade is conducted or marketing channels together with the flows of goods and services in the chain (ITC, 2003; Karel *et al.,* 2004). Koenig *et al.* (2008), in SLE publication series states that value chain is a development concept with two main perspectives that is functional role and institutional perspective.
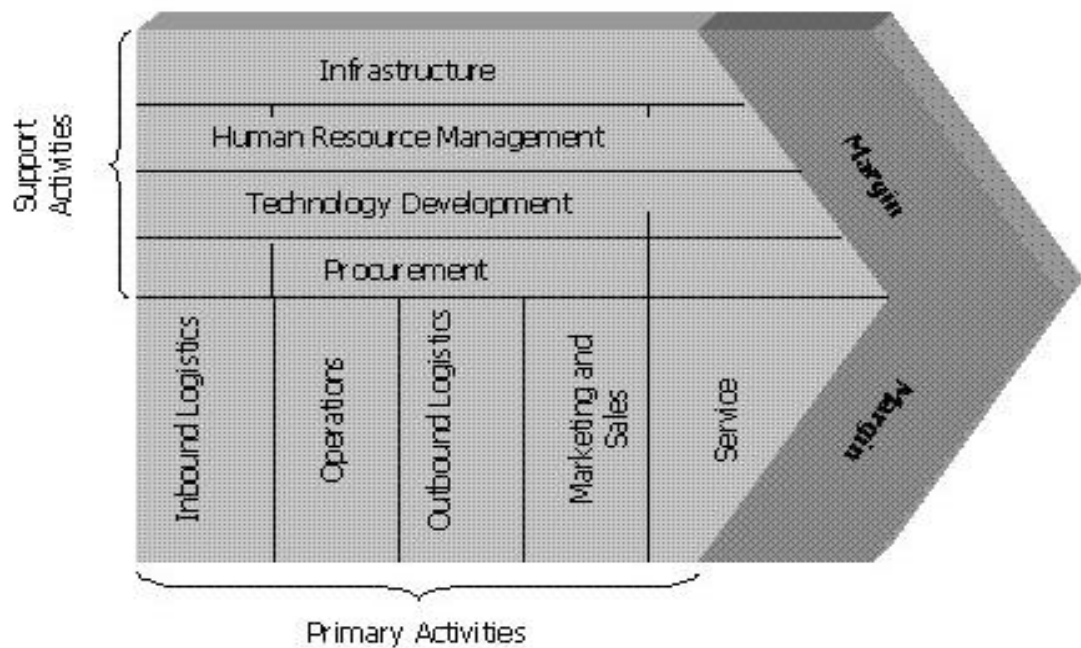
Figure 3: The Value Chain components as perceived by Porter

Source: Porter (1985)

Porter (1985) used the word 'margin' as the difference between the total value of certain products and the cost associated (Fig. 3). Other scholars have used the word 'added value' instead of margin to describe the same (Lynch, 2003).

2.4 Marketing Margin Analysis

Market performance was analyzed by the use of marketing margin. Marketing margin can be defined as an equilibrium entity that is a function of the difference between the equilibrium of retail and farm prices (Wohlgenant, 2001), or the difference between export and farm prices (Carambas, 2005). It measures the share of the final selling price that is obtained by a particular agent in the marketing chain. Marketing margins provide neither a measure of farmers' well-being nor of the marketing firms' performance. However, they give an indication of the performance of a particular industry (Tomek and Robinson, 1990). According to Shahi *et al.* (2012), marketing margin is defined as the

difference of price between rings of marketing chain. They argued that marketing margin is the difference between retail and farm price. Marketing margins can be affected by different factors which include adequacy of transport service provided and distance to be covered from production point to marketing point.

2.5 Conceptual Framework for Sweet Potato Value Chain in Tanzania

Sweet potato production is one of the economic activities that if properly managed can contribute much to poverty reduction in the lake zone and hence improve community livelihoods. Many studies had indicated that households income earned from sweet potato production could be increased if the production, processing and marketing related factors are addressed appropriately (FAO, 2003; Fuglie, 2005; Thiele *et al*., 2009; Mmasa *et al.,* 2012 and Kpaka *et al.,* 2013). Thiele *et al.* (2009) argued that improving the sweet potato value chain should lead to a linked set of impacts on the livelihoods of the poor including:

i.   Increased income of those selling sweet potato with particular advantages for women who often take the lead in managing this crop.

ii. Reduced expenditure on food of those purchasing sweet potato roots or processed products; and

iii. Enhanced nutrition for those producing and purchasing sweet potato.

Conceptually, households that would adopt effective strategies for addressing the factors affecting sweet potato production they are likely to increase income from the crop and thus improve livelihood. This implies that addressing the factors will have an added value to the value chain of sweet potato. On the other hand, households that would not adopt effective strategies their income will continue to be low and hence poverty will persist, if not increase in level. Fig. 4 below provides more detailed conceptual framework on how improved sweet potato value addition could lead to improved income at household level.
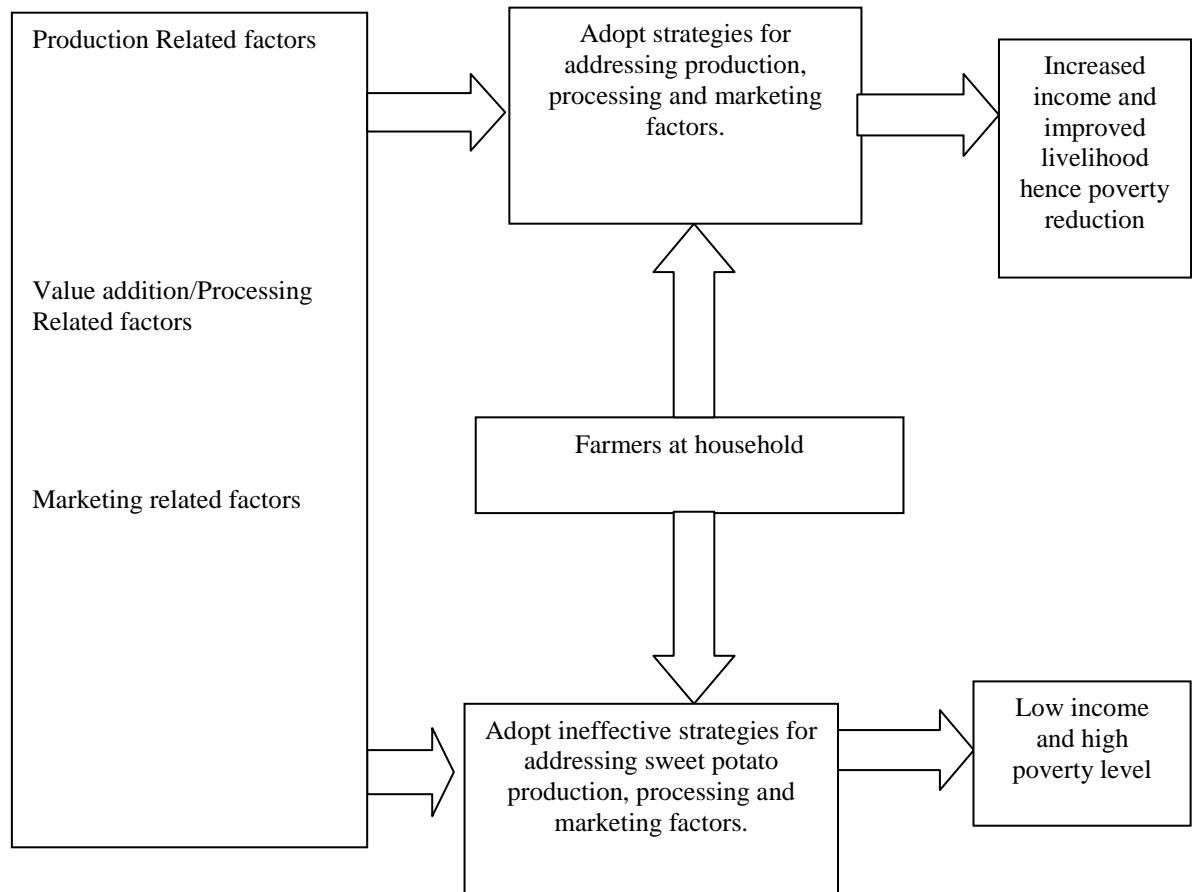
Figure 4: Conceptual Framework: Sweet Potato Value Addition

CHAPTER THREE

3.0 RESEARCH   METHODOLOGY

This Chapter aims at explaining the methodology used in conducting the study and justification for using those methods. It describes the rationale for the selected techniques and procedures and data collection methods, presentation plan and data analysis. This section specifically describes location, climate, population, infrastructure, sampling procedures, selection of respondents, methods of data collection, preliminary survey, recruitment and training of enumerators, operationalization of the fieldwork, secondary data, data analysis and interpretation, Regression analysis, Analysis of Variance (ANOVA), Correlation analysis, Profit margin analysis, Market margins, data quality (reliability and validity), limitation and delimitation of the study.

3.1 Location of Shinyanga District

Shinyanga District is one of the eight districts in Shinyanga Region. The District lies between latitudes 3º 20' and 3º 95' south of the Equator and longitudes 31º 30' and 33º 30' east of Greenwich Meridian. The District shares boundaries with Kishapu and Shinyanga Municipal in the East, Kahama and Geita in the West, Kwimba and Mwanza in the North, and Nzega District in the South (URT, 2002) (Fig. 5).
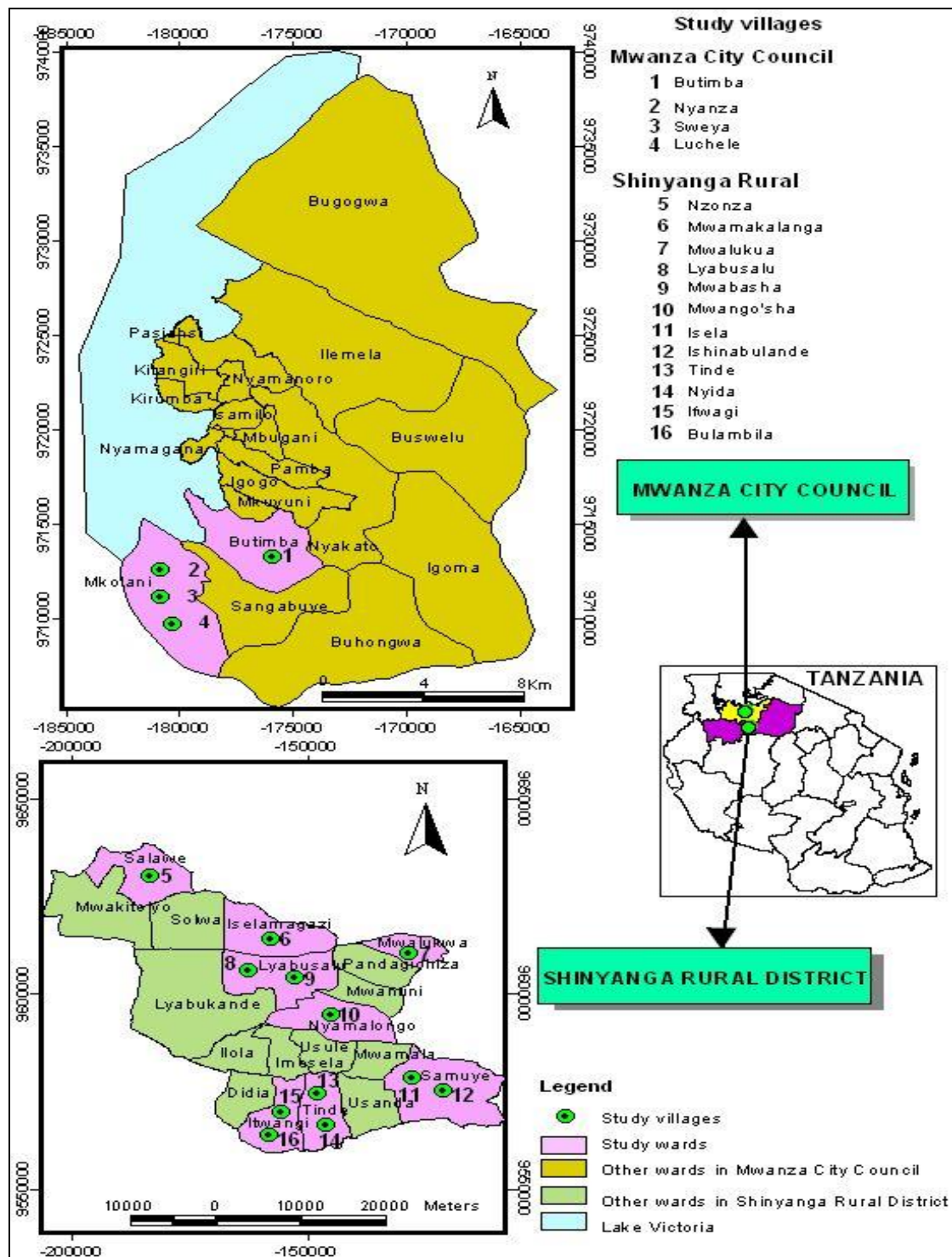
Figure 5: Map of Mwanza city Council and Shinyanga District

Source: Planning Department: Shinyanga District Council and Mwanza City Council

(2012)

The District is characterised by a flat and gently undulating plains covered with low and sparse vegetation. Ecologically the District is divided into three agro-ecological zones with the following soil types all of them are suitable for sweet potatoes production.

i.   Light loam soils in Nindo and Itwangi divisions. A common crop grown includes cotton maize, chick peas and paddy.

ii. Light loam red soils, Samuye division. Types of crops cultivated include sorghum, paddy and cotton.

iii. Sandy soils and heavy soils, crops grown include sorghum paddy and cotton.

Given the short distance from the Equator i.e. Latitude 3º 20' and 3º 95' South of the Equator, one could expect the District to have an equatorial type of climate, but due to high altitude and long distance from the sea, which is about 1120 kilometres, the area experiences, dry tropical climate.

The mean annual rainfall ranges from 450mm to 990mm which normally begins in October or November and ends in May. The rain is not abundant hence cultivation of sweet potato is of paramount of importance. Unreliable and poor distribution of the rain acts as an obstacle for agricultural and livestock production in the District. Agriculture sector contributes about 15% to 20% of the council's internal revenue and provide employment to 70% of the total population (URT, 2002b). The major food crops grown in District include maize, sorghum, paddy bulrush millet, sweet potatoes, legumes and cassava while cash crops are cotton, paddy and chickpeas (URT, 2002b). The District depend on sweet potato as a reserve food when other crops fails. Similarly the crop serves as a source of income for the farmers. According to the 2012 Tanzania National Census, the population of the Shinyanga Rural District was 333 502 (162 134M) and 171 368(F) (NBS, 2012).

3.2 Location of Mwanza City

Mwanza City is located on the southern shores of Lake Victoria in Northwest Tanzania. It covers an area of 1325 km^2 of which 425 is dry land and 900 km^2 is covered by water. Of the 425 km^2 of dry land, approximately 86.8 Km^2 is urbanized while the remaining area consists of forested land, valleys, cultivated plains, grassy and undulating rocky hill areas (URT, 2002a) (Fig. 5 above).

Mwanza City lies at an altitude of 1140 metres above the sea level. Mean temperature ranges between 25.7 ^{O}C and 30.2 ^{O}C in hot season and 15.4 ^{O}C and 18.6 ^{O}C in the cooler months. The City is characterized by gently undulating granites and granodiorite physiography with isolated hill masses and rock inselbergs. It is also characterised by well-drained sandy loamy soil generated from course grained cretaceous. The vegetation cover is typical savannah with scattered tall trees and tall grass.

According to the 2012 National Census, Mwanza City has a population of 706 453 (Nyamagana Municipal 363 452 (177Female) and Ilemela Municipal 343 001 (178 283 Female) people (NBS, 2012). The population density is 134 people per sq. km, being the second largest city in the country after Dar- Es- Salaam). The city was chosen based on the high population hence products will fetch a good market. Moreover, this study therefore focused in Lake Zone of Tanzania, because of high production potential, climate, population and potentiality of local processing done as compared to other regions in the country.

3.3 Location of Kibaha District

Kibaha District is one of the 6 districts of the Coast Region, Tanzania. The district covers an area of about 1812 total Sq. Kms. The district has 3 Division, 13 Wards, 53 mtaa and

25 Villages. The district is bordered to the North by the Bagamoyo District, to the East by Dar-es-Salaam, to the South by the Kisarawe District and to the West by the Morogoro Region. According to the 2012 Tanzania National Census, the population of the Kibaha District was 198 697 (NBS, 2012).

Roughly 80% of the district's population is engaged in agricultural activities. The main economic activity in rural Dar-Es-Salaam is agriculture, employing about 85% of the economically active population. The major cash crop Cashew-nuts, coconuts, cotton and sesame. Kibaha dwellers (indigenous) are mainly farmers who are famous for growing cashew nuts, coconuts, and cotton. They used to transport the crops to Dar es Salaam and the rest of the country, there are two means of transport, rail and the main road. The choice the district based on the previous huge project implemented by The African Institute for Capacity Development (AICAD) Tanzania County Office (TCO) in collaboration with Japan International Coop African Institute for Capacity Development (AICAD) and Japan International Cooperation Agency (JICA).The project embarked on the Community Empowerment Programme (CEP) which among of its major goal (long term goal) is to improve agri-food processing as viable strategy for income generation. Based on findings of baseline survey conducted by AICAD TCO in July 2010, it was recommended to conduct a survey or on the value added agri-based food products to examine the feasibility of the products in local and national market. In these response researcher conducted a part of the study on small-scale agro-food processed products.
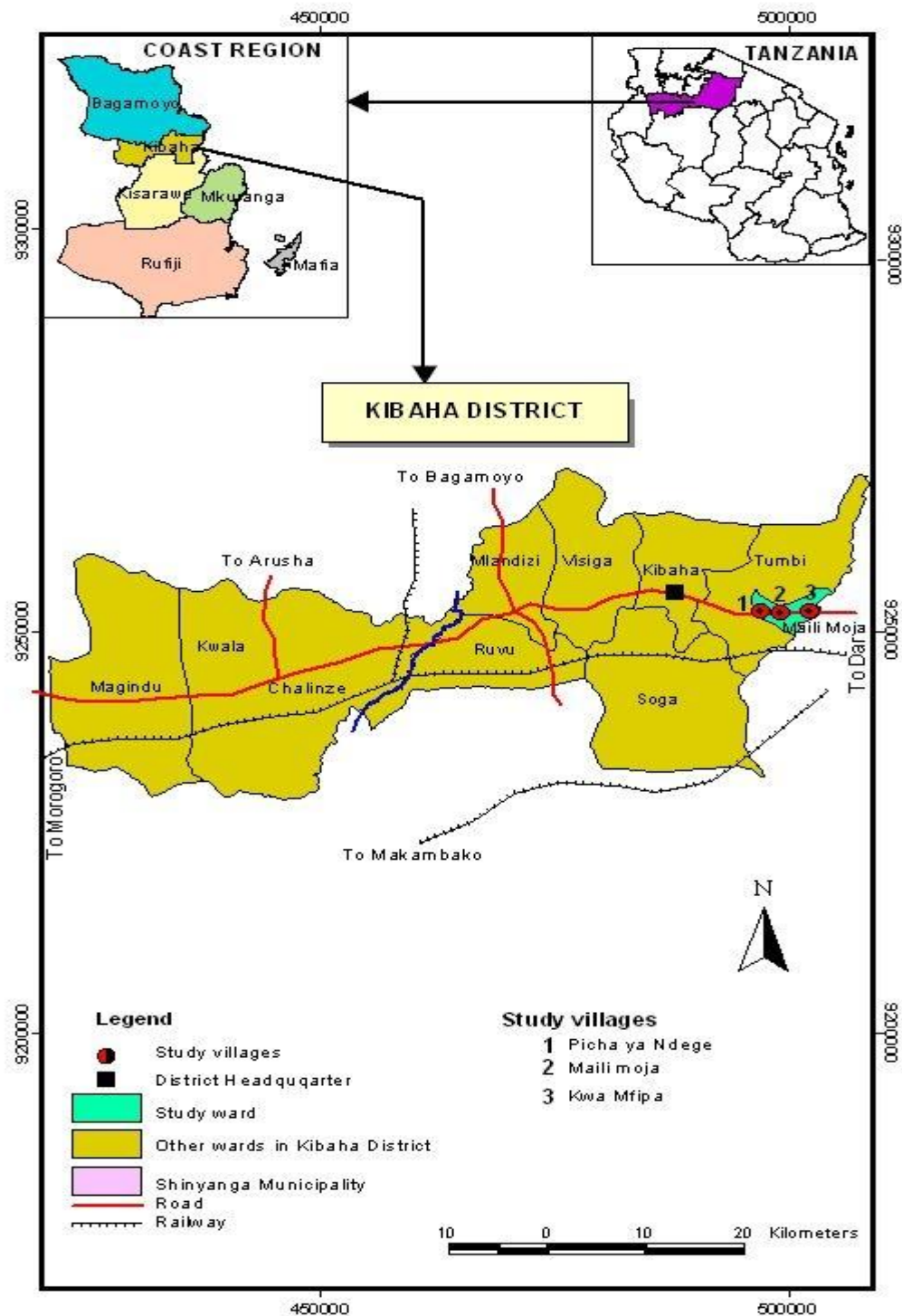
Figure 6: Map of Kibaha District Map

Source: National Bureau of Statistics and Coast Regional Commissioner's Office

(1997)

3.4 Research Design

This study used a quantitative cross-sectional research design. The design allowed data to be collected at a single point in one time and used descriptive study for determination of relationship of variables (Bailey, 1994). As it was used by Itika (2005); in studying structures and patterns of cotton value chain in Mwanza; Pascal *et al*. (2005) study on green beans supply chain in Arusha and Dar-Es Salaam; Ndunguru (2001) study on influence of quality attributes on the market value of flesh sweet potato tubers and processed in cassava Mwanza and Morogoro and Engoru *et al*. (2005, the study on characterisation of tuber utilization among sweet potato producers in eastern Uganda.

3.4.1 The sampling unit and techniques

The sampling unit for this study constituted producers (farmers), processors, traders (retail and wholesalers) and consumers of sweet potatoes. The sample size was 314 respondents. The sample size is reasonably large in conformity with Bailey (1994) argument that around 30 cases seems to be the bare minimum for studies in which statistical data analysis is to be done.

3.4.2 Selection of wards and villages

A multi-stage technique was used; The first stage involved the selection of wards purposively and then villages were selected randomly. The choice of wards was based on volume of production of sweet potatoes, accessibility and communication. The study applied four types of sampling procedures namely simple random sampling, stratified sampling, judgmental /purposive sampling and snowballing sampling.

3.4.3 Target population and Sample size

The study included producers, processors, traders and consumers of sweet potatoes products with various characteristics. The study covered 314 respondents altogether. These included one hundred and eighty four (184) producers, fifty traders (50), thirty processors (30) from Kibaha District and fifty (50) consumers from Shinyanga District and Mwanza City (Table 2).

Table 2: Distribution of sample size by category scheme

Category	Mwanza	Shinyanga	Kibaha	Total
Producers	0	184	0	184
Traders	30	20	0	50
Processors	0	0	30	30
Consumers	50	0	0	50
Total	80	204	30	314

3.4.4 Selection of producers

Selection of wards and villages was done during pre-survey. In Shinyanga District, Five wards were purposively selected and then five (5) villages; one form each wards were randomly selected and included in the study namely: *Mwamakalanga, Mwang'osha, Nyamalogo, Isela and Nyida*. In Mwanza City four street were randomly selected these were: *Sweya, Luchelele, Nganza and Butimba*. These add up to five (5) villages in Shinyanga and four (4) street in Mwanza City. The list of villages/streets in both study areas were obtained from respective District councils/ City authority. Similarly, the list of villages in each ward was obtained from ward Government offices.

From a sampling frame of sweet potato producers provided by village extension officers the researcher obtained 184 small-scale producers as shown in Table 3. Systematic sampling is a random sampling technique which is frequently chosen by researchers for its simplicity and its periodic quality. In systematic random sampling, the researcher first

randomly picks the first item or subject from the population. Then, the researcher selected each n'th subject from the list. The procedure involved in systematic random sampling was easy and was done manually. The results were representative of the population unless certain characteristics of the population are repeated for every n'th individual, which is highly unlikely. The process of obtaining the systematic sample is much like an arithmetic progression. The first stage involved systematic random sampling that form the list researchers pick first item randomly to select respondents.

The most common form of systematic sampling is an equal-probability method. In this approach, progression through the list is treated circularly, with a return to the top once the end of the list is passed. The sampling starts by selecting an element from the list at random and then every k^{th} element in the frame is selected, where k, the sampling interval (sometimes known as the *skip*): this is calculated as:

$$K = N/n$$

Where n is the sample size, and N is the population size

Table 3: Sampled villages and household engaging in sweet potato production

District	Wards	Village	Total number of HH	HH Engaging in SP production (80%)	Number of responde nts
Shinyanga rural	Iselamagazi	Mwamakalanga	587	(469)	39
	Nyamalogo	Mwang'osha	652	(521)	43
	Samuye	Isela	303	(242)	30
	Mwalukwa	Mwalukwa	421	(336)	30
	Tinde	Nyida	630	(504)	42
Total					184

The numbers in brackets are sweet potato producers presented by extension officers and then were systematically selected.

3.4.5 Selection of traders

Traders were selected by researchers with collaboration with heads of markets (Chairperson and Secretary) who had ideas of names of traders of sweet potatoes and their locations. Traders were found in *Nguzonane, Kambarage, Tinde auction*, *Mwanza opposite, Tanganyika stand and Kilumba.* Hence snowballing sampling techniques was use to obtain 50 traders. This sampling technique is often used in hidden populations which are difficult for researchers to access. This is true because sweet potato traders were scattered in various markets hence majority of traders who were operating during the study were included in the study.

3.4.6 Selection of processors

In Kibaha Districts, lists of 150 processors were obtained from SIDO representative who had names of processors. The list formed the basis for purposively selection of 30 sweet potato processors five (10) form each village. Criteria for inclusion were actual engagement in root and tuber processing (specifically sweet potato), being attended training on root and tuber processing, being member of the processing group and number of years in the business.

3.4.7 Selection of consumers

Sweet potato produced within and around Shinyanga District and Mwanza City reach consumers mainly through direct producer to consumer sales or via retail outlets such as local market place, shops and kiosks. Participants selected were regular buyers of sweet potatoes and were either the auction buyer or market place. Then researcher interviews them at the shopping centers. Researchers set inclusion factors which were; income, numbers household members, sex, marital status and age of the head of household. The decision to target these three groups was based on discussions held with Government

official during focus group discussion. Therefore the consumers were selected by using systematic random sampling. Hence 50 principal members/head of households visited the market were selected.

3.5 Methods of Data Collection

Both primary and secondary data collection methods were used to obtain sufficient and realistic information. A structured and semi-structured interview was administered to producers/farmers, processors, traders and consumers.

3.5.1 Primary data

Primary data were directly collected from the respondents, by using different techniques such as questionnaires, interviews and observation.

3.5.1.1 Questionnaires

The questionnaires were prepared in English and researcher and enumerators translated the questions to Swahili during interview. Both closed and open-ended questions were designed.

The first type of questionnaire was designed for producers of sweet potatoes. It was made up of four main parts (Appendix 1). The second type of questionnaire was designed for traders of processed sweet potatoes (Appendix 2). The third type of questionnaire was designed for consumers of sweet potatoes products (Appendix 3) and the last type of questionnaire was designed for processors of processed sweet potatoes (Appendix 4) and lastly was the checklist set for subject matter specialist, key informants and key actors. (Appendix 5).

3.5.1.2 Interviews

Both structured and unstructured interviews were used wherever necessary. Kothari (2004) defines interview as a two-way systematic conversation between investigator and informant, initiated for obtaining information relevant to specific study. Interviews allow clarifications by the researcher where needed and thus produces relevant results.

3.5.1.3 Direct observation

Direct observations were also employed to evaluate the conditions of processing premises as well as to assess the type and condition of processing technology used. It was also used to evaluate differences in product quality, product design and packaging between locally and imported processed sweet potato products. The information gathered using this technique was used to countercheck information provided by respondents.

3.5.2 Secondary data

Secondary data was collected from the following sources; Shinyanga Region and District agricultural offices, Sokoine National Agricultural Library (SNAL), Tanzania Bureau of Statistics (NBS), Ministry of Agriculture Food Security and Cooperatives (MAFSC), University of Dar-es-Salaam (library and other sources relevant to the study topic and websites).

3.6 Pre-testing of Survey Tools

Prior to operationalization of the main fieldwork, a preliminary survey was conducted. The objectives of the survey were to (i) solicit background information about the study areas, (ii) familiarize with the areas where the main survey was to be conducted, (iii) establish sampling frames and units, (iv) find out the most efficient way of carrying out the main survey and (v) pre-test the questionnaires in order to validate the relevance of

the questions to the intended respondents. The questionnaires were pre-tested using nineteen households, ten producers and processors, five traders and four consumers in Shinyanga and Morogoro Regions. Shinyanga was the main focus area of the study.

The following experiences were gained from the preliminary survey

(i)   It was noted that the interviews lasted between 30 and 45 minutes per respondent. Filling of the questionnaire for households lasted for 35 minutes an average whereas those of traders and processors lasted for 17-20 minutes. This duration was quite satisfactory because a period longer than this often leads to impatience on the part of the respondent.

(ii)   It was discovered that the questionnaires needed slight amendments. Therefore, some questions had to be reframed and others deleted or added. Moreover, sensitive questions such as those seeking income-related data were moved to the end of the interview partly because by that time a good understanding and rapport between the interviewer and interviewee had already been established

(iii)   It was also noted that the most efficient way of carrying out the main survey was to allow respondents who had no time for face to face interview to set appointment to fill the questionnaires at their own convenient time.

3.6.1 Recruitment and training of enumerators

Recruitment of the enumerators was guided by factors including:- Academic qualifications, willingness to work for long period of time in different environments, ability to speak fluently in English and Kiswahili as well as to interact with people of different ethnic groups and familiarity with places where the fieldwork was to be done. During the training, the objectives of the research were explained to all enumerators. Furthermore, some of the experiences, such as difficulties in obtaining respondents and

reluctance of some of the respondents to be interviewed gained during the preliminary survey and how to overcome them were discussed. Other aspects emphasized during the training were (i) to record clearly and explicitly units of measure used by respondents and (ii) to use notebooks for recording additional information that could not be recorded in the questionnaires. Lastly, the enumerators were informed that the overall quality of the data collected would entirely depend on how respondents were approached and how the questions were asked. Four enumerators were recruited.

3.6.2 Operationalization of the fieldwork

The fieldwork was conducted from 15th June 2011 to end of January 2013. The operationalization of the fieldwork involved questionnaires interviews and discussions with key informants and government officials in the study areas. The interviews and discussion were carried out by the researcher and four well-trained enumerators. Prior to the day of starting interviews, the researcher and enumerators visited ward, District or municipal council offices to inform the relevant authorities about the purpose of the study in order to acquire both political and administrative support.

Individual household heads and/or traders were interviewed in their homes or business places, offices or selected places after an initial appointment. Appointments were made at least one or two days before the interview date. The objectives of the study were explained to each respondent prior to interviews in order to create good understanding between interviewer and interviewee. Respondents were interviewed once and their responses were recorded immediately. However, it is important to note that although respondents were heads of households, conversations created interest among other household members who were listening and hence contributed to responses of the respondent in certain questions. This often occurred when discussing issues such as

expenditure on processed sweet potato products, local processing and effects of product quality and consumption habits.

To overcome language barrier, the interviews were conducted in both English and Kiswahili. English was used for respondents who knew the language, whereas Kiswahili was used for respondents who did not know English. The responses were recorded in Kiswahili and/or English. Besides questionnaires, informal discussions guided by checklists (Appendix 5 attached) were held with government leaders and other stakeholders such as representatives from local Non-Governmental Organizations namely Tanzania Home Economics and Nutrition Association (TAHEA), Africa Inland Church of Tanzania (AICT) and World Vision Tanzania (WVT). These discussions aimed at obtaining data related to prices, quality of processed products, supply pattern of processed products, marketing problems, interventions directed to agro-processing enterprises, constraints facing agro-processing firms and capacity building needs in order to strengthen and promote consumption of locally processed products. The supplementary data after defense were then collected as from November 2013 to January 2014. This was basically for processors form Kibaha District and producers from Shinyanga District.

3.7 Data Analysis

Both qualitative and quantitative data analysis methods were involved. That is, the study used description of the facts, to show the relationships of variables. The study used tables, graphs and charts for the descriptive information in order to make them easily understandable. Data were coded and entered into the Statistical Package for Social Sciences (SPSS) windows versions 18.0, cleaned by running frequencies of individual and later analyzed. Cleaned data were later exported to other software packages such as Micro soft Excel for further analysis.

The analysis also based on descriptive statistic such as frequencies, cross-tabulations, means, and correlation coefficients of some critical variables. These statics were used to characterize and describe the sweet potato value chain, to determine market potential for sweet potato processed product, to describe social economic factors affecting demand/consumption of various processed sweet potato products and to analyses social economic factors influences farmer profitability in the study area.

3.7.1 Characterisation and description of sweet potato actors

The study used focused group discussions, key informants interview and review of relevant practical documents from district and ward. The discussion were carried out with key informants such as local traders, district officials on agriculture, trade, cooperatives, nutrition, livestock and observations. Meanwhile, focused group discussion was held with staff from the following organization World Vision Tanzania (WVT), Africa Inland Church of Tanzania (AICT) and Tanzania Home Economics and Nutrition Association (TAHEA). The aim of this exercise was to visualize networks in order to get a better understanding of connections between actors and processes in a value chain, demonstrate interdependency between actors and processes in the value chain and create awareness of stakeholders to look beyond their own involvement in the value chain (Michael *et al.,* 2010).

3.7.1.1 Focus group discussion

Three focus group discussions (FGD) were conducted, including: District officials, producers and processors. Ten District officials were selected based on their involvement and specialization in sweet potato production, processing and marketing. Another FGD was also done to producers in Samuye ward. The ward was selected based on potentiality in production/processing, accessibility and marketing opportunities. Seven progressive

producers participated in the discussion Furthermore, three key informant interviews with NGO representative and progressive producers were also carried out. The last FDG was conducted with six small-scale processor at Kibaha.

3.7.1.2 Key informants interview

Key informants interviews were conducted with officials from WVT (3), TAHEA (2) and AICT (2). The officials were selected based on their experiences in projects on sweet potato in Shinyanga rural. Further, the team visited the market center (auction) or '*Gulio*' in Swahili and one trader was willing to be interviewed. Other three key informant interviews was done at Kibaha- District with three (3) small-scale processors.

3.7.2 Estimating market potential

Market potential analysis is not market forecasting, although forecasting when the potential of a market might be realized can be part of the analysis. At base, market potential analysis sizes markets based upon a sequential and increasingly refined process from global or regional to national markets and business, consumer and other segments within national markets.

The study by Kenneth and Dedrick (1998) on market potential analysis; The authors defined a market potential analysis as a strategic tool to identify market opportunities and invest resources where they will have the greatest return in the long run. Market potential analysis can help to target markets with high growth potential in the future. Market potential analysis enables companies to:

  i.   Categorize countries as lead markets, break-out markets or emerging markets.

  ii.   Quantify market potential for a given product by country, region or globally, now and in the future.

iii.   Identify growth drivers and barriers in those markets.

iv.   Understand how to exploit growth markets by tailoring marketing, product development and production strategies to meet customer demands and overcome market.

3.7.2.1 Market potential influencers conceptual framework

Many forces influence market potential, but there are two broad sets of factors that are key demand drivers and inhibitors (Fig. 7).
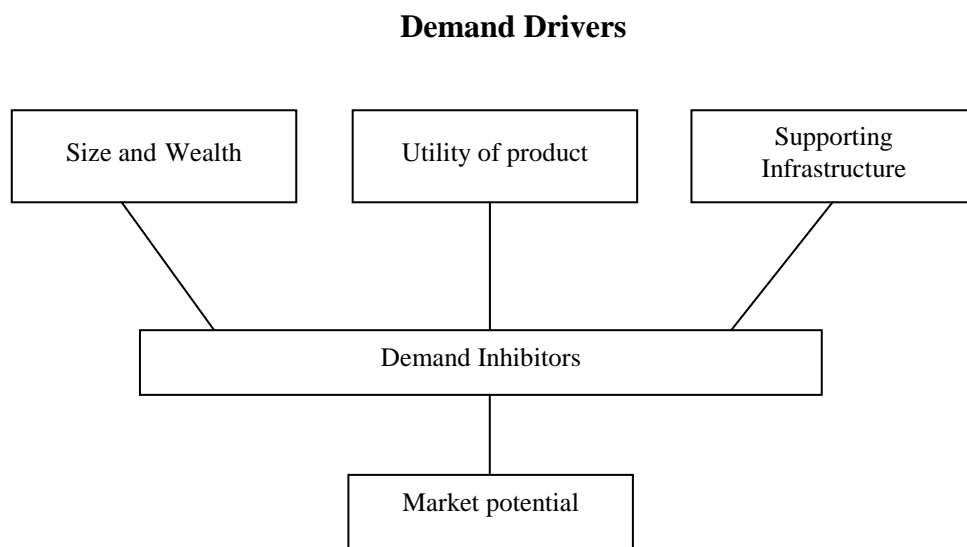
Demand Drivers

Figure 7: Forces influence market potential

3.7.2.2 Demand drivers

Demand drivers are the factors that affect the size, readiness or exploitability of markets. Three are especially important.

i. The first is the size and wealth of a market

This determines the number of households, companies, government agencies and other organizations that can actually afford to buy a product. This is not a simple calculation,

and average figures such as total population and GDP per capita offer only a starting point. Other factors include household income distribution and the structure of the business sector.

ii. The second is the utility of a product in a particular market

This varies according to the nature of the product and the characteristics of the market

iii. The third demand driver is the supporting infrastructure for a product.

Promote product should be supported with infrastructure that favors development of the crop.

3.7.2.3 Demand inhibitors

Market potential in a given country can appear to be high, but actual demand remains low. This is usually due to the presence of demand inhibitors that either raise the cost or lower the utility of a product.

Steps in Market Potential Analysis

Market Potential Analysis can be estimated by employing a top-down model driven by a country's wealth to measure market potential size. In doing so, we use an extensive database of national statistics. Then, we look at market penetration in a large number of buyers to understand historical trends and identify which consumers are leaders and laggards in adopting new technologies.

Thus a full analysis of market potential involves four steps:

i. Top down estimation of market potential size

ii. Elaboration of market types

iii. Analysis of market segments

iv. Integration and interpretation

3.7.3 Marketing margin

To evaluate market performance a marketing margins analysis was performed. Marketing margins calculations were made from the comparison of prices found in the various links in the chain, relating to the price paid by the final consumer of the sweet potatoes, which is the basis of the analysis (Mendoza, 1995). A marketing margin can be defined as a difference between the price paid by consumers and that obtained by producers; or as the price of a collection of marketing services that is the outcome of the demand for and supply of such services (Tomek and Robinson, 1990). It measures the share of the final selling price that is captured by a particular agent in the marketing chain (Mendoza, 1995). Measured in this form, the margins reflect the amount of services and hence processed to a commodity once it leaves the farm and sits on a shelf in a retail outlet in a form that is acceptable, useful, and appealing to consumers (Goetz, 1995).

The size of marketing margins is largely dependent upon a combination of the quality and quantity of marketing services, and the efficiency with which they are undertaken and priced. The quality and quantity of marketing services depends on supply and demand of marketing services and/or the degree of competition in the market place. The cost of service provision depends on both exogenous and endogenous factors and the efficiency is determined by the extent of competition between marketing enterprises at each stage.

According to Trotter (1992), the benchmarks to which results of marketing margin are to be compared with are the assumption of the margin to be equivalent to transfer cost as well as the constancy of margin per unit of product. Large gross margins may not express high profit rather than increased qualities and quantities of service; low labour, capital and management productivity. However, small gross margins may exist when there is inefficient use of resource, poor coordination and consumer satisfaction and unequal

profit elements. Therefore, higher marketing margins resulting from increased services, including better coordination, may leave producers and consumers better off, and low margins may be due to low productivity. Also called Marketing Gross Margin (MGM), the total marketing margin was given by the following formula:

$$TGMM = \frac{Consumer\ price\ -\ Farmers\ price}{Consumer\ price} \times 100 \quad \ldots (1)$$

Where TGMM is total gross marketing margin expressed in percentage. The value obtained corresponds to the share of intermediaries in the chain on the final price of the product.

$$GMMp = 1 - TGMM \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where *GMMp* = Producers' participation (farmers' portion). This is the proportion of the price paid by the end consumer that belongs to the farmer as a producer. In other words, this is the portion of the price paid by the final consumer of sweet potatoes corresponding to the producer.

3.7.4 Regression analysis

The linear regression model was used to identify factors influencing famers' profitability where farmers' profit margin was taken as a function of five (5) independent variable which included main occupation, years of schooling, land size, household size and selling price.

$$\prod = \sigma_0 + \sum_{i=j, j=1}^{5} (\sigma_i X_j) + \hat{\varepsilon} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Where;

$\prod =$ Profit margin obtained from SP (in Tsh)

σ_0 = The intercept of regression equation

σ_i = Coefficient of parameters

X_j = Parameters (j =1 up 5)

The regression model for profitability was specified as follows

$$\prod = \sigma_0 + \sigma_1 X_1 + \sigma_2 X_2 + \sigma_3 X_3 + \sigma_3 X_3 + \sigma_4 X_4 + \sigma_5 X_5 + \hat{\varepsilon} \quad \dots\dots\dots\dots (4)$$

Where;

X_1 = main occupation (dummy, 1 for farming and 0 otherwise)

X_2 = Years of schooling (in years)

X_3 = Land size

X_4 = Household size

X_5 = Selling price

$\hat{\varepsilon}$ = Error term

3.7.4.1 Expected signs of estimated coefficient and problems associated with regression analysis

Main occupation, years of schooling, land size, household size and selling price were hypothesized to positively influence profit margin, implying that they enhance efficiency. In respect to this, education was expected to improve the quality of labour. A study conducted by Gizachew (2005) and Rehim (2006) showed that formal education was

positively related to household market participation and marketed volume. Therefore, in this study, formal education is hypothesized to affect sweet potato profitability positively through training on sweet potato agronomical practices to increase production and marketing. Likewise, the education level attained by household head is also expected to increase customer awareness of the nutritional importance of processed sweet potato products.

The prices of processed sweet potato products were regarded to be the most important factor that could explain the difference in consumption of each of these products among households. Thus, an inverse relationship between prices of sweet potato and consumption of sweet potato was expected in the case of its own price. Differences in retail prices between fresh and processed sweet potato may explain differences in their consumption patterns among households. A positive relationship is expected between prices of fresh sweet potato and consumption of sweet potato. Selling price was expected to influence profit efficiency as it is assumed to be set above production costs the higher the profit margin.

Land size was expected to increase output level hence more profit from sweet potato business due to large quantity of sweet potato being producing and sold in the market. The expansion of household land use which is largely as a result of increased agricultural production. Farming being the main occupation was also expected to have positive influence in profit efficiency because farmers would tend to devote more attention and resources to the sweet potato subsector, there by gathering information, making decisions, and adopting technologies that increase efficiency.

Regression equations are associated with a number of problems depending on the type of data used, nature and form of regression employed in the analysis. The common problems encountered in regression analysis include heteroscadasticity, multicollinearity and autocorrelation problem was not expected as it is often found in time series data i.e. values of dependent variables related to their previous values (Bollerslev, 1986). The rule of thumb for this is if $0 < DW < 4$ there is no autocorrelation problems where, DW= Durbin Watson. Heteroscadasticity indicates uneven distribution of error term and multicolinearity describes a situation in which one or more independent variables are highly correlated. The rule of thumb for multicolinearity is VIF of 5 or greater, or if condition number (cn) is greater than 20 indicates severe multicolinearity (Engle, 1982). But the data for this study were free from the mentioned problems.

Furthermore, the common problems of autocorrelation, multicollinearity and heteroscedasticity were critically examined. Diagnostic tests to detect the presence of the afore-said problems were performed by using Variance Inflation Factor (VIP), Durbin-Watson statistic test and the MLE method and in most cases indicated the absence of serious autocorrelation, multicollinearity and heteroscedasticity problems. The goodness-of-fit of the OLS regression model was measured by the adjusted $R2$ (Koutsoyiannis, 1977; Maddala; 1983; Gujarati, 1995) with a chosen significance level of 5% confidence level.

Likewise, following criteria were also employed to verify the goodness-of-fit of the model: (i) statistical tests of significance (z-tests or t-tests for individual parameters), (ii) inspection of the signs of the estimated parameters to verify whether they agreed with expectations, (iii) values of the standard errors of the variables included in the model and (iv) whether the empirical model was correctly predicted. On the basis of these criteria,

the empirical models used in this study were found to be appropriate in determining the main factors that significantly influence demand for processed sweet potato. This is partly because the standard errors of all variables included in the models were found to be small and the estimated coefficients of all hypothesized variables had the expected logical signs.

3.7.4.2 Institutional analysis Framework of sweet potato

The study used focused group discussions; review of relevant practical documents from district and ward, discussions with key informants such as local traders, district officials on agriculture, trade, cooperatives, nutrition, livestock and observations.

3.8 Ethical Contemplation

In this work, the researcher took into consideration the issue of confidentiality at all the time in a way that unauthorized persons were not in position to have access to the data collected and the identity of the respondents remained as the researchers' knowledge. This has been done in an effort to protect the subjects. The issue of voluntariness was also observed as respondents participated in the research voluntarily no one was forced into participation.

3.9 Data Quality
(i) Reliability

The consistency with which repeated measures produce the same results across time and across observers refers as reliability (Patton, 2000). To ensure reliability, this study employed three methods of data collection namely questionnaires, focus group discussion, documentary reviews and key informant interview.

(i) Validity

Babbie (1990) defines the term validity to mean that, the extent to which the concept one wishes to measure is actually being measured by a particular scale or index; that is the extent to which an account accurately represents the social phenomena to which it refers. To ensure validity of measures, the data were gathered from various categories of respondents, including producers, processors, traders and consumers of various characteristics. Moreover, primary data were complemented with secondary data, website and primary data on specific issues of the study coincide with the secondary data.

3.10 Limitation of the Study

When conducting the research, the researcher faced the following obstacles/limitations:

i. On data collection procedures, due to the limited knowledge of most of farmers in rural area and poor system of record keeping it was hard to get data on production and prices. However, the researcher tried to cope with them by actual measuring and visit market places for confirmation and finally the data was complemented by group discussion avoiding open ended question. Lack of written documents in many household records keeping was a problem. So the researcher could not access written information and thus got unexpected results.

ii. Drought made it difficulty in getting updated data especially in quantity produced and prices. It was therefore decided to record and trace the data from previous years due to poor harvest during the exercise and visit market places.

iii. Respondents were busy in their daily duties and did not have time for interviews, meetings and filling the questionnaires. But, researchers and respondents agreed on the best ample time for the interview.

iv. Another difficult faced was the issue of money, time and resources for doing the

research. This is because, the research need a lot of money to be accomplished

successfully. But the allocated funds were used wisely to accomplish the work.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of Sampled Sweet Potatoes Actors

Researcher sought to establish if socio-economic characteristics of the population have a direct relationship with their consumption pattern (Fig. 8, Fig. 9, Fig. 10 and Fig. 11). About 51.6% of the sampled respondents were females and 48.4% were males. This shows that women were engaged more in sweet potato production than men. Most of the interviewed farmers perceived sweet potatoes as female crop because it does not command a place over maize or cotton in the market. As result many women grow it for household food security when maize harvest fails.

About 46.5% of the sampled respondents aged between 31 and 50 years and an average age of 45 years old. This is active age group with family responsibilities this findings is similar to study by Kabuje (2008) that age has implication on the roles and responsibilities in a society. For example, in the "*Sukuma*" communities it is the elders aged 30 years and above who are involved in general management and welfare of the household. The young family members of less than 30 years old are livestock herders. It was very important to categorize the age in order to determine which age participate more in the cultivation of the crop.
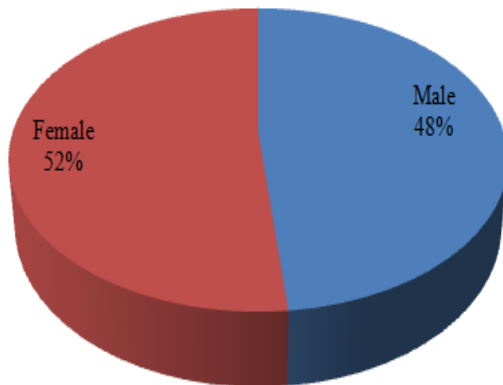
Figure 8: Distribution of respondents by gender
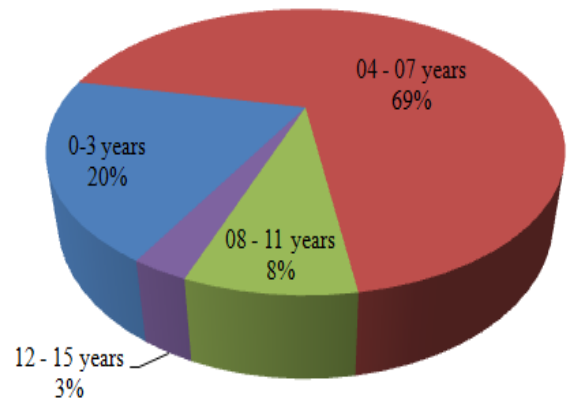
Figure 9: Distribution of respondents by years in school
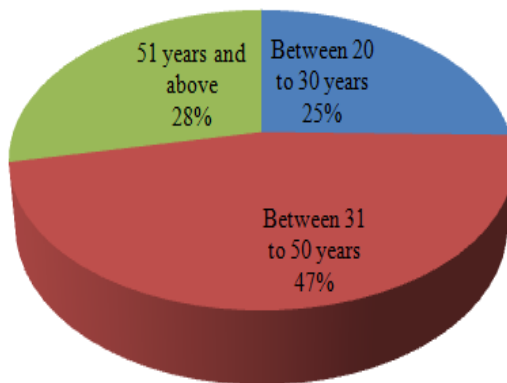
Figure 10: Distribution of respondents by age
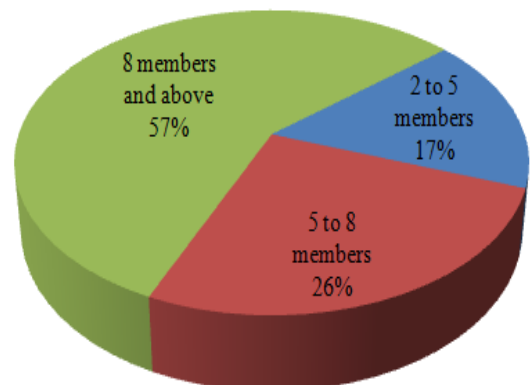
Figure 11: Distribution of respondents by household size

The data revealed that 69.3% of the respondents spent 4-7 years of schooling. Level of education was expected to have positive attitude towards the consumption of sweet potato products since it will enable them to understand the importance of feeding on good quality food such as of sweet potato products.

Figure 8: Distribution of respondents by gender

Figure 9: Distribution of respondents by years in school

Figure 10: Distribution of respondents by age

Figure 11: Distribution of respondents by household size

Moreover, 57.3% of the households have more than 8 members in their household. Furthermore, the findings from this study are similar to those of the study conducted by Gichuki *et al*. (2005). Size has great bearing on the amount of processed sweet potato, purchased and hence consumed. In general, a large size household would spend more on processed products than a small size household, *ceteris paribus*. The household size of more the 8 persons were larger than the National average household size of 6 persons per household (NBS, 2012). Further increase in household size at the current level of income would worsen the food security status of households.

Majority of processors were female age between 27 – 68 years old. Moreover, of these processors majority were married (63.3%). Furthermore, the data revealed that 50% of the interviewed respondents attained secondary school level with number of year in schooling of more than seven (7). Processing normally is carried out by female due to nature of activities itself. Cognizant, of the surveyed consumers data showed that more than half of the individuals were female (52.5%) and 48.3% were married.

4.2 Sweet Potato Value Chain: Actors and Their Functions

The sweet potato value chain analysis involved a number of functions and institutions. It has both backward and forward integration with producers at the central point. Key actors in sweet potato marketing in Tanzania comprise: Primary actors (producers/processors, traders and consumers), Secondary actors (inputs suppliers, researchers) and contemporary actors. Their functions and roles are as described.

4.2.1 Primary actors

(i)   Producers

There are two categories of sweet potato growers; subsistence farmers growing traditional varieties and very few growing improved varieties orange type. The main functions are; Produce sweet potato, harvest, handle/treat, package, bulk and retail. Sweet potato is the main substitute crop in Shinyanga rural and Mwanza households where maize and paddy are the major staple food crops.

Producers transported either raw or processed surpluses to Shinyanga town and Mwanza expecting urban dwellers to buy. Usually their selling points were located at the outskirt of town along the road or under shades of large trees. In general they do not have a defined market where they transport sweet potato to urban areas. Farmers who are persuasive and fortunate find customers along the way to urban area.

The crop gain significance when maize fails. It is obvious that production of sweet potato is higher than the consumption. This indicates that Tanzania is not self-sufficient in terms of sweet potato production and hence no surpluses sweet potatoes for exportation. The survey revealed that, common food crop grown in the study area were paddy, maize and sweet potato.

It should however be noted that fluctuations in production for sweet potato and maize is also mainly due to drought and poor agronomical practices including use of local seeds. This tendency is the push factor for majority of household to grow sweet potato which is considered more drought resistant than maize. Shinyanga rural producers use ridges in sweet potato farming, the season starts from mid of January to March and majority of producers own their farms through inheritance or buying. However, renting a farm for

producing sweet potato can cost up to 10 000 Tsh per acre per season and it was further observed that the crop matures after 2-3 months after planting depending on variety grown. Furthermore, majority of farmers sow sweet potato vines ""*marando*"" during November, December and February (Table 4).

Table 4: Planting months in Shinyanga

Planting months	(N= 184)
November	82
December	100
February	80
March	35
January	78

Producers were found using rudimentary technology in production, example majority of farmers used hand hoe and local seeds and furthermore no fertilizers were used. It was also noted that very few producers had used an oxen plough. Survey revealed that producers were doing at least preliminary processing or preparation of the produce before marketing by washing/cleaning, grading and local processing. Findings revealed that two main primary traditional products derived from the crop were, "*Michembe*," where the roots are withered, cut into slices and dried) and "*Matobolwa* where the roots are boiled sliced and dried. Product is mainly sold in *madebe,* used cement bags *or* polythene bags. The price ranged as from 6000 Tsh to 4000 Tsh per tin for "*Matobolwa*" and "*Michembe*" respectively.

Producers are the main production unit to feed the chain; producers use oxen carts and bicycle for transporting sweet potatoes to the markets. They sell part (20-30%) of their unprocessed/processed sweet potato to traders or fellow farmers with food shortages within the villages or neighborhood villages. Interesting findings were found to producers, where they play a dual role as a producers and local processors. Apart from

producing sweet potato, they also produce maize, paddy, cassava and groundnuts. This horizontal integration would add value to producers. Moreover, they engage in small business such as sale of domestic consumables, local chickens keeping and brewing and selling of local brew.

Moreover, producers were found to have very limited technologies on processing, nearly all the farm work is done manually at small-scale. It was also observed that the cost for ploughing is 25 000 Tsh per/acre while when one used power tiller it cost 30 000 Tsh per/acre. They sell processed products in auction during season and off season in the year depending on the household's cash needs. They sell individually in various forms including fresh sweet potato and dried sweet potato. Producers have access to marketing information on prices by direct visit to auction or hearing from their fellow farmers/friends. Bargain is mostly on an individual basis. They do not make any pre-arrangement with traders in selling their sweet potatoes. As it was describe earlier in this chapter, majority of the producers were female. This could be due to cultural background that women have to make sure food is available at home under any circumstances otherwise the community contempt a women whose house run out of food, hence in the study area SP was also commonly used as a backup during food shortage.

(ii)   Rural hawkers

Sweet potato hawkers are few in numbers and not widely available in Shinyanga District and Mwanza city. Hawkers buy dried sweet potato or fresh direct from farmers. They have inadequate capital and know where to sell. They transport what they have gathered by bicycle and or by hiring handcart or pushcart/ox-carts. Few town retailers who try to get supply directly from rural areas. Usually, many traders still work with

traditional varieties, especially *polista*, *sinia, simama,vumilia, mavuno jitihada, and mataya* because they are less prone to rotting and more known to the consumers.

(iii)   Small traders

The main functions of traders were bulk and transport and retail. Farmer reported that there are seasonal traders who buy sweet potato and transport out to other regions. However this category is very small and seasonal. They work in a small network with few farmers in producing villages. The reason could be associated to limited information on production and marketing of sweet potato. Most traders of sweet potato buy from farms and sell to wholesalers in urban areas.

(iv)   Retailers

The main functions of retailers were grade and retail. They are located in the local markets or at the street corners. In the rural areas, they source sweet potato from producers or middlemen who bring mango to their retailing point. They deal with a limited number of suppliers (1 – 20). In the urban areas, they source sweet potato mostly from wholesalers.

The retailers usually buy lots of 1 to 5 bags (12kg each) sweet potato according to their demand – and renew it when they have sold most of it (after 1 to 5 days). There are no special storage facilities in those markets. Local retailers can re-sell their sweet potato in bulk to town retailers who sometimes source the sweet potato directly from the rural areas. There are both urban and rural retailers involved in selling fresh and /or dried sweet potato together with other crops. Their selling points are at town markets and at village centres. They buy produce from farmers around Shinyanga rural or big traders from Kahama or Bukombe Districts.

(v) Wholesalers

The main functions were bulk, transport and grade. Wholesalers are based in the main sweet potato markets in Shinyanga and Mwanza and other near urban centres. They gather large quantities of sweet potato from the different supply areas. They either put orders with traders who bring the sweet potato to the wholesalers' trade point or they organize themselves a trip to the production areas where they get sweet potato from producers or local traders. The wholesalers sell sweet potato to retailers, consumers, and to processors if no other fresh market outlet is available. The actors sold (56 bags/ week) thus higher profit margin. It was noted that no private large scale buyers were known as it was been common to other cash crops.

(vi) Processors

The main functions of processors were grading, handling, preserving, process or add value and distribute. The sensory properties of the sweet potatoes and the drivers of liking are not established. The development of a sensory lexicon for sweet potatoes allowed for characterization of sensory properties and will assist in the understanding of key consumer liking attributes for sweet potatoes. These results can assist sweet potato marketers in understanding the impact of color and the importance of flavor and texture of sweet potatoes for the consumer fresh market. However, in Kibaha-District the sweet potato t is processed to nutritious flour (90%) other secondary products like *maandazi,* biscuits etc. The processors process the produce in small scale level. Processor bought 10 – 50 bags (50Kg each) of raw materials for processing, they sold 1 to 25 packs of (0.5kg to 2kg) at 3000 to 5500 Tsh per kg in a season as describe in chapter 4.15 of this section. Locally two main products were made which are "*michembe,*" where the roots are withered, cut into slices and dried) and "*matobolw*a" where the roots are boiled sliced and dried. These products were mainly for household food security.

Sweet potato leaves and shoots are also edible, but the starchy tuberous roots are far the most important product. In some tropical areas, sweet potatoes are a staple food crop. The roots are boiled, fried or baked. They can also be processed to make starch, and partial flour substitute. Industrial uses include the production of starch and industrial alcohol. Baked sweet potatoes are sometimes offered in restaurant as an alternative for potatoes. Sweet potatoes were sliced, fried and eaten just like potato chips.

Raw sweet potato can be eaten as well, mostly in chip form. Sweet potato butter can be cooked into a gourmet spread. Taiwanese companies are making alcohol fuel from sweet potato. Sweet potato leaves are also common side dish. The sweet potato is sold in Tanzania and few exported. It was observed that no large processing company that process sweet potato in Tanzania. Lack of processing plant slows chain development. Sweet potato can be processed in many other forms (dried, flours, baked and fried). Tanzania has only so far developed a few of them, hence there is potential for deepening the processing function in Tanzania. The processors were found to be the not reliable chain of sweet potato producers because only traditional and small-scale processing was observed.

(vii)   End users/consumers

End-user demand for processed food and nutrients products has been steadily growing in recent years. As such, there has been strong demand from retailers for quality locally made products. Sweet potato processes products are no exceptional to this trend, the interest for higher quality sweet potato products in particular has grown as well. This was evidenced by a shops and mini-supermarket surveyed which unfortunately there were no sweet potato products sold. Awareness of sweet potato was a relatively recent wonder for the majority of consumers. Participants were aware with cassava products that sweet

potato products. A large proportion of people interviewed or included in the interview described their childhood eating patterns and this seemed to influence their preferences for root and tubers cooking for much of their lives. This is particularly true for the male partners of those interviewed for whom sweet potato is included in their diet primarily as a consequence of their partner preparing it for them.

Cognizant, consumers believed they had started to eat sweet potato long time ago. Due to this, the majority of consumers were uncertain as to when and why they started purchasing and consuming sweet potato. However, there was little awareness of other varieties of sweet potato. A select few could remember other than *michembe* and *matobolwa*. There was some awareness of orange fleshed sweet potato "*viazi lishe*" and this seemed to be due to the availability of this variety in the market at the time of the consumer research.

Survey also found that the common sweet potato products produced and consumed in the study area included, fleshed and dried sweet potato leaves, fleshed sweet potato, *michembe"*and *"Matobolwa* or sometimes known as *"makopa"* and flour. It was observed that main consumers of sweet potato are the producers themselves. Contrary, Asia consumes almost half of the world's potato supply, but its huge population means that consumption was a modest 24 kg per person in 2005. The biggest sweet potato eaters are Europeans, while per capita consumption is lowest, but increasing, in Africa and Latin America (FAO, 2010).

4.2.2 Secondary actors

(i) Seed suppliers

The core functions were producing seedlings, test different varieties, trace the best root stock and sell vines. Seed distribution channels are divided into two types. The first involve NGO and research stations working together to disseminate an improved variety directly to farmers. This form of distribution works within a specified time and once the project ends they expect farmers to continue using improved variety. Farmers are also trained on agronomic practices and how to multiply the seed for the next season. The second mode of seed distribution which is prominent in the study area is done by farmers themselves but it operate informally.

A seed agent farmer (mostly are the beneficiary from the first distribution) keeps seeds at the back yard of the house mostly nearest to the point where water is readily available for the seed nursery. They identify the best rootstock and the orchards from where vines ""*marando*"" can be collected. These nurseries are used to keep both improved and local varieties until the next season. Seed agent farmers are very few and are well known at the village for having seed nursery. They usually supply seeds in different forms to fellow farmers. For example they sell seed at 10 000 Tsh per bag or they barter/exchange sweet potato seed with other crops preferably maize, chicken and millet. Seed multiplication is done by farmers at the beginning of the rain season. However, suppliers of machine, spare parts and packaging materials do not interact with producers/processors at all.

(ii) Extension services

Agricultural extension officers are intermediaries between research and farmers. They operate as facilitators and communicators, helping farmers in their decision-making and ensuring that appropriate knowledge is implemented to obtain the best results.

Survey results show that 94% of the sampled producers do not have access to or do not need or even access to extension services for sweet potatoes production. Meanwhile 5% reported to have received extension services from extension officers and the rest from other sources (Table 5). This indicates that majority of the farmers had never received extension services from village extension officers hence more effort is needed from Local Government, NGOs and other civil society organizations to support sweet potato sub-sector in order to improve sweet potato production. Producers reported to access limited extension services specific to sweet potatoes from the ward extension officer. It was revealed that a few producers were trained on agronomical practises and supported with seeds.

Table 5: Respondents' responses with respect to extension services (n= 184)

Extension services sources	Percent
Village extension officer	4.7
NGOs (WVT, TAHEA and AICT)	1.3
I don't access any service	94.0
Total	100.0

(iii)   Financial and services

There is a limited microfinance service along the sweet potato value chain probably due to untapped potential and limited knowledge to both farmers and service providers on the crop processing into multiple products beyond "*michembe*" and "*Matobolwa*". However few producers have organized themselves into informal group lending schemes. Each member is required to buy a minimum of 5 shares at 500 Tsh per share per week and will qualify a loan up to three times of the invested capital. Usually the loaned cash is used in purchasing seeds for either maize or sweet potato or to finance other household's expenses.

4.2.3 Contemporary actors

It was found that only three NGOs in Shinyanga rural engage in sweet potato business out of sixteen NGOs in the region.

(i)   World Vision Tanzania (WVT)

World Vision Tanzania Shinyanga office confines most of its activities on Food Security and Livelihood projects. WVT works in the form of Area Development Programs (ADP's) in which each area is categorized into ADP depending on the program objectives. Currently they are working on the following ADPs; Maswa ADP focus on vitamin A; Ndala ADP; Bukene ADP; Maswa ADP focus on rice, maize and sunflower.

WVT officers reported that Sweet potato is considers as traditional crop to protect household from hunger when there is failure of the other crops mainly maize. Since the crop is not one of the main tradable commodities, it is perceived to protect women and child during food shortage and it was further noted that in other places like Bukene the crop is mainly used for food consumption purposes. WVT officer reported that crop perform well and many producers used local seed varieties, hand hoe, and few used oxen plough and used oxcarts or bicycle for transportation of the crops. The future direction of WVT is to from supporting food security projects toward commercialization. Specifically they target on the various crops value chain improvement including sweet potato.

(ii)   Africa Inland Church of Tanzania (AICT)

Africa Inland Church of Tanzania (AICT) is a faith based Organization which was established in before independency. AICT had its beginning in the work of Africa Inland Mission missionaries from America and the church was founded in 1909. Sixty years later the Africa Inland Mission handed over the administration of the church to Tanzania

local leadership. The church is organized administratively into six dioceses. Their main line of activities focused in Agriculture, HIV/AIDS, Clean Water Supply, conservation farming and Food Relief projects. Sweet potato is highly prioritized in AICT agricultural projects because they promote crops that are drought resistant in the villages around Shinyanga Region. Specific activities under food security project which have been done include; Supply of seeds known as oranged fleshed sweet potato variety "*viazi lishe*". Sweet potato produced from this variety is used to make many other products like juice, chapati, crips, donats and maandazi; Provision of training on agronomical practices to poor farmers and Seed storage and multiplications technology.

During interview with AICT Programme Manager he said orange fleshed variety was compatible with local soil and resulted into higher yields despite that many beneficiaries used low technology in the production. AICT reported that on average the yield range between 1.5tonnes/ha to 2 tons/ha of fleshed sweet potatoes. This was equivalent to 15 or 20 bags of 100kgs. If they processed harvested sweet potato into *matobolwa* or *mapalage* it become 7 to 8bags of 100kgs and 10 or 15bags of 100kgs respectively. The price of *Matobolwa* for a Debe ranges from 6000 Tsh to 7000 Tsh while for *mapalage* is between 4000 Tsh and 7000 Tsh.

(iii)   Tanzania Home Economics Association (TAHEA)

Tanzania Home Economics Association (TAHEA) implement project on Food Security at Kishapu and Shinyanga rural Districts. TAHEA believe the crop is very important crops in the region like Shinyanga due to low rainfall and drought, TAHEA promotes oranged fleshed sweet potato variety "viazi lishe" the variety is suitable in production of products like juice*, chapati,* crips*, donat*i and *maandaz*i from sweet potatoes. TAHEA provide seeds to the household living with Orphan and Vulnerable Children (OVC). The crops

perform well, producers used local seed varieties that are sold at 300 Tsh per 100vines ""*marando*"" and produce up to 10tonnes/ha, they use hand hoe, and few used oxen plough and used oxcarts or bicycle for transportation of the crop. TAHEA reported that product is sold at Tinde, Old Shinyanga and Nyasamba auctions. TAHEA produced several products from sweet potatoes namely, juice, *chapati*, crips, *donathi* and *maandazi*.

(iv)   Research and development

Research and development at the study area was not vested to this crop unlike other roots and tuber crops despite its potential in household's food security. Furthermore the recently adopted approach of one District one crop, sweet potato was not selected and according to the criteria imposed by the government paddy was chosen. This implies that Research and Development for sweet potato in the study area was further marginalized while it is the main fall back crop if maize or any other crop fails. The crop is also largely grown by women due to its drought resistance and hence offers assurance for the household food security.

It is clear that importance of the crop needs no further justification and the District needs to invest for the development and adoption of new technologies to improve production and marketing of the crop. The findings revealed that researchers from ARI Ukiriguru produced the following varieties, Simama, Vumilia, Mavuno, SPNO, Jitihada, Ukerewe and Mataya. The following varieties are in pipeline (Polista, Ejumla, Nasport, Sekondari, Kakamea and others were Carrot Dar, Carrot C, Ex Bwere, Mwanatata, Berena and Kabone). It was reported that the yield for each variety the ranged from 9tons/ to 18tons. This depends much on area's soil and agro-ecological condition. Most of them are susceptible to medium tolerant to disease, pests and drought.

4.3 Marketing Channels of Sweet Potato

The marketing channels in Fig. 12 shows all the stakeholders involved in sweet potato chain in the study area. The sub sector map shows how sweet potato products currently flows via several alternative supply chain paths from farm to various end market consumers in Tanzania. The data revealed that three primary channels or supply chain paths operate within the country as described below.

(i)   The first channel is from producer direct to consumer

The first of these is what we can refer to as a low-income led market channel of "traditional" varieties. In this channel, producers get their seeds from various sources and practically don't use fertilizers and pesticides. Most of products move through regional traders and urban wholesalers, onto the retail outlets (open air markets and street vendors) to low income consumers. Furthermore, is the shortest where consumers purchase products directly from producers or from local market. The channel was very common but not significant. Data revealed that in this path 40- 65 bags (100kg) were sold in a week.

(ii)   Second channel; producers to retailers, where producers sell products in bulk to retail traders

This alternative channel focuses on the growing demand of processor (Small-scale in Kibaha and Dar-Es-Salaam) although small and medium scale processors in Coast and Dar-Es-Salaam regions are expected to become soon a substantial buyer of sweet potato. The processor(s) mainly rely on supply from the traditional varieties of sweet potato directly supplied by producers or traders, who are able to sell sweet potato at factory if price will be higher. This is a common channel where consumers purchase products from different retail outlets such as an open market "*mnada*" and local markets.

(iii)   Third channel: producers/processors to middlemen/village vendors

Urban consumers drive the third channel. These consumers are becoming more familiar and appreciate the properties of improved varieties. During this study it came up that oranges freshed "*karoti*" and *"ejumla"* are among the top varieties in high demand, which are mainly produced by few trained small-scale farmers. However the traditional varieties still dominates the urban market.

However, there is an export led channel, which is presently dominated by five companies, although there are a few other actors. The export drive has not been taken up actively in last year due to pest and disease threats. The channel is very similar to the third, only that it integrates all activities under control of a single company through to the retail level that enables this company to control quality and build up a reputation (brand) for their products. The driving forces behind this channel are own-initiated medium farms primarily selling improved varieties to the urban consumers.

It was leant than as the market channels increased (many market intermediaries); the farmer's profit margins was reduced which is in agreement to economic theories. The price change from producer to consumers the above channels was above + 100 -150%
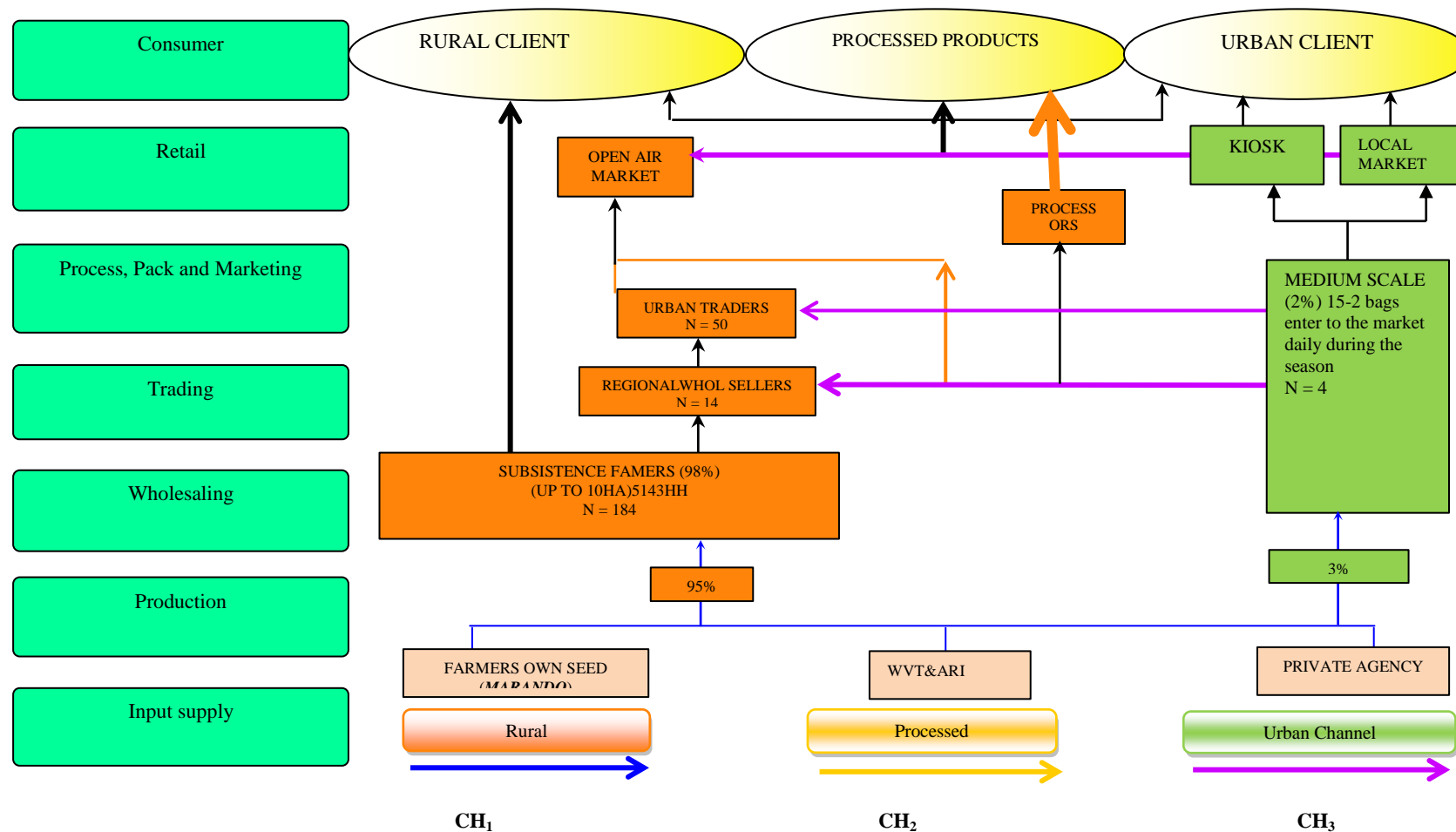
Figure 12: Sweet potato value chain map

As modified from mango value chain analysis in Tanzania final report (2011) by Match Maker Associate limited

4.4 Support of Links and Institutional Environment of Sweet Potato Chain

The sweet potato value chain analysis involves a number of functions and institutions. It has both backward and forward integrations.

<u>Input</u> ⟶ <u>Producers</u> ⟶ <u>Markets</u> ⟶ Consumers
Activities   Activities   Activities
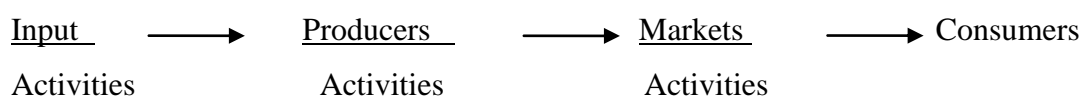
Small holder farmers as growers are at the central point. Farmers are linked with input suppliers. The inputs used include sweet potato local seeds. Other linkages with sweet potato growers involve oxen and tractor owners who do farm tillage operations for farmers. After harvesting sweet potato roots, farmers process to *"Michembe"* and *"Matobolwa"*, a number of routes are involved in the forward integration. In order to reach sweet potato consumers, farmers may sell directly to the consumers or sell through the middlemen or village hawkers. Under this route, transporters have a function of transporting fresh sweet potato or processed products to the retailers or consumers.

In Shinyanga and Mwanza, producers play dual roles as producers and processors. Processing is done at small-scale level with limited processing facilities. The current business practice in the dried sweet potato supply chain is through spot transaction relationships between traders, middleman and farmers at an auction or market place.

Processors who are producers also have no linkages with suppliers of machineries, utility suppliers, spare parts and packaging materials. There are number of activities involved after production of *"Michembe", "Matobolwa"* by processors such as transporting, retailing and distribution. In many places of Tanzania growers do process products from sweet potato and store for home consumption in future.

Similar result was found by Mpagalile *et al*. (2008) on their paper titled; Agribusiness innovation: in six African countries the Tanzanian experience. The author reported that root and tubers products have end markets all over Tanzania and all countries around Eastern and Southern Africa. However, the market trends for the sweet potato products are not fully utilized and local production does not meet the demand. Meanwhile, Shinyanga and Mwanza many end consumers prefer processed products.

Moreover, the general environment of sweet potato chain involves the influence of political, economic, technological, social and ecological factors. The sweet potato value chain analysis involves a number of functions and institutions. It has both backward and forward integration with small holder farmers as growers at the central point. Farmers are linked with input suppliers (backward integration). The inputs include sweet potato seeds, fertilizers, chemicals, plough, ox-cart and tractor owners' services for tillage and transportation.

4.4.1 Organisation and coordination of the chain

Survey revealed that there were no contractual relationships observed between actors at various levels of the value chain. There is informal marketing system. It was also reported during the FGDs with officials in Shinyanga District and processor at Kibaha District, there was a weak relationship between producers and extension services officials on sweet potato production. The district officials reported that plans are underway to address issues pertaining roots and tubers.

Furthermore, it was revealed that there was no coordination or mechanism for monitoring interventions to sweet potato value chain activities such as production, handling, processing and marketing. This was observed during discussion with district and city

staff. They were less informed with activities and operations of religious and non-government organization in the district on sweet potato value chain. Discrete knowledge of stakeholder's activities by the government official to this potential crop for food security and income generation leads to lack of proper plans at the district to synergize with stakeholder in developing the crop value chain. Within the actors along the chain communication on seasonal production, markets and prices is not openly shared despite high level of mobile services penetration in the district. Only few traders or farmers are informed on markets price offers and demands.

4.4.1.1 Horizontal coordination

There were no associations formed to serve sweet potato producers interests. Horizontal coordination among actors at each stage of the value chain is weak or does not exist, this results is similar with the study conducted by Kabuje (2008). The main reason for need of establishing the associations is to have one voice in sweet potato business. Unfortunately, there were no associations at a regional level, but they do communicate between regions. At the national level there is no association which deals with sweet potato which could be used as a platform for discussion in the sweet potato industry. The association would have been used to advocate sweet potato sub -sector policy changes. When there is a change in prices at the international market, association searches for such information and disseminates it to its members. Association would have also involved in SP investment promotion in Tanzania. Producers have no organizations that safeguarded their interests.

4.4.1.2 Vertical coordination

Interestingly, majority (100%) of the transactions between farmers and buyers were spot and all contracts were informal. The vertical coordination linked producers with wholesalers and small traders along sweet potato value chain. The chain has both forward

and backward linkages. Sweet potato possesses a weak backward vertical integration that producers are poorly not organized to get a reliable source of seed. It was further observed that some poor household linked with some NGOs found to be supplied with seed. This implies that donor intervention is very important to stimulate production and hence poverty reduction as suggested by the study on value chains, donor interventions and poverty reduction by Humphrey and Navas-Alemán (2010). Likewise, forward vertical integration is also weak hence none of the producers/processors had well-known established distribution centres and retailers where its products are sold. None of traders were advanced with capital in terms of cash to buy sweet potato to be delivered to the market centres. The study observed that all the sampled producers in the study areas in Shinyanga and Mwanza had informal contracts with wholesalers and sometimes they meet accidentally. The contracts assist sellers to sell the products to the respective markets/buyers. Majority of the buyers in Tanzania preferred informal contracts as a way of avoiding direct responsibility in case of dispute.

4.4.2 Market information

The market for sweet potato remains static, growing in line with population growth. This reduces attractiveness for assistance. The processors are insignificant. In Tanzania, Dar-Es-Salaam and Tanga are the largest market for sweet potato. The findings in Table 6 show that 46.7% of interviewed producers set prices cross check with fellow farmers, 36.7% of interviewed producers hear from friends while 16.7% of the said they visit the market directly and one percent said they receive price information from NGOs. It can be concluded that majority of producers sold their sweet potato products after hearing from their fellow friends or direct visit to the market. Because of poor market linkages, inadequate information and poor infrastructure, decisions concerning prices of sweet potato products are decided by few players in the value chain. The middlemen, retail

traders and end users of sweet potato products control the sweet potato market. The product is sold at farm get, village auction by the farmers themselves or on the roadside or at the rural collection points. The findings are similar to study by Msuya (2009 and Ashimogo (2001) which suggests owing institutional constraints, farmers in developing countries typically are not innovative and keen when it comes to marketing their product. The findings were also similar to Michael *et al*. (2010) in the study of strengthening potato value chains in developing countries who suggested that in the poorest countries like Tanzania, root and tubers are usually marketed through fragmented chains that lack coordination and information exchange, giving rise to high supply risks and high transactions costs because of poor market linkages, inadequate information and poor infrastructure, decisions concerning prices of sweet potato products are decided by few players in the value chain. The middlemen, retail traders and end users of sweet potato products control the sweet potato market. The studies revealed that majority of consumers eat "*Michembe*" (the roots which are withered, cut into slices and dried) a product which can last up to 8 months without being infected. Moreover this product is simple to process and requires minimum cost in preparation as compared to "*Matobolwa*.

Table 6: Market information sources as stated by respondents (n= 184)

Market information Sources	Percent
Direct visit to the market	16.6
Cross check with fellow farmers	46.7
Hear from friends	36.7
Total	100

4.5 Production of Sweet Potato

Figure 13 shows that majority of producers own one to four parcels for sweet potato production 25.5%, 18.5%, 21.7%, and 20.1% respectively. Similarly, parcel size varies from 0.25 acre to 1 acre. This shows that although the crop is of vital important but the size and number of parcels cultivated is still small hence low returns.
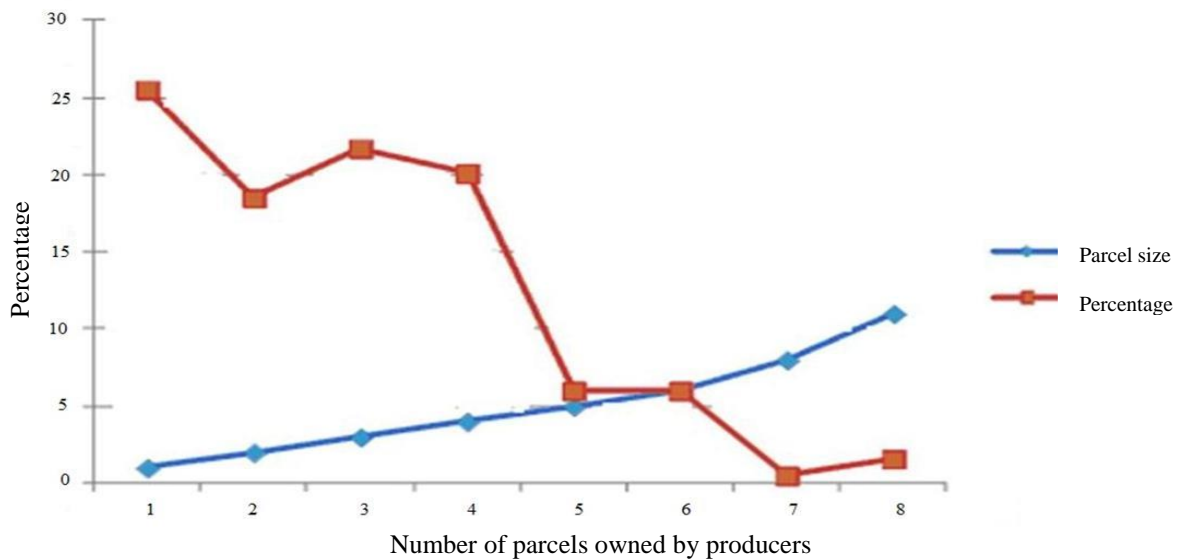
Figure 13: Percentage distribution of number of sweet potato parcels owned

Table 7 below shows that farmers harvest a minimum of 2 kg and a maximum 4128 kg of processed sweet potato products. Moreover one bag weighs up to 80kg (5tins) in fresh after harvesting ready for market. When processed, the bag can yield up to 40kg of sweet potato products. Similar results found by Mmasa *et al.* (2013) who reported that the average yield of sweet potatoes in Tanzania is 6 metric tons per hectare (6000kg) ~ 75 bags on dry weight basis. In other hand, the study by Elias *et al.* (1984b) in Bangladesh reported that the cost of sweet potato cultivation is higher than that of other crops, but the returns are also higher. However, in Africa, average yields remain far too low for small-scale potato producers to produce marketable surpluses.

Sweet potato is normally planted on ridges and rarely on flat land. Table 7 shows that cost for making ridges ranged from 5000 – 60 000 Tsh per acre when one hire labour. But most of this work is done using family labour.

Table 7: Sweet potatoes production and cost of production

Variables	Maximum	Minimum	Mean
Harvest in (Kg) per acre	4128	20	557.19
Cost of ridge preparation (Tsh)	60 000	5 000	23 133.30
Seed costs (Tsh)	100 000	4 000	18 383.1
Cost of weeding (Tsh)	70 000	5 000	1 443.44
Cost of harvesting (Tsh)	50 000	6 000	24 709.68
Cost of transportation (Tsh)	5 000	1 000	1 398.91
Quantity consumed (Kg)	1 600	10	184.71

Weeding cost weeding ranged from 5000 to 70 000 Tsh but normally farmers invite a community to assist weeding and arrange food and drink for them. Data shows that household spent 6000 - 50 000 Tsh per acre for harvesting. The activity is commonly done as a piece meal. Producers are forced to sell products in between 1-2 weeks after harvest to avoid deterioration.

The findings were similar to Omosa (1997) and Hall *et al.* (1998) whom reported that traders in Nairobi and Kampala reported selling consignments within 3 to 4 days after arrival before rotting occurs. Likewise, the study by Hall *et al*. (op.cit) reported that farmers have developed piecemeal harvesting technology to maintain supply of fresh sweet potato for as long as possible. In Uganda this involved piecemeal harvest of roots needed for immediate use. Piecemeal harvesting is an indigenous practice which may reduce weevil losses as more superficial and potentially damaged roots are harvested first.

Furthermore, the study by Hall *et al.* (1998) reported that Uganda and Tanzania farmers in areas with marked dry seasons sun-dry sweet potato to extend the period when it may be consumed. In Uganda, roots are sliced (*amokeke*) or crushed *(inginyo)* before drying *Amokeke* is reconstituted whole as a breakfast food and *inginyo* is used for flour to produce *atapa*, a starchy staple. In Tanzania roots are sliced fresh "*michembe*" or after boiling "*Matobolwa*" before drying and few crips were formed. These products can be

stored for six months in Uganda and perhaps longer in Tanzania. Attack by insects limits storage period.

The mean consumption of processed sweet potato products was 184.71kg, the Max was 1600kg. The crop usually sustains most of the households with fewer household size and low food demand hence they have something to consume during the whole year and the crop plays an essential role in food security, especially in those regions prone to drought and with poor soils like Shinyanga and Kagera in Tanzania. The results are similar to (FAO, 2010) that the crop rapidly is becoming a valuable source of cash income, as potatoes are increasingly used by food processing sector to meet the increasing demand of the fast food, snack and convenience food industries

The increased demand for processed products is itself a result of growing urban populations, rising incomes, diversification of diets and the substantial less time required. This data appealed that the produce is not able to sustain food need even for consumption purposes to lift the farmer to the next harvesting season because consumption is higher than what is harvested, hence it is common that majority of household becomes insufficiency in food. A household with food insufficiency offer their labour for other food or work for income as a copping mechanism; a situation that makes them becomes more vulnerable. The findings is contrally to study by Ellis and Freeman (2004) who reported that poor and better-off farm households engage in off-farm commercial activities to reduce farming-related risks.

4.5.1 Use of farming tools

Data revealed that, about 56.7% of the respondents used hand hoe in farming. Meanwhile 40.3% used oxen plough and hand hoe for cultivation (Table 8). Oxen plough is used

mainly for making ridges commonly known as "*sesa*". Uses of poor technologies affect land productivity and hence low yield levels per unit of production. Efforts are needed to train farmers on the use of improved farming tools to increase agri-business profitably.

Table 8: Farming tools as used by the respondents

Farming tools	Percent
Hand hoe	56.7
Hand hoe and Oxen plough	40.3
Hand hoe, Oxen-plough and Ox-cart	3.0
Total	100.0

4.5.2 Common vines used

The survey findings revealed that 99% of the respondents/producers used various local seeds in production of sweet potato. Most of the sweet potato planting material is obtained from within the study areas. Only one farmer from Shinyanga District mentioned having received planting vines from outside the study areas. The vines were given nicknames such as *lyochi, umeme, selena, mwanamakinu, pipi, bugoi, nyahinga, kalamu ya mwinyi, mwanamke hana siri, lukuba, mwana bundala* and *sinia.* These local seed varieties were selected on the basis of early maturity, potential production (size of the product produces and quantity) and disease resistance. Conversely majority of the respondents used to buy seeds from their fellow farmers. None of the farmers used improved seeds and farmers who had no seeds or money would get them through exchange with items like maize, livestock, chickens or millet. In other developing countries like Senegal, local traders often provide seeds on credit to producers, on the condition that they will sell all of their potato tubers to the trader at harvest, who then deducts the cost of the seed they provided on credit.

The data are similar found by Kapinga *et al.* (2000) who reported that most of the sweet potato seeds used in developing countries is from informal sources, which means that

quality of seeds cannot be guaranteed. This implies that efforts are needed to sensitize farmers on the rationale of using improved seeds to improve their production. For farmers to capitalize on the potential gains from using quality seed it will require a fast dissemination of improved sweet potato varieties through informal farmer seed multiplication and distribution channels. Thus, sufficient quantities of quality seed are essential to meet the needs of sweet potato growers, processors and traders. The study revealed that majority of respondents grew maize and sweet potatoes for food security while the rest cultivated paddy and groundnuts.

4.5.3 Sweet potato handling and harvesting

Farmers are not storing large quantities of sweet potato. Those who store normally perform traditional processing only store for home consumption. All the farmers interviewed do not have the processing skills besides boiling and roasting the tubers for home consumption. Sweet potatoes can be harvested either manually or mechanically the result with is similar to study done by Brooke (2003). Mechanical harvesting may result in high levels of mechanical damage, the level of which depends on the depth of the digger, the speed of the tractor and the soil conditions.

4.5.4 Sweet potato processing

The traditional methods of processing sweet potato in most countries have been limited to washing, peeling and boiling. However, in some communities, the roots are washed, peeled, cut into small pieces and then lemon or tamarind juice sparingly added. The pieces are, then, dried in the sun and milled together with sorghum into flour that can be used in making porridge. Some farmers make chips, sun dry, store and later reconstitute by adding water then cook by boiling. Others dry the grated product, mill and then add to other flours to make composite flours. The development of processed

products from sweet potato presents one of the most important keys to the expanded utilization of the crop. Just like white potatoes, sweet potatoes are multipurpose vegetables. This development will eventually transform the crop from a simple staple food to an important commercial crop with multiple uses such as a snack, ingredient in various foods and complementary vegetable. The same results were found by Lopez *et al.* (2000) who reported that sweet potato flakes (called sweet potato buds) with an increased β-carotene content were produced in Guatemala to conquest vitamin A deficiency in children.

Similar results were found by Mukunyadzi (2009) who reports that fresh market sweet potatoes can be baked, microwaved, broiled, grilled, and baked. In some countries alcohol is distilled from sweet potatoes. They can also be used in plate garnishes, casseroles, sautéed vegetables, pasta sauces, dipping vegetables green salads, (fresh cut sticks), soups, stir, fry, and stews They can be processed as follows (i) Dried/dehydrated: flour, flakes, chips (ii) Frozen: dices, slices, patties, French fries, and (iii) Canned: candied, baby foods, mashed, cut/sliced, pie fillings.

In Tanzania there are products that can be have been prepared from sweet potato including cakes, *chapattis*, doughnuts, *kalimati*, flour, porridge and crisp. However, traditionally in lake zone two main products are derived from sweet potatoes namely "*Matobolwa*" and "*michembe*". Artisanally, dried products are mostly used for home consumption with limited commercialization, probably because they are not competitive with dried cassava or irish potato chips. Slicing and drying by hand is labour intensive for processing large quantities when fresh storage would be preferable, but is an option for dealing with small quantities at a time**.**

4.6 Price of both Fresh and Processed Sweet Potatoes Products along the Chain

The survey found that the mean price of processed sweet potatoes at market stood at 3500 Tsh per kg, but normally the product is sold using traditional measurement of tins "*debe*" (~16kg) the market price was received after visiting traders and calculate average price. This actually results in loss to farmers and they do so owing to ignorance in measurement. Furthermore, the study found that the average price of fresh sweet potatoes was 1800 Tsh per kg. But produce is normally sold in small piles/bunches (0.5kg) at 500 Tsh to 1000 Tsh depending on the yield if the yield is good the price goes down.

Prices of sweet potatoes were more affordable to households with higher incomes than those with lower income. The relationship between income and quantity of processed sweet potato products consumed might therefore be more complex and there is an indirect relationship between the two variables. Moreover demographic data like age, education, marital status, occupation and gender could also influence the quantity of processed sweet potato products consumed. In terms of education level of the respondents, 69.3% of the sampled household heads attended primary school education which implies that they have adequate knowledge for making rational purchasing decisions on a particular brand of processed products.

4.7 Traditional Methods of Processing "*Michembe*" And "*Matobolwa*" Sweet Potato Products at Household

There are number of activities involved after production of "*Michembe*", "*Matobolwa*" by processors (Fig 14 and 15). Sweet potato processing has been proved to be a way of adding value to sweet potato by the researchers at MATI –Ukiriguru and SUA. Adding value through processing therefore expands sweet potato market.

Sweet potato (raw)

↓

Sun drying for few days (up to 3 days)

↓

Water - Washing used water

↓

Peel - Discard peels

↓

Slicing into reasonable size

↓

Drying for few days (sun drying)

↓

Dried chips

↓

Packing into polythene sacks/"vihenge"
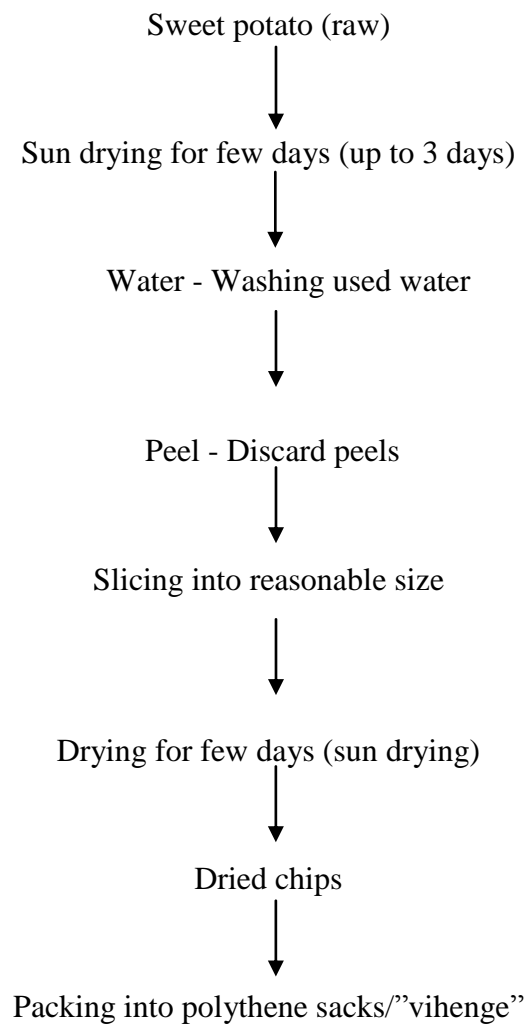
Figure 14: Traditional methods of processing "*Michembe*" or *"Mapalage"*.

Sweet potato storage roots (raw)

↓

Sun drying   for few days (up to 3 days)

↓

Cooking

↓

Grate/manually

↓

Slicing

↓

Drying for few days (sun drying)

↓

Cooked chips/Crisp

↓

Packing into sacks/*"vichanja"*
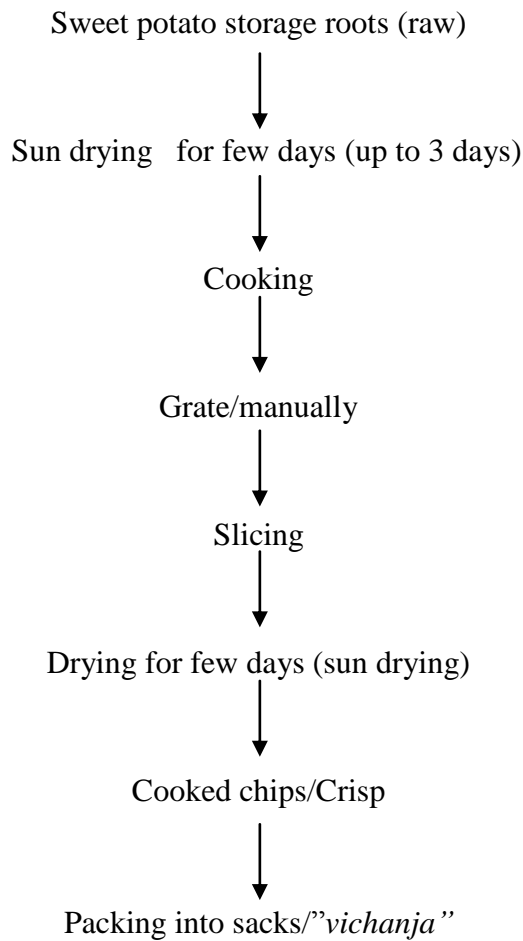
Figure 15: Traditional methods of processing "*Matobolwa"* crisps

Processing of other products like sweet potato jam and sweet potato bread is still at research level. According to Visser and Van Goor (2006), the different phases of the products market life cycle affect the pricing of that product. As shown on Fig. 14 and 15, the local processor is incurs high costs of production and gains a small gross income. Gross margin analysis showed that the processor incurs loss. The sweet potato need to collaborate with local engineering companies to design processing technology that would reduce cost of production especially during washing, peeling and chipping which the processor does it manually.

Processing of "*Michembe*" involves; Sun-drying of sweet potatoes for few days, washing, peeling, slicing into reasonable size, sun- drying the processed products for a few days and packing into polythene sacks and other store in local storage structures knowns as "*vihenge*". Likewise "*Matobolwa*" is prepared in a similar procedure but the sweet potato must be boiled before grating and slicing and the product tastes good as "*Michembe*". However, "*Michembe*" are more available in auctions/market than "*Matobolwa*" because it is simple in processing and majority of farmers can manage the cost.

The processed products are stored in polythene bags which are now very common in rural areas due to availability in plenty and low cost .The result is similar to study conducted by Ashimogo (1994). Others reported to store the products in "*vihenge*" a traditional way that many Tanzanian practise in rural areas. However, production of crips is not viable in the short term; but may be viable in the long term and if a lower discount rate prevails. Processing of flour is viable whether homegrown or purchased roots are used.

4.8 Process of Adding Value in Sweet potato Product

In the country processing is done at small-scale level. The current business practice of the dried sweet potato supply chain is through spot transaction relationships between traders, middleman and farmers. There are number of activities involved after production of sweet potato products (Fig. 16). The activities include; sun-drying fresh sweet potatoes for a few days, washing, peeling, slicing into reasonable size, sun-drying for few days (sun drying) and packing into paper packs into 0.5kg – 2kgs.

This study is also agreed with Fernando *et al.* (2011) that farmers are normally used to be cheated by middle-men/hawkers. SP prices had drastically dropped due to a sweet potatoes glut in the market. The only solution to help farmers earn more was by adding

value to the sweet potatoes. Farmers can have added value by making sweet potato powder (flour) that is used to bake biscuits, bread, cakes, cookies and sweet potato porridge. They are can supply the flour to food processing Industries. They also produce sweet potato juice and sweet potato flour which is used to make *chapatti*.

In many parts of Tanzania, farmers process products from sweet potato for home consumption. Hence there is need to capture niche market[1] for processed sweet potato products. Furthermore, low cost storage was validated by NRI in Tanzania and adoption of stores for commercial use depends upon the expected price difference between the time of harvest and the moment of sale and this is varieties across and within countries. A much higher price out of season was encouraging adoption of storage in Tanzania in 2004 (RIU, 2007).

---

[1] Is the subset of the market on which a specific product is focusing

Fresh Sweet potatoes

↓

Sun drying for few days (up to 3 days)

↓

Water   Washing (The sweet potatoes)

↓

Peel -   The sweet potatoes

↓

Slicing the sweet potatoes into reasonable size

↓

Drying the slices for few days (sun drying)

↓

Dried chips

↓

Milling of chips

↓

Sieving

↓

Flour (Packed into 0.5 kg – 2kg) packs
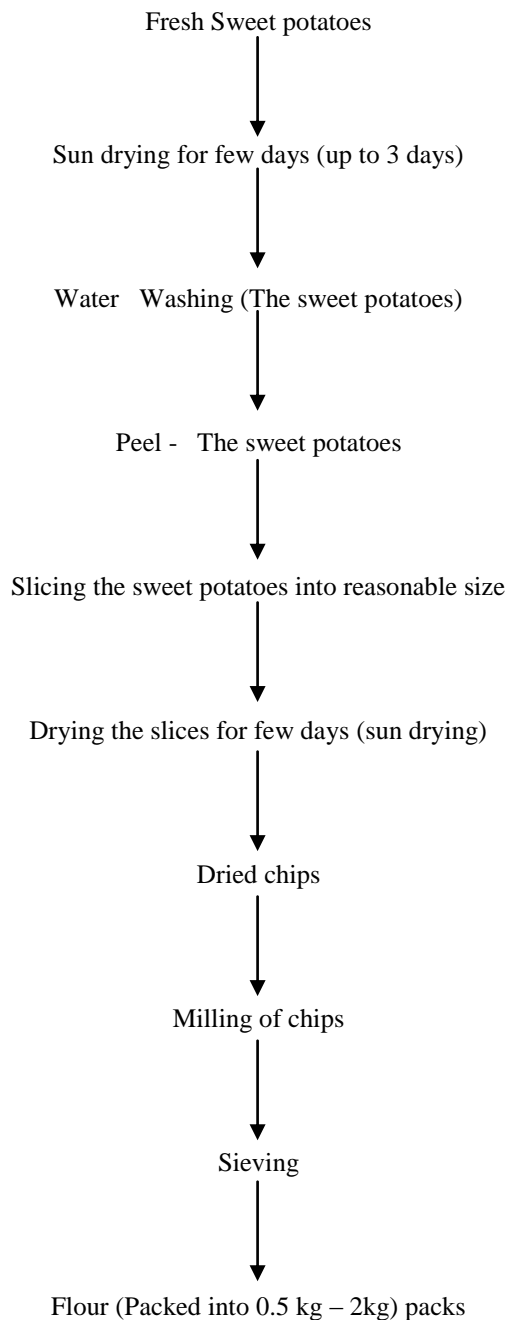
Figure 16: Processing sweet potato into flour

4.9 Availability of Raw Materials

The data in Fig. 17 shows that the variation of raw materials availability, it was learnt that materials were available mostly in April to October and scarce in January to March and then November to December. This could be due to rain season form various locations where people grow sweet potato.
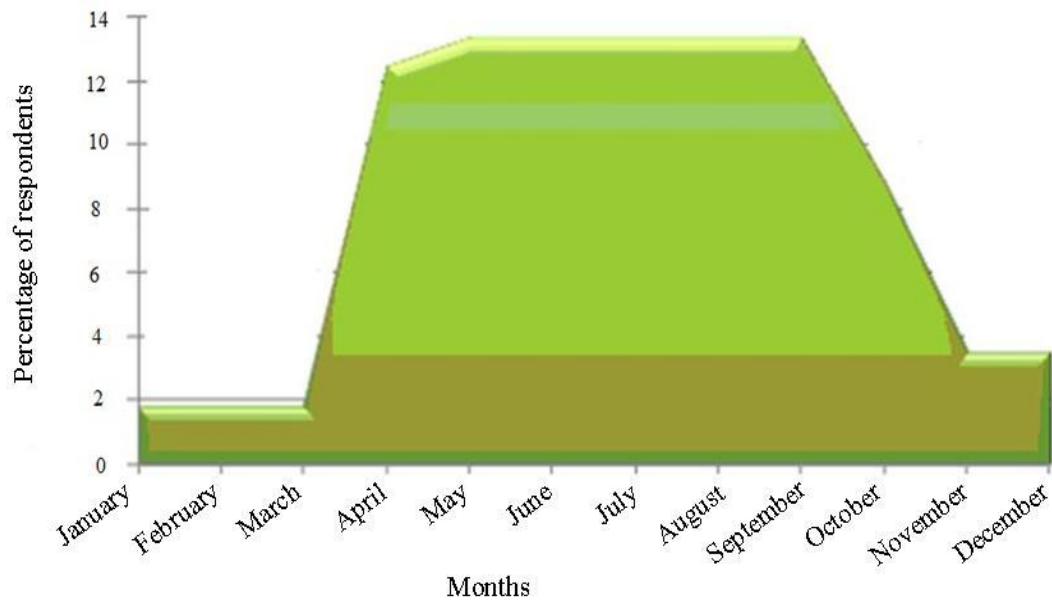
Figure 17: Percentage of distribution of months where produce is available

4.10 Food Processing Methods and the use of Machine

The survey sought to understand different methods and technologies of used by sampled processor in their efforts to process the product and hence improve quality of their products. Processors were asked about deferent processing methods, discussion revealed that most of small-scale processor used heat (sun drying) and the methods used for testing the quality of the products such as taste (flavor) and shelf life for items that they produce. None of the processors did test the products quality of such product using advanced technology. Some did use unclear method of testing the products. These methods were mainly such as visual observation and sensory taste of amount of sugar and or salt. It was further learnt that processors had limited use machines used during processing.

Majority of processors neither own nor use any machine during processing (69%). However, few of them used blender and sealing machines (Table 9). This finding is similar to what Fellows (2000) and said that food processing entails combined procedures

to achieve intended changes to the raw material and the processing technologies in the food industry. The study agrees by Lebovka *et al.* (2007) suggest that processing is subdivided into two main groups (i) Processing of foods with non - thermal methods (i) such as high pressure processing, pulsed electric field (PEF), electronic beams, and (ii) Processing of foods with the application of heat (Yadav *et al.,* 2006; Leeratanarak *et al.,* 2006; Ahmed *et al.,* 2010; Fernando *et al.,* 2011; Singh and Pandey, 2012) such as blanching, pasteurization, sterilization, evaporation or concentration, drying or dehydration, microwave and infra-red heating.

Table 9: Machines used during processing

Machine used	Percent
No machine (n = 30)	69.0
Blender (n = 30)	35.0
Electric oven (n = 30)	6.0
Sealing machine (n = 30)	15.0

4.11 Processors Market Outlet

It is common that in many regions products reach the consumers through direct producer to consumer sales or via retail outlets such as local market place, shops and groceries. A significant number of processors worth mentioned they sale their produce within their vicinity (56.7%). However, few sales and bring products to trade fairs and other business shows where there is high demand of their products (Table 10). This could attributed by low products produced and reach market. Furthermore, this processor would have been linked with producers in the lake zone for the potentials of getting raw materials.

Table 10: Processors target market

Target market by processors	Percent
Exhibition show like 88(n = 30)	3.3
Kiosk (n = 30)	13.3
Dar-Es- Salaam (n = 30)	26.7
Kibaha maili moja and Picha ya ndege (n = 30)	56.7
Total	100.0

It was further revealed that, ability to regular supply to the market and meet demand of the customers for processed food is characterized by seasonality. This is because production of many of agricultural products like sweet potato depends on crop calendar of a particular location. Similarly, processors and majority of traders' assent that seasonality highly affects their capacity to supply the market with products produced from sweet potato. Unlike sweet potato, vegetables are more evenly distributed throughout the year, thus advantage for products processed from vegetables.

Further the survey sought to seek consumers' opinions on the availability of the sweet potato processed food. Three attributes considered was whether products are easy to get within their localities; seasonality affect products availability or there are few suppliers of the products in the market within their localities. Majority of consumers (74 %) showed their not satisfied with availability of the products in the market due to seasonality. The survey also can suggest that these regions are not constantly supplied with products throughout the year due to few numbers of processors engaged and or suppliers and availability of raw materials. Other reasons could be lack of market information and weak linkage with producers.

4.12 Consumers Reasons on the Consumption of Local Processed Food

Results show that consumers are well aware of processed products. The data form shows that most of the interviewed sampled consumers used local made food products. The most frequently mentioned (34.7 %) reason by consumers for using these products is its nutritional value while (31.3%) reported that they purchase local made sweet potato products because of not having enough cash to by other processed imported products. When consumer attained a high level of literacy like attaining post-secondary education

influence their use of local made processed food due to its nutritional importance. Other reasons are as shown in the (Table 11). Having established that sweet potato processed products are an important to consumers and contribute significantly to consumption of food in the selected regions, we now turn our attention to the willingness to pay of consumers for particular type of product. Survey data found that sampled consumers preferred other popular processed products like Nutritional Flour '*Unga wa Lishe*', sunflower cooking oil, mango pickle, peanut butter and dried rosella.

The study by Ruteri *et al.* (2009) argued that customer perceived value in Tanzania differ significantly from one processed food producer (industry) to another, consumers are also willing to pay high for a product from a certain producers even if the functional quality of the product does not support the price paid. This situation helps the processor to create the market or consumer segmentation. Satisfied customers are always reluctant to look information from alternative suppliers. Personal observations and experience show that levels of income and education have influenced the perception of products. It was further noted that childhood food experiences and adulthood eating behaviours (Birch, 1999; Hilbran and Peterson, 2009).

Table 11: Factor Influencing Consumers Purchase of Processed Sweet Potato

Factors	Percent
Nutritional value (n =30)	34.7
No cash to buy alternatives (n =30)	31.3
Not aware on imported products (n =30)	17.0
Saves during off season (n =30)	17.0
Total	100.0

4.13 Factors Influencing Consumer Purchase of Processed Food

Experience suggests that it not necessarily that when an individual purchase a product will ultimately consume it. In contemporary society many factors such as influence of family members or market force such Television and radio advertisements can lead one to purchase a product. Hence in this survey it was sought to identify the factors influencing consumers' purchase of processed food.

Table 12 below consumers mentioned attractive packaging (51%) and brand loyalty (12.1%) were the major factor for decision to purchase processed food products, other factors included advertisements, availability, price and shop loyalty as factors behind their decision to purchase processed food. It was further observed that only a few of processors have managed to develop some means for advertise their products. This is done through leaflets and contact cards.

Table 12: Factors influencing consumer purchase of processed food

Factors	Percentage
Advertisements (n =30)	10.5
Availability (n =30)	10.8
Price (n =30)	10.0
Shop loyalty (n =30)	5.6
Attractive packaging (n =30)	51.0
Brand loyalty (n =30)	12.1

4.14 Volume, Costs of Production, Volume Sold, Price per Unit, Revenue and Margins

As discussed earlier in this paper, processors were doing processing at small-scale levels due to several factors. Sweet potato flour was the main processed products that processor produce in at least larger quantity. Table 13 shows that processors bought $10 - 50$ bags (50Kg each) of raw materials for processing. Similarly the sell an average of 1 to 25

packs of (0.5kg to 2kg) at 3000 to 5500 Tsh per kg. Moreover, processor accrued 50 000

Tsh to 2 250 000 Tsh per annum from the sales of flour leave alone other products which

are very minimal.

Table 13: Descriptive statistics for the volume, cost, price and margin of producing flour from sweet potato

Variable	Min	Max	Mean
Volume of Flour produced in 2012/13(Kg) (n=30)	10	50	24.56
Cost of production (Tsh) (n=30)	20 000	30 000	25 312.50
Volume sold in targeted market(Kg) (n=30)	1	25	2.33
Price per unit sold(Tsh) (n=30)	3 000	5 500	6122.22
Revenue accrued from sales of flour(Tsh) (n=30)	300 000	750 000	612 222.22
Total Cost incurred in production of flour(Tsh) (n=30)	100 000	875 000	512 222.22
Gross profit-flour (Tsh) (n=30)	50 000	400 000	156 111.11
Net profit-flour (Tsh) (n=30)	50 000	2 250 000	264 166.66

4.15 Processed Food Quality, Regulations and Standards

Quality is an important factor is processed food and its importance is multifaceted. This is

because not only consumers' demands for high quality products but there are food

standards with provide specific and legally binding requirements for certain processed

food. Laws and regulations normally state that product must be of good quality and safe.

To make sure they are safe and quality their characteristics are put together in standards.

Standards are made for products and how products are made. Some of these standards are

set for good hygiene in a processing process and the premises, packaging materials, level

of microorganisms, absence of toxic matter and extent of shelf life. Standards give the

properties of the products. They also show how products are packaged and labeled.

In Tanzania two organizations have a mandate to ensure among others that laws,

regulation and standards of food products are performed. These are Tanzania Food and

Drugs Authority (TFDA) and Tanzania Bureau of Standards (TBS) (Appendix 14).

4.16 Awareness on Processed Food Quality

Aside from helping to ensure the standard of processed food, hygiene and quality assist in boosting the image of food products and thus may have a promotional effect on local processed food consumption.

4.16.1 Processors Awareness on Quality

Analysis of survey results shows that processors understanding of quality of food products varied from awareness to unawareness. Table 14 shows majority of the processors (60%) consider attractive packaging and labeling as most important attribute of quality. 25% of were aware about the need to meet the processed foods standards as required by TBS. This reflect what was found by TFDA that the body is facing a number of challenges in enforcement of the Tanzania Food, Drugs and Cosmetics Act No.1 of 2003 including promotion of voluntary compliance by both local food producers and food importers thus posing food safety risks for foods consumed. Surprisingly one processor did not show to know any aspect regarding the quality of products she is producing.

Table 14: Different Quality Attributes as Perceived by Processors)

Quality attribute	Percent
All aspects that meet the food standards set by TBS (n =30	25.0
Not aware (n =30	6.0
Attractive packaging and labeling (n =30	60.0
Clean (n =30	14.0
Shelf life (n =30	8.0
High hygiene processing environment (n =30	7.0

Note: Percentage based on responses

4.16.2 Consumers awareness on quality

The survey also sought to determine understanding of consumers' quality attributes for the processed foods. Table 15 below shows different quality attributes by consumers on local processed foods. Generally survey results shows that consumers are aware of

different quality attributes required for processed foods, with majority (95%) mentioned taste as most important attribute.

Table 15: Consumers Awareness of Quality Attributes for Processed Foods

Quality attribute	Percent
Taste (n=50)	95.0
Freshness (n=50)	80.8
Shelf life (n=50)	85.8
Texture (n=50)	57.5
Economy (price) (n=50)	57.5
Nutritional factor (n=50)	72.5
Colour (n=50)	50.8

4.17 Estimating Market Potential for Sweet Potato

There is clear driven and high demand from the Middle East, European Union (EU) and Turkey and their preparedness to pay higher prices for high quality sweet potato. Moreover, Tanzania has the advantage of producing sweet potato if there will be a political will. Furthermore, the main producing countries are also consuming countries and majority are located in the Northern Hemisphere, the off-season therefore provides the chain with a window though short that has great market potential. Still Tanzania needs to compete with other countries in the Asian countries.

However the foreign demand is so much higher than supply that this is more of a longer-term concern. Therefore it is not surprising that Tanzania sweet potato farmer actors are currently preparing themselves to tap into this market. Tanzania has been exporting very small quantities of sweet potato but with challenges of weevil, local varieties and drought and not been able to supply sufficient volumes, halted the exports.

Top down estimation of market potential size was adopted. Hence using the top-down model, researcher identified lead markets, likely break-out markets, and longer-term

emerging markets. The lead markets were Dar es Salaam, Mwanza and Mbeya Regions due to higher GDP and population. The most likely break-out markets were Dodoma, Arusha, Kilimanjaro and those with GDP not below 1 000 000Tsh. Researcher calculated market potential for a number of regions based on how many tonnes these regions would have to purchase to match the lead market regions relative to their income.

Furthermore, the study by FAO (2012) showed that Tanzania average sweet potato consumption is approximately 3.2 tons per annum (90%) of the total production. The most widely grown variety is Polista. The average production of sweet potato is about 3.5 tons per ha against a potential of 30 tons. The survey further found that households in the study area consumed sweet potato regularly and consider it an important part of their diet. However, its consumption reduces with increased income. As incomes increase, a big percentage of the respondents do not serve it to an important visitor. Lead market regions can consume more than 2.6M tonnes of sweet potato annually which is double of what is produced. Example, data shows that Mwanza Region produced an average of 150 000 to 250 000 tonnes of sweet potato annually and consumed all of them and the demand for this market is still higher.

All regions with GDP not below 1 000 000Tsh were referred to as a break-out market, which had the wealth to support a sweet potato market, but was being suppressed by a set of demand inhibitors like low productivity, poor quality of product, poor marketing information about the product. Once these barriers were overcomed, demand leaped to very high level. Other demand inhibitors can be poor road, poor storage structures and poor policy in place. Rural infrastructure development can also make a significant and sustainable contribution to poverty reduction.

Furthermore, the data has identified a number of countries as big emerging markets, based on market size and potential, as well as their role as regional economic drivers. The EU imports of sweet potato average about USD 20 million annually over the period 2002-2004 (Eurostat Comext). The major sources of imports were the USA (36%), Israel (32%), South Africa (12%), Egypt (8%) and Jamaica (5%). The largest importers were the UK (39%), France (20%), Italy (16%), Netherlands (13%) and Portugal (4%).

Similarly, the data also shows that Kigoma, Mtwara, Dar es Salaam, Rukwa and Morogoro Regions had higher yield per hectare in kilograms of sweet potatoes (Fig. 18). Sweet potato production by regions indicated marginally higher production in the Mwanza Region where mean production was 1397kg/acre (3451 kg/ha) against 1326kg/acre (3275 kg/ha) in the Mara region. Low yield per kg is contributed by several factors notably weather, poor agronomical practices, insects attack and lack of capital to expand farm business.
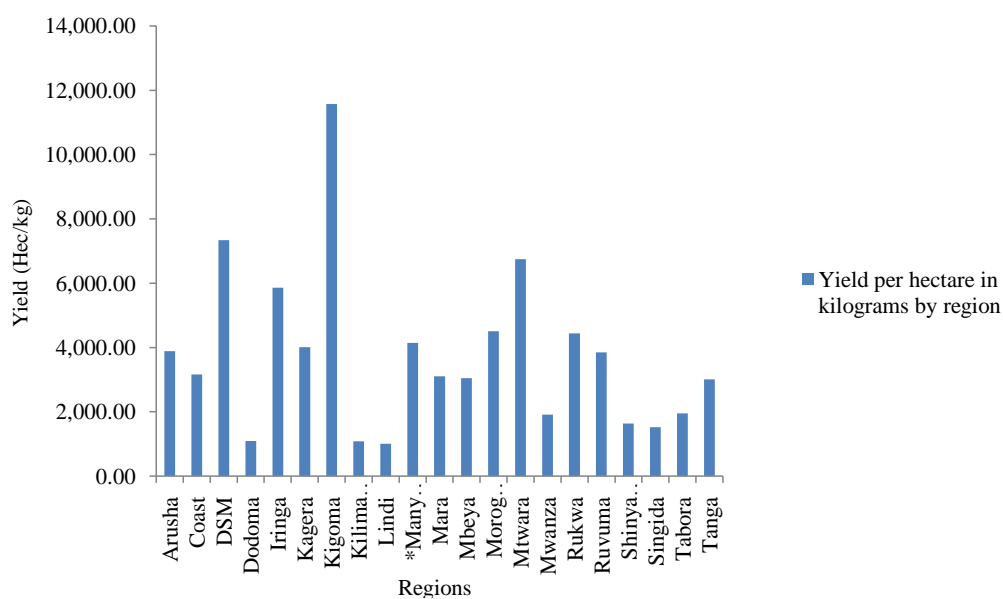
Figure 18: Distribution of regions and yield per hectare in kilograms

4.18 Market Margins for the Raw Sweet Potato Value Chain

On the basis of these findings, the marketing margin for potatoes depends on the number of factors, the price difference between processed and fleshed potatoes and the units and grades at which they are sold. At harvest time, there is intense competition among growers doing their own marketing. Therefore, the marketing margin appears to be lowest in March, April and May when most fresh potatoes are sold. Results are similar to those from (Jolejole-Foreman and Mallory, 2010).

The results in Table 16 show that gross market margins for different actors the sweet potato value chain. The larger gross marketing margin for wholesalers/exporters could be explained by the associated costs incurred such as labour, transport and handling before selling. On other hand producers had relatively lower margins probably because they incurred only production costs. These findings are similar to those obtained by Kabuje, (2008).

Table 16: Marketing margins along sweet potato value chain

Marketing chain actors	buying price(Tsh)/kg	Selling price(Tsh)/kg	Market Margins	Participation Share (%)
Freshed Sweet Potato				
Producer/Processor	0	500	0	0.0
Village collectors	450	600	100	10.0
Hawkers	600	750	250	25.0
Small traders	700	800	300	30.0
Big traders	750	1 000	500	50.0
Marketing margin along *michembe* value chain				
Producer/Processor	0	700	0	0.0
Village collectors	650	800	100	8.3
Hawkers	750	950	250	20.8
Small traders	900	1 000	300	25.0
Big traders	950	1 200	400	33.3
Marketing margins along *Matobolwa* value chain				
Producer/Processor	0	900	0	0.0
Village collectors	850	1 000	100	6.25
Hawkers	900	1 100	200	12.5
Small traders	1 100	1 250	350	21.87
Big traders	1 300	1 600	700	43.75

*Assumption One bag of fresh sweet potato has 80kg, when dry it is equivalent to 40 Kg,

4.19   Profit Margins Obtained by Actors along the Sweet Potato Value Chain

4.19.1 Profit margin at farm level

Table 17 Indicates that the profit margin per bag at farm level was 2326 Tsh. The lowest margin earned by farmers found to be caused by relatively small quantity of yield, poor access to good market (demand and prices in urban areas) hence they sell their produce at low prices at the farm gate price and probably other reason could be lack of processing skills.

Table 17: Profit Margin Analysis of raw sweet potato at farm gate price per bag in acre

Description	Quantity	Price/Unit	Total
A. Gross Revenue			
Sweet potatoes sold (freshed) (Bags/week)	83	3 000	249 000.0
		TR	249 000.0
B. Variable costs			
Farm clearing	1.0	20 000.0	20 000.0
Tillage/Making ridges	1.0	22 945.5	22 945.5
Planting	1.0	20 053.6	20 053.6
1st weeding	1.0	25 757.6	25 757.6
2nd weeding	1.0	50 000.0	50 000.0
Harvesting (Food)	1.0	20 000.0	20 000.0
Transportation to home or market place (20kg)	20.0	3 000.0	60 000.0
Storage costs (Sacks)	7.0	700.0	4900.0
C. TVC			223 656.6
Variable cost for the first harvesting (TVC/4)			55 914.15
D. Profit margin			193 085.85
E. Profit Margin per bag			2 326.33

Note: One acre of sweet potato can produce up to 1500kg.
Farmers use to harvest in piecemeal (Assume an acre can be harvested in four times)

4.19.2 Profit margin at wholesale level

At the wholesale level the average profit margin was found to be 4049 Tsh per bag of (12kg) which is almost twice times that of farmer (Table 18). The costs incurred at the wholesale level are lower because they are distributed over large quantities of sweet potato handled compared to other chain actors. This means that wholesalers enjoy

economies of scale by selling large quantities of sweet potato at minimum costs and at very short time (56 bags/ week) thus higher profit margin.

Table 18: Profit Margin at Wholesale Level

Description	Value (Tshs)
Quantity of SP bought in bags	83 bags
(*Average of 83 bags of 12 kg each are bought by one wholesaler at farm gate level)*	
Average purchasing price per bag	3 000
Average selling price per bag	8 000
Total Revenue	664 000
Costs	
Cost of purchasing SPs (3000/- per bag of 12 kgs)	249 000
Transport costs (625/- per bag of 12 kgs)	51 875
Market levy (700/- per day per one wholesaler)	4 900
Storage (No cost, this is covered by market levy)	0
Security (200/- per day per one wholesaler)	1 400
Labour (250/- per bag of 12 kgs)	20 750
Total Cost	327 925
Profit Margin	336 075
Profit Margin Per Bag	4 049

Note: One wholesaler can sale 8 bags of 12 kgs per day.
Farmers in the study area packed *sweet potato* products in the used cement bags which is equivalent to 12kg

4.19.3 Profit margin at retail level

Table 19 shows that the retailers have relatively higher profit margins compared to farmers. At the retail level the average profit margin was found to be 3400 per bag. This could be explained by the fact that at retail level sweet potato were sold per *bunch "mafungu" of* sweet potato *at Nguzonane, Kambarage, Tinde auction* (Shinyanga town*)* and *Mwanza opposite, Tanganyika stand and Kilumba* markets (Mwanza city) which in turn gives higher profit margin per bag.

Table 19: Profit margin at retail level

Description	Tsh
Quantity of SP bought in bags (1bag of 12kgs is bought by one retailer per day)	52 000
Average purchasing price per bag	8000
Average selling price	12 000
Total Revenue (7 bags * 12 000)	84 000
Costs	
Cost of purchasing SPs (7 bags * 8000)	52 000
Transport costs 300 per bag * 7bags	2100
Market levy (500/- per day per one retailer)	3500
Storage (No storage cost)	0
Security (No security cost)	0
Labour (300/- for cleanness per one retailer per day)	2 100
Total Cost	59 700
Profit Margin	24 300
Profit Margin Per Bag	3471.4

Note: One retailer can sell up to 1 bag of 12 kgs per day.

4.19.4 Profit margin for wholesalers of local processed products (Matobolwa and

   Michembe)

Table 20 shows the average revenue, costs and profits obtained by local sweet potato

local processors in the study. This can be seen from the table the profit margin of local

processor was 15 616 Tsh per bag as compared to 13 300 Tsh that retailers/rural hawkers

received in selling of one bag of processed products (Table 21). This shows that value

addition through processing is an effective way of increasing profit margin.

Table 20: Profitability of wholesalers of local processed products famous known as *"Matobolwa" and "Michembe"*

Description	Tsh
Quantity of SP bought in bags 6 bags of 60 kgs each	6 bags
Average purchasing price per bag	30 000
Average selling price	54 000
Total Revenue (6bags* 54 000)	324 000
Costs	
Cost of purchasing SPs (6bags* 30 000)	180 000
Transport costs (5, 000/- per bag of 60 kgs)	30 000
Market levy (700/- per day per one wholesaler)	4 900
Storage (No storage cost)	0
Security (200/- per day per one wholesaler)	1 400
Labour (2 000/- per bag of 60 kgs)	14 000
Total Profit Cost	230 300
Profit Margin	93 700
Profit Margin Per Bag	15 616.7

Note: *One wholesaler can sell one bag of 60 kg per day.*

Table 21: Profitability of village hawkers/retailers of local processed products famous known as *"Matobolwa"* and *"Michembe"*

Description	Tsh
Quantity of SP bought in bags (1 tin of 10 kgs bought by one retailer per day)	700kg (7tins) ~ I bag
Average purchasing price per bag (9000 Tsh per tin of 10 kgs)	9 000
Average selling price (12 000/- per tin of 10 kgs)	12 000
Total Revenue (7 Tin* 12 000 Tsh)	84 000
Costs	
Cost of purchasing SP products (9000 Tsh * 7Tins)	63 000
Transport costs (300/- per tin of 10 kgs)	2 100
Market levy (500/-per day per one retailer)	3 500
Storage (No cost)	0
Security (No cost)	0
Labour 300/- for cleanness per day.	2 100
Total Cost	70 700
Total Profit Margin	13 300
Profit Margin Per Bag (There is only one bag sold in week)	3 300

Note: *Amount of sweet potatoes received in Shinyanga Municipal ranges from 42 – 65 bags of 100 kg each per week.*

4.20 Comparison of Profit Margins along the Sweet Potato Value Chain

Table 22 compares the profitability along the sweet potato value chain in the study area. Results from the table indicate that there was significant mean different in profit margin among sweet potato value chain actors at $p < 0.01$. Further test was conducted using ANOVA Post Hoc test between each pair of profit margin. The table reveals that the farmer's profit margin was statistically significant different from the wholesaler's profit margin at $p < 0.01$, while in comparing again the profit margin of farmers with that of retailers, the farmers" profit margin was not statistically significant different at 5% level. The results indicate that, wholesalers obtained the highest profit margin both for selling raw or processed products.

Table 22: ANOVA Post Hoc tests, pair- wise comparisons between actors' profit Margin (Tsh)

Actor	Mean profit difference	Sig.
Farmer's profit Vs Wholesaler's profit	1.90988E5	0.000***
Farmer's profit Vs Retailer's profit	2.06005E5	0.000***
Wholesaler's profit Vs Retailer's profit	15016.43478	0.000***

The mean difference in profit is significant at 0.01 significance level.

4.21 Determinants of Sweet Potato Profitability at Farm Level

The factors influencing profitability of sweet potato production were analysed using regression analysis (forward exclusion) as described in section 3.8.5 of chapter three. The dependent variable was profit margin at farm level and the regressors were main occupation, years of schooling, land size, household size and selling price. The results of linear regression analysis at farm level indicated that 63.9% of the variation, in sweet potato profit margin obtained at farm level was due to the independent variables included in the regression model. That is to say the specified predictors explained 63.9% of the variation in profit margin. All variables had an appropriate signs except number of

household had negative relation with profit margin (Table 23). Also there was no multicolinearity between predictors as VIF of each predictor was less than 5.

Table 23 shows that years of schooling was statistically significant at $p < 0.01$ and positively related to profitability of the sweet potato as it was hypothesized. This implies that better education of the producers has advantages as it enlightens them on how best to strategize and adapt better production and marketing conditions of sweet potato business. Nwaru *et al.* (2004) on their study found similar results on the level of formal education which was statistically significant and positive related to profit.

Main occupation of the household head was also significant at $p < 0.01$ and positively related to sweet potato profitability. This implies that, sweet potato production being the core activity, farmers would devote more attention and resources to the sweet potato sector, thereby gathering information, making decisions, and adopting technologies that will raise profit margin. Table 23 also indicates that size of land was significant at $p < 0.01$ and positively related with sweet potato profit margin. This implies that the size of the land that a sweet potato producer own defines his scale of business operation. *Ceteris paribus,* the higher the scale, the higher the profit margin because of possible economies of scale. Thus farmers with large farms are liable to get higher profit margin than those with small farms. The Table 23 below shows that an increase in one acre of farm size leads to an increase in profit margin by 613 906 Ths.

Price of the sweet potato at farm gate was also significant at $p < 0.01$ and positively related to sweet potato profitability. This implies that, sweet potato price could be the prime factors that will reflect high margin to farmers in proportional to variable costs and

this agree with economic theories. The parameter estimates of each variable carried a sign

that is related to prior expectations except for the experience in sweet potato production.

Table 23: Linear regression model results of determinants of sweet potato Profitability at farm level

Predictor	Coefficient	Expected Sign	VIF	Sig.
(Constant)	- 620 000.19			0.0000*
Main occupation	680 055.19	+ve	1.198	0.000***
Years of schooling	21 675.34	+ve	1.125	0.000***
Land size (Acreage)	613 906.86	+ve	1.070	0.009**
Household size	138 504.64	+ve	1.139	0.029**
Selling price	620 034.54	+ve	1.198	0.000***

*R^2 = 63.9%, Adjusted R^2 = 62.6, DW= 1.91, * =significance at (p < 0.01)*

An informal interpretation of a *p*-value, based on a significance level of about 10%, might

be:

- $p \leq 0.01$;Very strong presumption against null hypothesis
- $0.01 \leq p \leq 0.05$; Strong presumption against null hypothesis
- $0.05 < p \leq 0.1$; Low presumption against null hypothesis
- $p > 0.1$; No presumption against the null hypothesis

4.22 Institutional Review of Sweet Potato Farming

At all level of the Government machinery there is a general consensus that agricultural

sector growth is an important instrument in poverty alleviation to an agricultural

dependency economy like Tanzania. In supportive of this premise has been existence and

harmony implementation of the National Strategy for Growth and Reduction of Poverty

(NSGRP or "*MKUKUTA*" in Kiswahili) and the Agriculture Sector Development Strategy

(ASDS).These strategies are also supported by two policy instruments, which are (i)

Agricultural and Livestock Policy 1997: A comprehensive and milestone framework that

inform preparation of ASDS in 2001. Following operationalization of ASDP, the separate

policy for livestock sub -sector was formulated recently. Therefore, there is an urgent

need for the ASLMs to work towards completion of preparation of a separate crops sub - sector policy especially on root and tubers in order to align with implementation of ASDP in its third year i.e. FY 2008/09 and Agricultural Marketing Policy 2007: This is the most recent policy document for the sector, completed during the second year of ASDP. The policy is yet to be populated and challenges remain in promoting and educating the stakeholders on its implications in driving the improvements in the agriculture sector marketing.

The Institutional Analysis/review (IA) primarily focused on ways in which the sweet potato value chain and all of its actors are organized to support (or not support) successful outcomes for sweet potato industry in Tanzania. There were a poor institutional environment (support) and lack of enforcement mechanisms including the lack of capacity of governmental bodies to coordinate and implement sweet potato marketing.

Besides the fact that the district authorities do not have the means to effectively enforce the bylaws and regulations, the general environment of the sweet potato chain that involves the influence of Political, economic, technological, social and ecological factors. Poor infrastructure in the country has also contributed to increased costs on agricultural production process in terms of high costs of transports, increased costs of farm inputs and maintenance of agricultural inputs and equipment. The roads networks especially in rural areas are in bad condition and in most of rain seasons village roads are impassable.

Furthermore, there was lack institutional arrangement (legal and policy setting) governed sweet potato production in the study area. Sweet potato production was considered by majority as a female crop and back up crop that serve during lean periods. The regulation

of Sweet potato farming lies with MAFS and DADP plans the crop has never been given priority as compared to paddy and cotton the process is top down approach.

The crop is bulky, perishable hence prone to deterioration. Somehow, sweet potato farming is not of priority is thus discouraged. However, according to the discussions with District official, the crop is of high important especially in drought areas like Shinyanga. Furthermore it was noted that district staff were less informed. Discrete knowledge of stakeholder's activities by the government official to this potential crop for food security and income generation leads to lack of proper plans at the district to synergize with stakeholder in developing the crop value chain.

4.23 Challenges Facing Sweet Potato Subsector in Tanzania

4.23.1 Producer challenges

Actors were asked to identify the most critical problem in sweet potato production and marketing along the chain. Chronic shortage of vines (33.1%) is the most important challenge that needs to be dealt with, others are lack of capital (26.8%), unpredicted weather (20.6%) and pests/insect attack were the most critical challenges facing the subsector (Table 24). The findings are similar to the survey carried out by Olawoye (1989a) that mentioned other constraints as access to extension services, women's legal status (property rights and inheritance laws) (Jiggins, 1997). Lack of extension staffing and management, lack of land, lack of capital and credit facilities and ineffective extension services, lack of encouragement, lack of commitment by officials and high cost of labour, lack of credit and storage facilities (FAO, 2003).

Table 24: Respondents' critical problems in the sweet potato production (n=184)

Critical problems in sweet potato subsector	Percent
Low capital	26.8
Lack of improved seeds	33.1
Unpredictable weather	20.6
Lack of manpower	4.6
Pest attack	13.9
Poor storage facilities	1.0
Total	100.0

Cognizant, agriculture policies and resources have traditionally focused on cash crops for export and on cereals, leaving sweet potato and other root crops at the periphery. Readdressing this imbalance with policy-makers providing more support and seeking substantial levels of public and private investment is critical if the potato sector is to thrive. Such investment would include breeding programmes, infrastructural improvements and commercialization initiatives that are all geared towards strengthening the value chain.

4.23.2 Processors challenges

Micro and small-scale food processing in Tanzania faces many constraints. These include poor quality of equipment; low processing skills; little publicity; lack of habit of consuming processed fruits and vegetables and inadequate packaging materials. This findings are similar to study on agro-processing industry in Tanzania by Makombe (2006) who found that inconsistent and inadequate supply; lack of quality raw materials; lack of string preference by consumers; lack of capital and undynamic market are among the major challenges of small-scale food processing enterprises in the country. Other constraints are high production costs, absence of cold chains (necessary to some products); inadequate electrification and potable water and its associated high tariffs.

In the survey on sampled processors, most frequently mentioned constraints during individual interviews and focus group discussions were: Packaging materials (80%); Seasonality of agricultural production (87%). Others were; Lack of Capital and Processing equipment; Inadequate training Food Laws; Regulation, Standards and Quality Assurance.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

The overall objective of the study was to investigate and create awareness on the sweet potato processed products marketing potential/analysis in the small holder production system in Tanzania. Specifically the study sought (i) to characterize and describe the sweet potato value chain (ii) to estimate market potential for sweet potato processed products (iii) to describe social economic factors affecting demand/consumption of various processed sweet potato products and (iv) to analyses social economic factors influences farmer profitability. The study was cross sectional in design. Therefore, a total of 314 households were surveyed. The study employed Regression analysis, Analysis of Variance (ANOVA), Market Potential Analysis, Profit Margin Analysis and Market Margin Analysis. This chapter presents conclusions and recommendations emanating from the major findings of the study.

5.1 Conclusions

Characterization and description of the sweet potato value chain: Overall the chain for sweet potato in Tanzania was characterized by low value addition process/techniques, market chain is largely characterized by informal system, weak and poor coordination among actors. Most of the products were sold in raw-form with very small portion/percentage of processed products. Basically value additional activities were limited by inadequate support services particularly lack of improved seed, inadequate processing techniques, poor extension services and poor policy favor the crop development.

Sweet potato value chain governance structure: Generally both vertical and horizontal coordination along the chain were weak and inactive. Weak coordination between actors along then chain has probably been responsible for the low production and hence marketing of sweet potato products. Likewise, no organization in place to safeguard their interests. The study findings also showed contracts in the informal sweet potato business do not exist.

Market potential for processed products: The data revealed that there is a market potential for processed sweet potato producer. It was further found that lead markets could be Dar es Salaam, Mwanza and Mbeya Regions due to higher GDP and population. The most likely break-out markets were Dodoma, Arusha, Kilimanjaro and those with GDP not below 1 000 000Tsh.

Prices and margins obtained by actors along sweet potato value chain: Empirical evidence shows that prices and margins obtained by different actors along the chain varied significantly with the wholesalers and processor obtaining significantly higher profit margins despite the high costs they incurred. Hence it can be concluded that value addition through processing and engaging in wholesaling is an effective way of generating profit as for sure prices at this node are higher because of value addition activities like handling, sorting, slicing, cutting and drying.

Sweet potato profitability: Based on empirical evidence form linear regression model, it can be concluded that main occupation, years of schooling, land size, household size and selling prices were the major factors influencing profitability of sweet potato production at farm level.

Institutional arrangements and policy setting: Sweet potato has a vast potential in the country, provided that crop yields and quality are enhanced and that processing strategies are developed to meet urban consumer needs. At macro level, lack of enforcements of existing sweet potato products laws and regulations does not provide incentives for producers to improve quality. The challenges remain on how to improve sweet potato processing at household level at all stage of the value chain.

Challenges facing sweet potato subsector: Based on the results it can be conclude shortage of improved seed, lack of capital, unpredicted weather and pests/insect attack were the most serious challenge impede sweet potato crop development.

5.2 Recommendations

(i) The findings of the study show that local variety was largely grown the study area. However, the quality and quantity of the variety were found to be poor. Therefore, the poor sweet potato pieces observe by researcher in the study area suggests the use of agronomical practices and hence use of quality seed is inevitable if one want to fetch good market price.

(ii) The results revealed poor coordination along the chain. Hence suggests the strengthening both vertical and horizontal coordination is of paramount important

(iii) Local Governmental should establish a policy/regulation regarding sweet potato production, processing and marketing by creating enabling environment for the crop

(iv) Action research for sweet potato value chain to find out possibility of including small scale farmers in profitable producer driven chains

(v)   Public sensitization for private sectors to invest in sweet potato processing in the areas of study. For-example, establishment sweet potato flour milling plant to produce cossettes, or cooked tubers, to be used in making cakes, bread, and drinks.

Suggestions for Future Research: Basing on this study, it is suggested that more empirical research to be undertaken, so as to focus on the following:

(i)   The study has just concentrated on value chain development. Further studies can be conducted on cost benefit analysis of sweet potato on farm enterprises is of paramount important

(ii)   The study has just concentrated on market potential. Further studies can be conducted on role of sweet potato and other staples in urban diet and cultural perceptions of different foodstuffs in order to change product image and consumer behavior.

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APPENDICES

Appendix 1: Questionnaires for producers

Sweet Potatoes Producer Household Survey Questionnaire
Section 1: Identification Particulars, Staff and Survey Time Details

1	Region:			9	Name of interviewer			
2	District:			10	Date of interview	DD	MM	YYYY
3	Division:			11	Name of supervisor			
4	Ward:			12	Checking date	DD	MM	YYYY
5	Village/hamlet			13	Starting time	Hours	Minutes	
6	Head Name;	Male	Female	14	Ending time	Hours	Minutes	
7	Name of Respondent	Male	Female	15	HH Phone number			
8	Name of Respondents							

Q1. A: Household demographic

HID	Name	Sex 1. Male 2. Female	Relation to HH (1)	Age	Marital status (2)	Education (3) indicate years	Occupation (5) more than one response	Agricultural/ extension Training 1. Yes 2. No
1								
2								
3								
4								
5								
6								
7								

Code (1)	Code (2)	Code (3)	Code (5)
1. Head	1. Single	1. Non	1. Farmer
2. Spouse	2. Monogamous	2. Adult	2. Pastoralist
3. Second/third wife	3.Polygamous	3. Primary	3.Agro-pastoralist
4. Child	4. Widow	4. O Level	4. Employed
5. Parent	5. Divorced	5. A Level	5.Self employed Specify)
6. Worker	6. Separated	6. Certificate	6. Student
7. Grandchild		7. Diploma	7. Disabled
8. Other (specify)		8. University	
9. None			
10. Job seeker			
11. Casual labour			

Section 2: Q2. Land access in 2010/2011and 2010/2011. Note: Land access refers to cropped land, wood lots, fallow land, land under tree crops, gardens and rented land.

S/N	Parcel ID Name	Parcel size (acre)	Acquisition (Code 6)	Year start using this plot	If rented in amount paid in TAS	
					2010/2011	2010/2011
1						
2						
3						
4						
5						
6						
7						
8						
9						

Code (6)
1. Inherited
2. Purchased
3. Borrowed in
4. Rented in
5. Government allocated
6. Just walked in
7. Other (specify)

Q3. Do you experience agricultural land scarcity? {1} Yes {2} No

Q4.Crop income 2010/2011 and 2011/2012. Note: Land access refers to cropped land, wood lots, fallow land, land under tree crops, gardens and rented land specific to sweet potato

Par cel ID	Crop code	Area plante d (acre)	Croppin g pattern (Code 8)	Seed cost (TAS)	Cost of hiring labour (TAS)	Insecti cide and herbici de cost (TAS)	Rental cost for machine ry and animal (TAS)	Quantity harvested	Unit (Code 9)	Conver sion factor to kg	Quantity consume d	Quantit y retained	Quan tity sold	Mark eting cost (TAS)	Price per unit (TAS)
2010/2011															
2011/2012															

Code (8)   Code (9)

1.   Pure stand   1. Kg

2.   Intercropped   2. Sado

3.   Tin/Debe   4. Bag

NB; 1Bag = 80 Kg (5Tins)

Q5. Is quantity of food crops stored enough to take you up to the next season? {1} Yes
{2} No

Q6. Farm Assets owned by HH

Asset	Number of item current owned	Total value (TAS)
Farm equipment		
Tractors		
Trailers		
Vehicles		
Carts		
Donkeys/draught animal		
Wheelbarrows		
Ploughs		
Borehole		
Hand hoe		
Spray pumps		
Power tiller		

Q7. Planting and planting materials

Source of planting	How can be planted	Months for planting	Season per year	Varieties of SP planted	Any Training attended	Who decide variety	Why the variety

HARVESTING AND POSTHARVEST HANDLING

Q8. Harvesting and post harvesting practices

(i) Harvesting

Practice	When	Mention factors that made you to decide to harvest	Methods used	Harvest in piece or whole	Reasons for the harvesting in piece/whole	Cost/bag(TSH)
Harvesting						

(ii) Storage

Practice	Do you store	Where	Methods	Causes of loss	Costs associated (if any)
Storage					

MARKETING

Q9.Do you sell your raw sweet potato?

Q10. If yes, where do you sell your raw sweet potato?

S/N	Where sold	Rank	Reasons of the option	Price	Code (16)	Price		Who set price Code (17)	Distance to market destination (Km)	Amount supplied/ week	Contact Code (18)	Contract		Costs Code (19)	Mode	Costs
						2010/ 2011	Dry					Formal	Infor mal			
1	At farm gate															
2	Sweet potato vendor															
3	Sweet potato hawkers															
4	Wholesaler															
5	Sweet potato collection centre /Auction or market center)															
6	Processing plant															
7	Others (specify															

Code (16)
Bicycle
1. Tin /Bag
2. Cart
3. Acre

Code (17)
1. Producer
2. Buyer
3. Negotiation

Code (18)
1. Through other family members
2. Through neighbors
3. Buyer contacted me

Code (19)
2.Public
3.Hired vehicle
4.Own
5. By foot
6Draught   animal

Q11. If No, Why?

……
……
……

Q12. Is there any price fluctuation for you Sweet potato products in different season of
the year?   [YES/NO]
Q13. Is your Sweet potato graded according to the quality? 1. Yes 2.No
Q14. If yes, what quality attributes/special requirements/specification observed?

Quality attributes		Tick	Price (Low/Price)
Size	Large		
	Small		
Colour	White		
	Red/Purple		
Shape	Regular		
	Irregular		
Nutrients value	Oranged fleshed SP		
	Others		

Q15. Do you have supplier of inputs?   1. Yes   2. No
Q16.Are there any regulations governing sweet potato products in this area?
        1= Yes   2= No
Q17. Describe
……
……
Q18.Are you a member of any producer organization/association?
        Yes/No

Q19. What are the functions and benefits of these associations?
    1……………………………………………………………..
    2………………………………………………………….
    3………………………………………………………….
Q20. Do you receive extension service regarding to sweet potato {1} Yes {2} No
Q21.What types of extension services/packages you have received?
    1……………………………………………………………..
    2………………………………………………………….
    3………………………………………………………….

Q22.Which packages you need but you didn't receive?
    1……………………………………………………………..
    2………………………………………………………….
    3………………………………………………………….

Q23. How do you collect market information for sweet potato?
{1} Direct visit to the market
{2}Crosschecks with fellow farmers
{3} hear from friends
{4} from extension officers
{5} From NGO's

Challenges
Q24. What is the most critical problem in;
(a)   Sweet potato production
    (i)…………………
    (ii)………………
    (iii)……………….

(b)   Sweet potato handling and processing
    (i)…………………
    (ii)………………
    (iii)……………….

(c) What are the problem(s) do you face during marketing of the sweet potatoes?

Low process during the Seasonal [ ]	Unreliable Buyers [ ]	Price uncertainty [ ]	High competition [ ]	Unfaithful customers [ ]	Short shelf life [ ]	Others

(b) How do you think these problems can be solved?
{a} Sweet potato production
    (i)…………………
    (ii)………………
    (iii)……………….
(b)   Sweet potato handling and processing
    (i)…………………
    (ii)………………
    (iii)……………….
{c} Sweet potato marketing
    (i)…………………
    (ii)………………
    (iii)……………….

THANK YOU FOR YOUR COOPERATION

Appendix 2: Questionnaire for traders

Section I: Traders Socio-Economic Profile

If trade in SP or SP products   1= Yes   2=No
1. Name of trader/company……………………………………………….
2. District…………………………..Ward……………………
    Village…………………….
3. Gender of respondent   1=male   2= Female
4. Age of respondents ……………………
5. Marital status
    1=married   2= single   3=widowed   4= divorced
6. Education level of the respondent
    1= No formal education 2= Primary 3= secondary 4= Post secondary
7. Main occupation
    1= self employed   2=Farming   3= unemployed   5= others
8. Type of trade involved
    1= Whole seller   2= Retailer   3= Exporters   4=others (specify) ……………
9. Are you a member of any association/cooperative?
    1= Yes   2=No
10. If yes, what benefit do you get by being a member of the association or organization?…………………………………………………………………
11. When started sweet potato (SP) business…………………………………………………
12. Are you trading other perishable s   1= Yes   2=No
13. If yes mention them………………………………………………
14. Do you have collection centre   1= Yes   2=No

Section II: Commodity Flow and Marketing Practices
(a) Buying
15. What kind of product do you normally buy? 1= sweet potato 2= sweet potato products 3= both 1and 2.

Products	Volume(kg) bought	Price (TSH)/bag	Remarks
Sweet potato			
Sweet potato products			
Sweet potato and Sweet potato products			

16. Who buys produce for you? 1= Self 2=Relative 3= Commissioned agent 4= Inter-village collector
17. From whom did you buy most produce in the last 12 months? 1= Farmers 2= Wholesales 3=Village collectors 4= Other (Specify)……………….
18. From how many different sources did you buy produce?
       1= One   2=Two   3=Three   4= Four or more
19. What is buying prices and volume traded in each source

Source	Volume(kg) bought	Price (TSH)/bag	Remarks
One			
Two			
Three			
Four or more			

20. Do you have collection centre?
21. Do you own a business license? 1= Yes   2= No

(b) Selling
22. What kind of product do you normally sell? 1= sweet potato 2= sweet potato products
    3=both 1and 2
23. Volume, price and costs

Products	Volume sold(kg)	Price (TSH)/bag	Remarks
Sweet potato			
Sweet potato products			
Sweet potato and Sweet potato products			

24. Where did you sell most of your sweet potato?
        1= Village   2= Shinyanga urban   3= Mwanza   4= Dar -Es - Salaam
        5= other (specify)…………
25. Is there any SP processing or value before trading?

Products	Volume sold (kg)	Volume processed	Price/kg	Processing costs
Sweet potato				
Sweet potato products				
Both Sweet potato and Sweet potato products				

26. What factors are used to set the price?
     1= supply   2= Demand forces
     3= quality/grades   4= others……..
27. Are you able to supply the required order according to customer requirement throughout the year? 1. Yes 2. No
28. Do you have special requirements/specification for your supplier? 1. Yes 2.No
29. If yes, what is the requirements/specification?
     (i) …………………………………………………………………………
     (ii) …………………………………………………………………………..
30. 15. Do you have special requirements/specification of products from your buyers/customer? 1. Yes 2.No
31. If yes, what is the requirements/specification?
     1……………………………………2…………………………..3………………….
32. Who sets the following for your products?
33. Buying price………………… Selling price………………………………
34. Selling point

Selling point	Selling Price		Quantity sold(Kg)	
	Wet season	Dry Season	Wet season	Dry Season
At home				
At Street				
Supermarkets				
Kiosk/retailer shops				
Hotels/Restaurants				
Others (specify)				

(c) General information

35. What were the buying and selling prices per bag of sweet potatoes during the following periods;

Period	Buying price sweet potatoes	Selling Price sweet potatoes Products
October-December		
January- March		
April – June		
July – September		
Total		

36. How do you normally get price information? 1= Newspaper 2= Radio 3= Telephone 4= Fellow traders 5= Visit market places 6= other (specify)….
37. Do you make use the prices broadcast by TBC1?   1= Yes 2= No
38. How do you fix prices of your commodity?
       1= Take market price   2=Calculate costs in involved   3= Other (explain)…
39. Are you aware of the prices on various adjacent markets 1= Yes   2= No
40. Do you normally know prices in advance before taking your consignment to the market? 1= Yes   2=No.
41. How many months do you normally spend out of sweet potatoes business per year?_____months
42. Estimate your annual income from sweet potatoes trade activities _____TSHs.
43. Estimate your annual income from off- sweet potatoes trade activities _____TSHs.
44. Do you sometimes sell or buy produce on credit? 1= Yes   2= No.
45. If yes explain _____
46. Have you ever had access to formal credit to support your sweet potatoes trade
          1= Yes   2= No.   If no explain _____
47. Do you have any form of cooperation with other traders?
          1= Yes   2= No. If   Yes, explain.
48. Estimate your mean working capital at the moment? _____
49. What a kind of measuring instrument do you normally use in determining units of sale for sweet potatoes?
    1= Kopo   2= Tin   3= Sack   4= Scale   5= Other (specify)
50. What kind of measuring instrument do you normally use in determining units of sale for sweet potatoes products? (Code as question 41 above).
51. Do you normally store produce to take advantage of high prices late in the season?
    1= Yes   2= No
52. If yes, where do you store the produce?
     1= Own rooms   2= Hired rooms   3= Other (specify) _____
53. What quality problem do you normally face in sweet potatoes marketing?
    1= Infestation   2=Sand   3=High moisture content
    4= Broken sweet potatoes particles 5= sweet potatoes colour
    6= Aroma   7= Other (specify)_____
   54. What constraints are you facing in sweet potato business?   …………………

THANK YOU FOR YOUR COOPERATION

Appendix 3: Questionnaire for consumers

1. Date of interview …………….2. Respondent name …………………………….
3. Age …………   4. Sex ……….
5. Marital status: Single [ ] Married [ ] Widowed [ ] Widower [ ]
6. Education level: …………..7. Region…………………District:………….……...
8. Do you use Agri-food processed products from sweet potato? Yes [ ] No [ ]
9. If Yes in qn.8, list at least five of the local made products that you prefer?
(i)………………………………………………………………………………
(ii)………………………………………………………………………………
(iii)………………………………………………………………………………
(iv)………………………………………………………………………………
(v)………………………………………………………………………………

10. If No in qn. 8 give reasons,
(i)…………………………………………………………………………………………
(ii)…………………………………………………………………………………………
(iii)………………………………………………………………………………………
(iv)………………………………………………………………………………………

11. Where do you normally buy the products mentioned in qn. 9 above, Tick?
    (i) Shops   (ii) Supermarkets   (iii) Local market place
    (iv) Exhibitions (v) Processors (vi)Others *(specify)*

12. Information on products availability
(i)…………………………………………………………………………………………
(ii)…………………………………………………………………………………………
(iii)………………………………………………………………………………………
(iv)………………………………………………………………………………………

13. What are the factors influencing purchase of Agri-food processed products from sweet
    potato?

Factors influencing purchase	Rank
Product features	
Advertisement	
Availability	
Brand loyalty	
Price	
Influence of family members	
Shop loyalty	
Packaging	

14. What do you consider to be the quality of the Agri-food processed products from sweet potato?

Quality attributes (product feature)	Rank
Taste	
Freshness	
Shelf life	
Texture	
Economy	
Nutritional factor	
Color	
Flavor	

15. Are you satisfied with the price of the sweet potato products? Yes [ ] No [ ]
Give reasons for your answer,
(i)……………………………………………………………………………………
(ii)……………………………………………………………………………………

16. What are your comments on the local made agri-food processed products from sweet potato?
(i) …………………………………………………………………………………
(ii) …………………………………………………………………………………
(iii)…………………………………………………………………………………
(iv) ………………………………………………………………………………

THANK YOU FOR YOUR COOPERATION

Appendix 4: Questionnaire for Processors

1. Date of interview …………….
2. Respondent name …………………………….
3. Age …………
4. Sex ……….
5. Marital status: Single [ ] Married [ ] Widowed [ ] Widower [ ]
6. Education level: …………..
7. Region…………………District:…………..……...
8. Do you perform value adding activities after purchase/produce your sweet potato? 1= Yes   2= No
9. Where did you acquire the processing skills
10. When did you start processing sweet potatoes?
11. What made you venture into sweet potatoes processing?
12. Where do you normally get your raw material?..................................
13. Are there any season variability from these sources?
14. Of the sources of sweet potatoes mentioned above which one is most preferred? (why?)
15. Quantity bought in Kg

2009/2010	2010/2011	2011/2012	2012/2013

16. Which month do you normally buy your raw materials……………………………
17. What are constraints facing during supply of raw materials

    ……………………………………………………………………………………………
    ……………………………………………………………………………………………
18. What re the mitigation   measures taken to rescue the situation?

    ……………………………………………………………………………………………
    ……………………………………………………………………………………………

19. Which products do you normally process/produce? (a)------------------------(b) ------------------(c)   -------------- (d)………………..
20. What kind of materials do you use during processing of the above named products?

Product	Material needed	Source of material		
A				
B				
C				

21. Describe step in processing of each mentioned products in question (14) above

S/N	Product	Steps in processing	Challenges
1	Fried sweet potato		
2	Dried sweet potato		
3	flour		
4	crisp		

22. How/where do you store processed products?

Vihenge [ ]	Gunia [ ]	Kichanja [ ]	Up the Roof [ ]	Others (specify)

23. What volumes, cost and selling destination?

Products	Seasons		Costs/ Volume	Where do you sell (Market)	Volume/ size	Price
	2011/2012	2012/2013				
Fried sweet potato						
Dried sweet potato						
flour						
crisp						
Other specify						

24. Estimate gross margin for each product

S/N	Product	Total revenue per (100kg) (TSH)	Cost incurred (TSH)	Gross Profit (TSH)	Net- Profit (TSH)
1	Fried sweet potato				
2	Dried sweet potato				
3	flour				
4	crisp				

25. What have you done recently to improve your products or services?

(i)………………………………………………………………………………………………

(ii)……………………………………………………………………………………………

THANK YOU FOR YOUR COOPERATION

Appendix 5: Checklist for subject specialist

1. General information on Sweet potatoes sector
   a. Farming system (land use, farming season, ownership)
   b. Technology used
      i. Seeds varieties, sources and practices, yield from each variety, and robustness to diseases and drought
      ii. Type of Fertilizers used (ask for manure if used)
      iii. Equipment used in farming
   c. Processing activities and technology used
   d. Market (prices and sales volumes) – probe for locally used volumes and take note of local names
2. Who are the actors that are involved and their roles (NGOs, SACCOS, private businesses, individuals) – probe if loans for sweet potato production/marketing/processing exists
3. What kind of relationships that exist among actors?
   a. Informal or formal contracts with buyers or sellers, seed suppliers, processors
   b. Cooperatives/SACCOS
   c. Individual agreements
4. What are the production volumes
5. What are the current and potential uses of sweet potatoes?
6. Policy issues?
   a. How the government does sweet potatoes' contribution into food security, income, gender and environment?
   b. What efforts/initiatives have been made to increase production and marketing of sweet potatoes?
7. Main challenges faced by the sector (probe for the following issues – irrigation; inputs supplies; access to loan (for each actor along the chain); fiscal environment-levies, tax, market access; transportation; packaging; extension services; training; youth and women involvement)

Appendix 6: Checklist for NGOS

1. General activities/function in relation to sweet potatoes
   a. Position of sweet potatoes activities in relation to other activities in the organization
   b. Performance of the sweet potatoes activities
2. Relations observed in sweet potatoes production, selling, transporting, processing and using
3. Main and potential use of sweet potatoes
4. Potentiality of more processing of sweet potatoes
5. Challenges to the industry
6. What are the possible interventions?

Appendix 7: Checklist for research stations

1. Production:
   a. Varieties available
   b. Yield for each variety (period, amount, location)
   c. Robustness to disease, pests and drought
   d. Dissemination procedure (training of farmers, distribution of seed, follow up and feedback)
   e. Main challenges
2. Processing
   a. Any initiative in processing? (Various products, processing technology?)
   b. Challenges?

Appendix 8: Checklist for various actors

1. What are your main activities?
2. What inputs are used? (seeds, fertilizer, equipment)
3. What are the sources for each input?
4. What kind of services do you get (financial, extension and market information services?)
5. What are the sources for the services mentioned above?
6. What are the production volumes?
7. How is the market for the products? (availability, location, price, volumes sold)
8. Who are your
   a. Input suppliers?
   b. Buyer?
   c. Sweet potatoes supplier?
   d. Transporter?
9. Any relationship with those above? If yes what kind of relationship?
10. If contract
    a. Is it informal or formal contract?
    b. How did you come into contact?
    c. What kind of agreement you have?
    d. How is the enforcement of the contract?
    e. What happens if one breaches the contract?
    f. What are your the main challenges in relation to sweet potatoes business/activities?

Appendix 9: Sweet potatoes yield per hectare in kilograms by region

Region	1998/99	1999/00	2000/01	2001/02	2002/03**	2003/04	2004/05
Arusha	2,400.00	2,300.00	1,700.00	3,697.00	2,129.79	2,830.41	3,880.00
Coast	-	-	-	4,675.00	783.88	59.20	3,154.68
DSM	-	-	-	1,126.00	996.76	7,537.79	7,341.39
Dodoma	3,200.00	2,000.00	1,800.00	1,500.00	1,132.67	738.27	1,086.49
Iringa	2,200.00	2,300.00	2,000.00	8,310.58	2,199.41	4,706.16	5,855.11
Kagera	2,900.00	2,500.00	1,500.00	4,257.94	1,809.47	4,694.82	4,004.35
Kigoma	2,300.00	2,500.00	1,500.00	8,458.13	2,373.57	8,498.57	11,572.61
Kilimanjaro	3,200.00	2,300.00	2,000.00	9,055.56	1,448.14	8,161.29	1,074.07
Lindi	-	-	-	-	761.95	1,000.00	1,000.00
*Manyara	-	-	-	-	1,121.68	2,768.28	4,146.20
Mara	2,200.00	2,000.00	1,400.00	1,000.00	2,601.22	3,104.52	3,101.39
Mbeya	2,200.00	2,500.00	1,700.00	3,252.01	1,356.68	3,534.69	3,043.11
Morogoro	2,200.00	2,300.00	1,700.00	5,028.57	1,655.35	6,337.37	4,508.93
Mtwara	800.00	1,000.00	1,300.00	-	2,042.89	7,000.00	6,750.00
Mwanza	3,900.00	2,400.00	2,000.00	5,028.57	1,356.42	1,649.27	1,912.34
Rukwa	2,200.00	2,600.00	1,500.00	4,143.90	1,752.78	4,484.93	4,436.04
Ruvuma	2,500.00	2,000.00	2,500.00	1,536.75	2,208.74	3,223.79	3,844.61
Shinyanga	1,700.00	1,500.00	2,600.00	3,913.34	919.38	1,756.47	1,633.13
Singida	1,300.00	1,700.00	1,100.00	2,144.33	1,949.39	1,753.08	1,521.40
Tabora	1,700.00	2,100.00	1,900.00	3,104.55	1,346.47	3,154.08	1,943.83
Tanga	2,200.00	2,400.00	2,000.00	3,392.00	933.56	1,324.32	3,002.95
Average	**2,004.65**	**1,915.51**	**1,835.18**	**3,462.33**	**1,565.72**	**2,901.52**	**3,015.97**

Source: Statistics Unit-Ministry of Agriculture, Food Security and Cooperatives.

* New region

 ** National Sample Census of Agriculture 2002/2003

Appendix 10: Sweet potatoes area ('000'ha), production ('000'tons) and yield (tons/ha) by region by District and year

Region	District	Data	2005/2006	2006/2007	2007/2008*	2008/2009	2009/2010
Mwanza	Geita	Area ('000'ha)	30.59	33.18	8.15	28.04	19.09
		Production ('000'tons)	106.83	87.41	11.45	26.95	28.90
		Yield (tons/ha)	3.49	2.63	1.40	0.96	1.51
	Ilemela	Area ('000'ha)	0.66	0.66	1.50	0.81	0.58
		Production ('000'tons)	2.76	1.87	3.06	1.01	1.15
		Yield (tons/ha)	4.19	2.81	2.05	1.25	2.00
	Kwimba	Area ('000'ha)	9.84	7.16	10.49	8.81	12.99
		Production ('000'tons)	23.91	20.09	13.86	11.04	20.17
		Yield (tons/ha)	2.43	2.81	1.32	1.25	1.55
	Magu	Area ('000'ha)	17.43	17.59	8.40	21.40	10.65
		Production ('000'tons)	32.01	33.67	13.42	29.82	17.71
		Yield (tons/ha)	1.84	1.91	1.60	1.39	1.66
	Misungwi	Area ('000'ha)	6.45	9.83	6.94	10.39	8.12
		Production ('000'tons)	13.52	11.59	6.26	5.63	9.01
		Yield (tons/ha)	2.10	1.18	0.90	0.54	1.11
	Nyamagana	Area ('000'ha)	0.44	0.44	-	0.54	0.39
		Production ('000'tons)	2.76	1.87	-	1.01	1.15
		Yield (tons/ha)	6.29	4.21	-	1.88	2.99
	Sengerema	Area ('000'ha)	8.72	13.20	7.00	16.05	7.65
		Production ('000'tons)	60.59	32.13	16.20	18.54	23.20
		Yield (tons/ha)	6.95	2.44	2.32	1.15	3.03
	Ukerewe	Area ('000'ha)	8.94	9.02	8.26	10.97	10.10
		Production ('000'tons)	0.24	25.33	25.87	13.76	24.64
		Yield (tons/ha)	0.03	2.81	3.13	1.25	2.44
Mwanza Area ('000'ha)			83.07	91.08	50.74	97.01	69.57
Mwanza Production ('000'tons)			242.63	213.95	90.13	107.76	125.94
Mwanza Yield (tons/ha)			2.92	2.35	1.78	1.11	1.81

Source: Statistics Unit-Ministry of Agriculture, Food Security and Cooperatives *National Sample Census of Agriculture 2007/2008

Appendix 11: Sweet potatoes area ('000'ha), production ('000'tons) and yield (tons/ha) by region by District and year

Region	District	Data	2005/2006	2006/2007	2007/2008*	2008/2009	2009/2010
Shinyanga	Bariadi	Area ('000'ha)	11.32	102.05	11.24	24.73	16.06
		Production ('000'tons)	7.77	215.60	20.12	104.23	122.87
		Yield (tons/ha)	0.69	2.11	1.79	4.22	7.65
	Bukombe	Area ('000'ha)	31.31	99.97	3.41	27.77	53.09
		Production ('000'tons)	169.26	223.34	5.04	25.34	300.25
		Yield (tons/ha)	5.41	2.23	1.48	0.91	5.66
	Kahama	Area ('000'ha)	9.09	12.56	16.60	25.93	30.58
		Production ('000'tons)	46.72	24.44	50.49	40.60	70.28
		Yield (tons/ha)	5.14	1.95	3.04	1.57	2.30
	Kishapu	Area ('000'ha)	30.87	14.07	10.76	20.01	15.03
		Production ('000'tons)	163.14	32.78	13.63	8.95	9.02
		Yield (tons/ha)	5.29	2.33	1.27	0.45	0.60
	Maswa	Area ('000'ha)	20.92	56.95	9.27	44.52	11.79
		Production ('000'tons)	60.62	48.72	14.02	99.23	39.21
		Yield (tons/ha)	2.90	0.86	1.51	2.23	3.33
	Meatu	Area ('000'ha)	10.39	1.28	4.77	18.65	13.52
		Production ('000'tons)	15.03	1.26	8.05	7.79	17.99
		Yield (tons/ha)	1.45	0.98	1.69	0.42	1.33
	Shinyanga (Rural)	Area ('000'ha)	24.11	47.30	10.61	11.48	7.25
		Production ('000'tons)	78.60	71.42	16.62	29.96	24.12
		Yield (tons/ha)	3.26	1.51	1.57	2.61	3.33
	Shinyanga (Urban)	Area ('000'ha)	2.40	26.76	2.49	3.24	2.22
		Production ('000'tons)	4.67	61.63	8.91	2.26	5.63
		Yield (tons/ha)	1.95	2.30	3.58	0.70	2.54
Shinyanga Area ('000'ha)			140.41	360.96	69.14	176.33	149.53
Shinyanga Production ('000'tons)			545.80	679.18	136.90	318.37	589.37
Shinyanga Yield (tons/ha)			3.89	1.88	1.98	1.81	3.94

Source: Statistics Unit-Ministry of Agriculture, Food Security and Cooperatives *National Sample Census of Agriculture 2007/2008

Appendix 12: **World production of sweet potatoes (tons)**

	2006	2007	2008	2009	2010
Total World	106,641,705	100,943,340	104,578,294	102,323,748	106,569,572
Asia, including:	88,430,581	83,124,117	85,702,879	84,182,639	88,511,139
China	81,039,000	75,600,000	78,830,000	76,772,593	81,175,660
Indonesia	1,854,238	1,886,852	1,876,944	2,057,913	2,050,810
Vietnam	1,460,900	1,437,600	1,325,600	1,207,600	1,317,060
India	1,066,500	1,067,200	1,094,000	1,119,700	1,094,700
Japan	988,900	968,400	1,011,000	1,026,000	863,600
Philippines	566,773	573,734	572,655	560,516	541,525
Africa, including	14,712,718	14,098,182	15,275,678	14,353,091	14,213,680
Ouganda	2,628,000	2,602,000	2,707,000	2,766,000	2,838,800
Nigeria	3,462,000	2,432,000	3,318,000	2,746,817	2,838,000
Tanzania	1,396,400	1,322,000	1,379,000	1,381,120	1,400,000
Angola	684,756	949,104	819,772	982,588	986,563
Kenya	724,646	811,531	894,781	930,784	383,590
Madagascar	869,000	890,000	941,355	910,857	919,127
Mozambique	929,826	875,216	890,000	900,000	920,000
Rwanda	777,034	841,000	826,000	801,376	840,072
Ethiopia	388,814	388,814	526,487	450,763	401,600
Latin America, including:	1,961,714	2,104,017	2,057,497	2,162,830	1,966,398
Brazil	518,541	529,531	548,438	477,475	479,200
Cuba	303,000	414,000	375,000	437,000	384,700
North America, including:	744,046	819,741	836,662	883,207	1,081,720
United States	743,937	819,641	836,560	883,099	1,081,590
Oceania, including :	719,410	763,716	641,861	680,177	742,554
Papua New Guinea	560,000	580,000	485,181	534,085	576,000

Source: **FAOSTAT, Février 2012**

Appendix 13: Tanzania Food and Drugs Authority

Released on: 01st April, 2010

TANZANIA FOOD AND DRUGS AUTHORITY

TFDA
Tanzania Food & Drugs Authority

PUBLIC NOTICE

RENEWAL OF BUSINESS PERMIT FOR LOCAL FOOD PROCESSORS / MANUFACTURERS FOR THE YEAR 2010/2011

Tanzania Food and Drugs Authority (TFDA) would like to inform all Local Food Processors/Manufacturers whose premises are registered and having TFDA businness permit that with effect from financial year 2010/2011 (starting from 1st July 2010 – June 2011), all business permits will not be renewed unless for those Processors/Manufacturers whose products are registered by TFDA. However, the Authority would like to use this opportunity to inform its esteemed customers dealing with the mentioned above business to make sure that they send their applications for the registration of their food products before 30th May 2010.

All applications should be submitted to the Director General, Tanzania Food and Drugs Authority (TFDA) Headquarters, Off Mandela Road, Mabibo-External, Dar es Salaam; Or via TFDA Zonal Offices at Lake Zone Office, Nkurumah Street, Mwanza; Northern Zone Office, Opposite Sakina Abattoir, Arusha; Southern Highlands Zone Office, Regional Livestock Building Mbeya; Eastern Zone Office, TFDA Headquarters, Mabibo-External.

The Guidelines for application for registration of Prepackaged Food are available at TFDA webite (www.tfda.or.tz) and TFDA Headquarters, Mabibo-External.

Issued by:

**The Director General,
Tanzania Food and Drugs Authority (TFDA)
Off Mandela Road, Mabibo-External,
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