THE CONTRIBUTION OF CASSAVA VALUE ADDITION ON REDUCTION OF POVERTY FOR SMALLHOLDER FARMERS IN BAGAMOYO DISTRICT

BATULI JUMANNE NYANGASSA

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION

SOKOINE UNIVERSITY OF AGRICULTURE.

MOROGORO, TANZANIA.

2014

ABSTRACT

Cassava (*Manihot spp.*) has become an important crop in many parts of the world for processing into several human foods and industrial products. In poorer developing countries of the tropical and semi-tropical climate cassava has become a major source of revenue, contributing significantly to industrial development, food security and livelihoods. The objective of the study was to assess the contribution of cassava value addition on reduction of poverty for smallholder farmers. The study was conducted in Bagamoyo, 120 producers/farmers and 25 actors in the cassava production and value addition participated. Data collected was summarized using Statistical Package of Social Sciences (SPSS) and content analysis. Analysis of data shows that value addition was done by producers after flour making, grading cassava in size, sun dried cassava to reduce moisture content respectively. In general on farm value adding technologies became difficult because most of cassava producers/processors don't have cassava processing machines. Low on farm value adding technologies is a result of poor quality of value added cassava products. Three main marketing channels exist in the study area: Producers selling directly to consumers; producers to retailers to consumer; and producers to hawkers/village vendors to consumer. Also data showed that majority of producers /processors don't pack their products (flour) or use plastic bags instead of using paper bag. The sub-sector in general faces a number of structural and technological problems that need immediate attention to help smallholder farmers in reduction of poverty. The study revealed that value added cassava have more profit than raw cassava. The mean gross margin of value added cassava was 621 000 Tshs/ha while the mean gross margin of raw cassava was 275 000 Tshs/ha. The GM difference is 346 000 Tshs. This implies that value added is more profitable than raw cassava.

DECLARATION

I, Batuli Jumanne Nyangassa, 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.

Batuli Jumanne Nyangassa — Date: 11.4.2014

(MSc. Candidate)

The above declaration is confirmed

Professor Z. S. K. Mvena — Date: 11.04.2014

(Supervisor)

DEDICATION

To the Almighty God, the creator and giver of knowledge. To my parents the late Mr. Jumanne Mbuguni Nyangassa and my mother Mrs. Mwanaidi Omari who together laid the foundation of my education. To my beloved twin daughters Marianne and Catherine.

ACKNOWLEDGEMENTS

This study would not have been accomplished without the help and encouragement of many people, therefore acknowledgment is extended to the following individuals and organizations.

I wish to express my sincere acknowledgment to the Presidential Office and Civil Service for financial support that enabled me to carry out this study.

I owe my supervisor, Professor Z. S. K. Mvena of the Department of Agricultural Education and Extension for his tireless guidance, encouragement, constructive and patience throughout my study. I feel privileged to have had the opportunity to work under him.

I would also like to express my sincere thanks to farmers and leaders from Bagamoyo, Kongo, Yombo, Kerege, Kiwangwa, Msata and Kikaro villages for their heartily support in giving proper and complete information needed to organize and accomplish this study. Further thanks go to the Bagamoyo District Executive Officer, for granting me a study leave. I finally extend my hearty appreciation to all other individuals, organizations and institutions that have not been mentioned for their assistance in the course of accomplishing this study. ''God bless you all''

DEDICATION

To the Almighty God, the creator and giver of knowledge. To my parents the late Mr Jumanne Mbuguni Nyangassa and my mother Mrs Mwanaidi Omari who together laid the foundation of my education. To my beloved twin daughters Marianne and Catherine.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDENCES

LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
BCR	Benefit- Cost Ratio
BDALDO	Bagamoyo District Agriculture and Livestock Development Office
CAADP	Comprehensive Africa Agriculture Development Programme
CIAT	Centro Internacional de Agricultural tropical
CNp	Cyanogenic potential
COSCA	Collaborative Study of Cassava in Africa
DADP's	District Agricultural Development Programmes
DALDO	District Agricultural and Livestock Development Officer
DRC	Democratic Republic of Congo
FAO	Food and Agriculture Organization
GM	Gross Margin
GOK	Government of Kenya
HCL	Hydrogen Cyanide
HIV	Human Immunodeficiency Virus
HQCF	High Quality Cassava Flour
IFAD	International Funds for Agricultural Developments
IITA	International Institute of Tropical Agriculture
IRR	Internal Rate of Return
Kcal	Kilocalories
mm	Marketing Margin
MSG	Monosodium glutamate
NEPAD	New Partnership for Africa's Development
P	Price of the product
Q	Quantity of product

ROI	Return on Investment
SMEs	Small and Medium Enterprises
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Sciences
TR	Total Revenue
TVC	Total Variable Cost
URT	United Republic of Tanzania
VAEO	Village Agricultural Extension Officer
VEO	Village Extension Officer

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Cassava (*Manihot esculenta Crantz*) is an important food crop for developing countries, being the main source of energy for between 200 and 300 million people (Laswai *et al.*, 2006). It is a drought resistant crop grown mainly in dry areas and contributes significantly to the nutrition and livelihood of many farmers. It is also said to be more productive per unit of land and labour than even the high yielding cereals and the highest producer of carbohydrates (Nweke, 2003).

Cassava is the world's fourth most important staple crop after rice, wheat and maize and is an important component in the diet. Moreover, cassava plays an essential role for food security, especially in those regions prone to drought and with poor soils. The second most important utilization of cassava worldwide is feed. Cassava has also various industrial uses, particularly as starch for breweries, wood and textile industry (Van der Land *et al.*, 2007).

In some African countries, cassava is more and more perceived not only as a food security crop, but also as a raw material for various types of industries. In countries such as Nigeria, Ghana, Uganda, Angola, Mozambique, Tanzania, and Democratic Republic of Congo there are concerted efforts on cassava value addition being initiated, sometimes with strong political support at the highest level (Nang'ayo *et al.*, 2007). Cassava can be a powerful poverty fighter in Africa. Improvements in quality, processing, and product marketing could increase the value of cassava products by about 20 % (Akinpelu *et al.*, 2011). According to Nweke *et al.* (2002) Cassava performs five main

roles namely: famine reserve crop, food staple and cash crop for urban and rural consumption, industrial raw material, and earner of foreign exchange. Tanzania is one of the largest cassava producers in Africa. About 655 700 ha of land are under cassava with a total annual production of about 1 795 400 tons. Cassava is a staple food crop in most of the semi-arid and the frequently drought stricken areas (Mtambo, 2007). Cassava is grown in many parts of the country and the chief growing areas are Mtwara, Lindi, Mwanza and Tanga.

In Tanzania, cassava is an important subsistence food crop, although it is still considered by many as a famine reserve crop when cereals, especially maize, fail (Mtambo, 2007). Around 84 % of total cassava production in Tanzania is utilized as human food. The remaining fraction is used as livestock feed, starch making and export (Laswai *et al.*, 2006). Cassava contributes an average of 15% to the national food production basket and is second to maize, which is the leading staple food crop for many Tanzanians (Mtambo, 2007).

Poverty levels are high in Tanzania, and poverty reduction during the past decade occurred mainly in urban areas, while rural areas have seen relatively little change. Poverty levels are highest in rural areas, where 39.9 % of households fall below the basic needs poverty line according to the 2000/01 National Household Budget Survey (National Bureau of Statistics, 2002), making up about 81 % of the poor in Tanzania. The poverty profile further suggests that changes in agricultural production and farm gate prices have the potential to significantly impact poverty in Tanzania. Again (Akoroda, 2007) observed that diversification of cassava use promises high potentiality for wedging hunger, alleviating poverty as well as enhancing the livelihoods of many rural farm households. Alternative uses of cassava through value addition has resulted in emergence

of wide food recipes from cassava through processing which involves conversion of edible food into another form more acceptable or more convenient to the consumer.

Value addition in cassava can be done by making flour, drying cassava chips, decreasing sand contamination and particle size. Baked products such as bread, biscuits, cake, buns and non food products which are starch, charcoal binder which is a mixture of cassava and starch and biofuel as ethanol also are among the value added cassava products (Nwanko *et al.*, 2007).

This study sought to fill the knowledge gap and contribute to increased understanding of how individual cassava farmer's act in the value addition, price formation, their relationship with other actors and their respective farm returns at the micro level. The outcome of the knowledge can provide clues on how farmers can be helped to participate effectively and efficiently in upgrading cassava products and to enhance commercialization of cassava that offers significant potential for improving farmer's incomes, food security and reduce poverty in the rural areas.

1.2 Problem Statement and Justification

Processing is important for the marketing of cassava, and reduces the bulk, extends shelf life thereby reducing transportation cost. Fresh cassava roots have low value per unit weight; whereas processing adds value to it and therefore increases the market value. Fresh roots of some cassava cultivars contain cyanogens which are reduced or eliminated through processing. Cassava is the main staple food crop in Bagamoyo District. Cassava is being promoted as food security crop, because it is a famine crop, or last resort crop. It is high yielding and it has ability to tolerate highly unfavorable environmental conditions. Currently, data shows that only 40 % of cassava is processed to add value in the district (BDALDO, 2011).

There is limited utilization of cassava due to the low level of processing and lack of alternative convenient products. Inadequate awareness on appropriate processing knowledge and entrepreneurship. Emphasis to preferred cassava value added products was mainly noted as a reason for the declining cassava utilization trend. A crop can be preferred for food if it is available in a form which a consumer finds convenient to prepare into food. The major product (flour) is not a convenient food product and it is not attractive to urban consumers, due to poor processing and packaging. In many cassava growing areas, including Bagamoyo District in Tanzania, there are efforts being done to add value to cassava using appropriate cassava value adding technologies. Yet, to the best of author's knowledge very little is known on how the cassava value adding contributes to poverty reduction among smallholder farmer's households. Therefore if cassava is to find a niche in the urban supply system it is imperative to transform it into a durable and ready to use form.

The aim of this research, therefore, is to inform the development of more effective strategies for improving cassava value addition activities in the study areas, cassava on farm value adding technologies, the profitability of value addition in cassava production and the contribution of value added cassava to the livelihood. Also the findings will help advise policy makers to facilitate government and private sectors to put much consideration in planning and implementing processing unit of cassava at least one in each ward where cassava production is an important economic activity, so as to increase peoples income to attain the objective of national strategies for growth and reduction of poverty Millennium Goal of poverty reduction by 2015 and Tanzania Development Vision, 2025.

1.3 Significance of the Study

The study was significant as would help to understand how value added cassava can play an important role in food security as well as a source of income to the people. The study intended to provide a way forward for formulating future strategies for addressing the different activities such as chipping, grinding, grating, sieving which related to the improvement of cassava value addition in the study area. The study will contribute towards the information base urgently needed to fill the knowledge gap relates to lack of appropriate processing technologies for adding value to cassava. Also farmers to organize themselves to find reliable and profitable market for their processed cassava products, hence improve their livelihood.

1.4 Objectives of the Study

1.4.1 Overall objective

The overall objective of this study was to establish the contribution of cassava value addition on reduction of poverty for smallholder farmers in Bagamoyo District.

1.4.2 Specific objectives

i. To identify cassava value addition activities in the study areas.
ii. To identify cassava on farm value adding technologies.
iii. To determine the profitability of value addition in cassava production.
iv. To assess the contribution of value added cassava (product) to the livelihood.

1.4.3 Research questions

The study was guided by the following research questions:

i. What are the major cassava value addition activities in the study area?
ii. What are the main cassavas on farm value adding technologies?

iii. How efficient is the cassava value addition in terms of profit received by different actors along the value addition stages?

iv. What are the contributions of value added cassava (product) to the house hold livelihood?

1.5 Conceptual Framework

In order to assess contribution of cassava value addition on reduction of poverty for smallholder farmers, contextual factors, dependent and independent variables interact as shown in (Fig. 1). The main dependent variable in this study was the contribution of cassava value addition on reduction of poverty for smallholder farmers, independent variables were machinery such as cassava chippers, cassava millers, cassava grinders, while contextual factors were Bagamoyo District technological, social and political environment. Socio factors were age, sex, marital status and education level of respondent. Value addition activities were the indicator of poverty reduction to smallholder farmers (Fig.1).

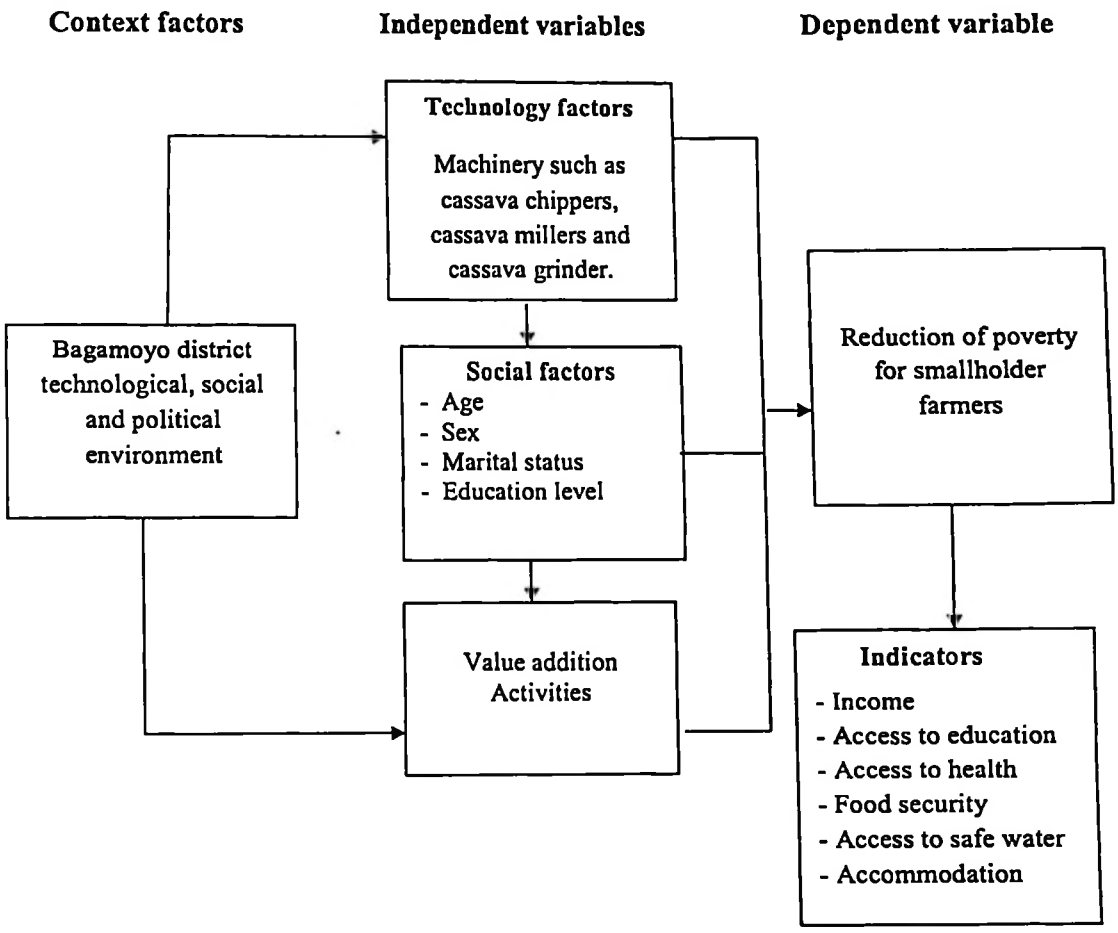

Figure 1: Conceptual framework of this study

CHAPTER TWO

2 0 LITERATURE REVIEW

2.1 Importance of Cassava to Livelihoods

Cassava is one of the most important food crops of Africa. It is consumed in different traditional dishes varying from country to country and across communities in a country (Adebayo *et al.*, 2009). Cassava can be produced with family labour, land, hand hoe and machete, making it an attractive and low-risk crop for poor farmers (Kawano, 2003). reported that cassava grows well on marginally fertile soils. Its edible tuberous roots can be left unharnessed in the ground up to four years depending on cassava species or variety, which makes it an ideal reserve crop for consumption or for sale to meet unforeseen household expenses.

Cassava provides increased income for farming households; increased employment opportunities; potential to target development benefits to women; potential lower food prices for consumers; competitively priced raw materials and more convenience e.g. improved traditional products.

According to Kaganzi *et al.* (2006) cassava is a vital food security crop because it is reliable, producing life sustaining yields when unfavorable climatic conditions cause cereals and pulse crop failure. He further reported that cassava produces more food energy per unit cultivated land than any other staple crop in Sub-Saharan Africa, and it provides cheap sources of carbohydrate for urban residents, whose numbers are on increase every year.

It is estimated that more than 500 million people around the world obtain 100 Kcal per day from cassava. Of which 70 million people in Africa consume more than 500 Kcal per day from cassava (Kawano, 2003). Cassava is available to low-income rural households in the form of simple food products (for example, dried roots and leaves) which are significantly cheaper than grains such as rice, maize and wheat.

Focusing on high quality cassava flour (HQCF) are that value can be added at the rural household level by processing of the intermediate product (cassava grits or wet paste), thereby increasing incomes for farmers; the requirements for capital investment is lower and less environmental damage is caused than starch manufacture (Adebayo *et al.*, 2009). However, cassava has been neglected for numerous reasons by researchers, African policy-makers and by most donor and international agencies (Nweke *et al.*, 2002).

Cassava is being promoted as food and cash crop in the study area because is cultivated and did well almost in all part of the district, although there is lack of supply coordination between farmers in order to meet continuous market demand. Bulkiness and perish ability affects post-harvest system of cassava as it has a shelf-life of little more than three days after harvesting. Hence is both desirable and necessary to process cassava into storable products. In other words value addition is necessary if farmers are to enjoy higher benefits from the crop. Cassava is mainly boiled or roasted and very little attempt has been done to make flour or crisps. Many farmers, processors, traders are not aware of the many value addition possibilities of cassava in the study area.

2.2 Cassava Production and Consumption

2.2.1 Global perspective

Cassava is a perishable commodity with a shelf life of less than three days after harvest. Processing provides a means of producing shelf stable products (thereby reducing losses), adding value at a local rural level and reducing the bulk to be marketed (Phillips *et al.*, 2004).

Worldwide, cassava is planted on about 16 million hectares, with 50 % in Africa, 30 %in Asia, and 20 % in Latin America. Total root production is around 152 million tons (Lundy *et al.,* 2006). According to FAO (2000), almost 70 % of the world's cassava production are concentrated in five countries namely Nigeria, Brazil, Thailand, Indonesia and the Congo Democratic Republic. World cassava production increased from 1984 to 1994 at a rate of 2.2 % a year, the same as in the previous decade, reaching 164 million tons in 1997.That increase relied mostly on an area expansion (1.8 % a year) while the contribution from yield increases was small (0.4 % a year). Nigeria with an output of 38 179 000 tons is the world's leading producer of the crop, followed by Brazil and then Indonesia (FAO, 2000).

Worldwide cassava is mostly used for human consumption, while in some areas particularly, in Asia and Latin America it is used commercially for the production of animal feed and the starch based–based products (IITA, 2004). Cassava is also applicable in many industrial uses to produce different types of products such as food, confectionary, sweeteners, glues, plywood, textiles, paper, biodegradable products, monosodium glutamate and drugs (www.cassavabiz.com Site visited on 15/5/2013).

Sub-Saharan Africa is expected to experience the most rapid growth in food demand in root and tubers averaging 2.6 % per year through 2020 (Scott *et al.*, 2000). This growth will account for nearly 122 million metric tons with most of the increase coming largely from cassava, 80 million metric tons (66 % of the total). Cassava demand is estimated to grow at 2.0 % annually for food and 1.6% per year for feed for developing countries with the right policies and incentives. Moreover, with the increasing establishment of starch–utilizing industries in developing countries, the production of starch will simply have to increase beyond the projected figures as shown in Table 1 (Scott *et al.*, 2000).

Table 1: Cassava production and use in 1993, and projected to 2020

Country/region	Area (million ha)		Yield (mt/ha)		Production (million mt)		Total use (million mt)	
	1993	2020	1993	2020	1993	2020	1993	2020
Sub-Saharan Africa	11.9	15.9	7.4	10.6	87.8	168.6	87.7	168.1
Latin America	2.7	2.7	11.3	15.6	30.3	41.7	30.3	42.9
Southeast Asia	3.5	3.5	12.1	13.7	42.0	48.2	18.9	24.4
India	0.2	0.2	23.6	28.4	5.8	7.0	5.7	7.3
Other South Asia	0.1	0.1	9.4	13.5	0.8	1.3	0.9	1.4
China	0.3	0.3	15.1	20.2	4.8	6.5	5.1	6.4
Other East Asia	na	na	na	na	na	na	1.8	1.9
Developing	18.8	22.9	9.2	12.0	172.4	274.7	152.0	254.6
Developed	...	...	12.1	14.7	0.4	0.4	20.7	20.5
World	18.8	22.9	9.2	12.0	172.7	275.1	172.7	275.1

Source: Scott *et al.* 2000.

2.2.2 Cassava production and consumption in Africa

Cassava is one of the most important food crops of Africa. Its high resilience and adaptability to a wide range of ecological conditions has sustained its production through many generations in sub-Saharan Africa (Adebayo *et al.*, 2009). Over 50 % of the current global cassava production is in Africa although the crop is cultivated in 39 countries, stretching through a wide belt from Madagascar in the Southeast to Senegal and to Cape Verde in the Northwest. Nearly 70 % of the region's output is harvested in Nigeria, the

Congo Democratic Republic, Ghana and Tanzania (FAO, 2000). Cassava yields vary from a high 18.5 tons per hectare in Cameroon to a low 5.3 ton/ha in Angola.

At the region level, they averaged 8.2 ton/ha in 1994, little changed from the 7.3 tons/ha in 1984 (Vander land *et al.*, 2007). Although cassava is a basic staple for diet in the main producing countries, also is used as an important source of cash incomes, as farmers sell a sizeable share of their output. In other parts of the region it is cultivated for security in case of failure of the other basic crops and is often harvested as needed, since farmers take advantage of the root aptitude to keep stored underground for up to 24 months (Vander land *et al.*, 2007). Cassava is consumed in different traditional dishes varying from country to country and across communities in a country (Adebayo, 2006). According to Nweke *et al.* (2002), cassava plays five important roles in African development: famine-reserve crop, rural staple food, cash crop for both rural and urban households and to a minor extent, raw material for feed and chemical industries.

2.2.3 Cassava production and consumption in Tanzania

Tanzania is self sufficient in terms of cassava. According to Van de land *et al.* (2007) Tanzania is among the largest producers of cassava in the world and the fourth largest producer in Africa after Nigeria, Democratic Republic of Congo and Ghana. Van der Land and Uliwa (2007) documented that Tanzania produces about 6.8 million tons of cassava annually, which is 5.5 % and 14 % of world's and Africa's cassava production respectively. Cassava is cultivated and produced in all regions of Tanzania, the main producing areas are: Mwanza, Lindi, Shinyanga, Tanga, Ruvuma, Mara, Kigoma, Coast, regions and most regions in Zanzibar (Van der land *et al.*, 2007). The production of cassava within the context of farming systems and trade flows offers varying forms of employment to over 60 % of the rural population. It is relatively high prominence in

production because of ability to grow on poor/marginal soils and good yield has given it attention as being able to provide basic food in regions where people might otherwise starve or perish (Kalu, 2003).

The average acreage of cassava fields ranges from 1.5 to 2.4 acres per household with variation from place to place. The main farm implement used by smallholder farmers for cultivating cassava is the hand hoe. According to Oluwasola (2010) major constraints to smallholder agriculture are the paucity of affordable and environmentally appropriate technology. The paucity of appropriate technology makes the smallholder farmers to depend mainly on natural systems for sustenance.

The average yield of cassava in Tanzania is 2.0 metric ton per hectare on dry weight basis, and contributed 12 % of the average daily intake per person in Tanzania while maize contributed 23 % (Nweke *et al.*, 1998). It is thus a widely held belief that "there is no famine where cassava is grown" cassava is simply a "food security" crop (Kalu, 2003).

In Tanzania, processing of cassava for value adding has centered mainly on production of fermented and non-fermented flours for making porridge. Such flours could be blended with cereal flours to improve acceptability of the cassava-based porridges (Laswai *et al.*, 2006). Exact proportions of these blends have not been fully established. Cassava has also been used in baked products (e.g. bread) and fried products like doughnuts, buns and *chapati* (a pan fried unleavened flat round wheat-based product), although not to the extent of the stiff porridges. Another area of utilization of cassava is in the starch industry for food and non-food uses. This product can be obtained from the fresh dried cassava The easiest form of extraction of this cassava starch is from the fresh cassava using graters to grate the cassava into a fine paste (Laswai *et al.*, 2006).

The Government of Tanzania has long been advised to encourage production and local consumption of cassava, organize the marketing of cassava and promote cassava drying and the milling industry for export (Silayo *et al.*, 2001).

2.2.4 Cassava production in the study area

Bagamoyo District depends on agriculture as the mainstay of its economy. Cassava plays an important role in food security as well as a source of income to people who cultivate process and market it in rural and urban areas. Cassava leaves are good source of protein, minerals and vitamins; also a source of cash to producers who sell leaves (BDALDO, 2008). Production of cassava crop in Bagamoyo District is very low with average annual yields ranging between 6 to 10 tons per ha.

2.3 Cassava as Staple and Food Security Crop

Cassava is a staple food for people in Angola, Benin, the Democratic Republic of Congo (DRC). Ghana, Malawi, Mozambique, Uganda and Tanzania to mention just a few. Unpredictable weather conditions and high cost of farm inputs have forced many African governments to earmark cassava as the most suitable alternative food crop (Babalaye, 2007). Cassava is food security crop and supplies daily calories for more than 200 million people in sub–Saharan Africa. According to Government of Kenya (2004) one major hindrance to achieving food security is low level of value addition especially through agro-processing which can impact on food security by reducing food losses, increasing food availability and improving access to food.

Composition of the cassava root

The root consists of the peel and the flesh. The peel comprises 10-20 % of the roots. Of this, the cork layer represents 0.5- 2.0 % of the total root weight (Babaleye, 2007).

The edible fleshy portion constitutes 80-90 % of the roots .The roots flesh is composed of about 62 % water, 35 % carbohydrates, 0.5-1.5 % protein, 0.3 % fat, 1-2 % fiber, and 1 % mineral matter (Babaleye, 2007). Most of the carbohydrate fraction is starch, which makes up 20-25 % of the roots flesh. Among the minerals in the roots, phosphorus and iron predominate. There is small amount of calcium. It is relatively rich in vitamin C (35 mg per 100g fresh weight), and contains traces of niacin and vitamin A, B1 and B2, but the amount of thiamine and riboflavin are negligible (Babaleye, 2007).

Cassava root is a poor source of protein as shown in Table 2 the quality of cassava root protein is however, fairly good as far as the proportion of essential amino acids as a percentage of total nitrogen concerned. Methionine, cysteine and cystine are however limiting amino acids in the root. Only about 60 % of the total nitrogen is derived from amino acids and about one percent of it is in the form of nitrates, nitrites and hydrocyanic acid. The remaining 38-40 % of the total nitrogen remains unidentified (Tewe, 2004).

Table 2: Nutrients in cassava compared with other food products

	Calories Per 100g	Protein	Fat	Carbohydrates Percent	Ash	Moisture	Fibre
Cassava roots	127	0.8-1.0	0.2-0.5	32	0.3-0.5	65	0.8
Cassava flour	307	0.5-0.7	0.2	85	0.3	15	0.5
Potatoes	89	2.1	0.1	20	1.0	77	0.7
Potato Flour	331	-	0.3	82	0.3	15	0.4
Husked rice	347	8.0	2.5	73	1.5	15	0.7-1.0

Source: FAO (2000)

Raw cassava roots are an excellent source of calories compared to potatoes and also it has more carbohydrate compared to potatoes and husked rice they have less protein and moisture compared to potatoes. Also cassava flour is an excellent source of calories compared to cassava roots. The cyanogenic content of fresh roots is not a serious problem in cassava flour production, since it is almost entirely eliminated during flour processing.

2.4 Cassava Value Addition

Cassava value addition refers to those agro-industrial activities which are related to the transformation of the root crop with a view to modifying its physical, chemical and rheological characteristics thereby enhancing its value (Onabolu, 2001). According to (Kaplinsky *et al.*, 2001).Value addition facilitates transportability of processed products, reduces perish ability and toxicity, enhance edibility and nutritive quality, stabilizes the product for storage and guarantee higher prices for farmers (Onabolu, 2001). With Nigeria currently the largest producer of cassava, producing over 43million metric tons annually (FAO 2009), the cassava transformation coming up in Nigeria will largely depend upon processing and finding additional markets for increased production. In Nigeria, cassava has been processed into food products mainly gari, lafun, "foufou". However, an emerging market with tremendous capacity exists in animal feed, textiles, pharmaceuticals, confectioneries etc where high value cassava products like starch, high quality cassava flour (HQCF) and chips would be demanded (FAO, 2009).

The challenge to value addition and commercialization of cassava is to meet the quality requirements of elite consumers of food products, as well as the limitless opportunities that exist for utilization of processed products by industries and the international market. Nweke *et al.* (2002) identified two broad methods of cassava processing, traditional and mechanized processing. He reported that both methods had constraints including compromised product quality, reduced efficiency in labour and cost of production, and occupational\health hazards due to exposure of processors to physical and mechanical factors. Ayoade and Adeola (2009) noted that the major constraints to domestic industrialization of cassava were high cost of processing and lack of financial assistance to processors.

Interest in value-added commodities has grown over recent years with farmers, traders and small agro processors working towards the adoption of mechanized technologies in an effort to earn higher returns (FAO, 2007b). Smallholder agriculture is associated with a lack of value addition in agricultural products with little agro-processing and with most smallholders selling raw agricultural produce without adding value. Consequently, the manufacture of cassava-based industrial products may be of interest as a potential way of boosting the economic value of the crop. Producing a valuable, nutritional and safe food from cassava involves certain challenges. Cassava has poor protein content (1% fresh root weight) and contains cyanogenic glucosides that may cause intoxication (Tivana, 2012). Cassava transformation has arguably proven to be the most poverty fighter to date. Value addition is also often synonymous with investments in high-value processing, however significant value can be added to raw produce without changing the physical form of the product by introducing activities including for instance, cleaning, grading or labeling (FAO, 2012 a).

Alternative uses of cassava through value addition has resulted in emergence of wide food recipes from cassava through processing which involves conversion of edible food into another form more acceptable or more convenient to the consumer (Ekwe *et al.*, 2008). Some value added products from cassava include cassava flour, cassava starch, cassava bread, cassava chips, cassava flakes, cassava odorless *"foufou"* cassava doughnut, cassava cake, cassava biscuit and cassava salad cream (Nwakor *et al.*, 2007). The value addition technology in cassava possesses enormous potential for increasing cassava consumption, diversifying its uses as well as using the same to enhance livelihoods of farm families through providing opportunities for employment; micro agro enterprises development income and boosting economy of rural households (Nwakor *et al.*, 2007).

2.5 Cassava Processing

Cassava is amenable to various processing forms (IITA, 2007). The concept" cassava processing "entails the special treatment of the cassava root before it is consumed to make it last longer (Ukpongson *et al.*, 2011).When cassava is processed, value has been added to the produce. Cassava processing could be manually done or could be mechanized. (Ukpongson, *et al.*, 2011) The manually prepared ones do not require sophisticated equipment.

According to researcher knowledge, the crop has the tendency to have reduced quality if not processed soon after harvesting. It is bulky, and this single characteristic also has implications for physical handling in terms of haulage, that is, transportation cost, storage space and risk. So that processing of the crop is important to add value and increase shelf life.

Raw cassava roots and uncooked leaves are not palatable; they also contain varying amounts of cyanide which is toxic to man and animals. (Hahn, 2007) Cassava is susceptible to physiological deterioration after the roots are harvested, this means that harvested roots greater than 48 hours old have little market value and limits the range over which fresh roots can be marketed Westby (2008). Fresh cassava contains cyanogenic glucosides, if cassava is inadequately processed this creates a potential health hazard. Cassava processing is important because it focuses on the reduction of the cyanogenic glycoside in the fermentation process and the fortification of the nutrition value of cassava for human consumption (Westby, 2008). This applies to fresh cassava root because it contains between 62–65 percent water and starts deterioration within two days after harvest. Cassava processing methods include a combination of several procedures that are performed during specific time periods and in specific sequence.

Due to their bulkiness and high moisture content (70%), transportation of the roots to urban markets is difficult and expensive. Consequently, cassava must be processed to increase the shelf life of the products, facilitate transportation and marketing, reduce cyanide content and improve palatability. Processing of cassava helps to reduce postharvest losses and stabilizes seasonal fluctuations in the supply of the crop (Hahn, 2007). So, it is very important for the farmer to be equipped with modern technology in production and processing, packaging of the value added products. This includes planning and control systems, such as finance, accounting, and corporate strategies (Hahn, 2007).

Processing is important in order to add value to the cassava. Processing is carried out;

i) Reduce water content in the roots to convert them into products that are more stable, easier to transport, and more marketable.

ii) Eliminate or reduce gynogenic glycosides content

iii) Improve the flavor of the cassava product

iv) Create an opportunity for farm surpluses to receive aggregate value and thus enter alternative market.

The quality of the traditionally processed products is generally poor and result in poor market value. Better processing methods can improve the wellbeing and health of the rural population through processing efficiency and labor saving (www.sesrtcic.org. site visited 8/5/2013). Processing using low-cost machinery and processes for producing high quality intermediate products under small-scale rural conditions would be encouraged on-farm or as near the farm as possible to reduce transportation costs (Van der Land, 2007). Storage and packaging technologies to extend product shelf life will contribute to increasing reliability of supply, stabilize prices and facilitate trade.

2.7 Traditional Cassava Processing

In Tanzania, traditional cassava processing is common where is various techniques are used to produce different processed products differing from one place to another depending on the intended use of end product (Mkamilo *et al.*, 2005). On average, 75 % of the total cassava produced in Tanzania is processed and only 25 % is used in fresh form (COSCA Tanzania, 1996). The proportion of total cassava processed is higher among farmers who grow bitter cassava than sweet varieties (Mlingi, 1995). The methods employed are simple ones and are not efficient in removing cyanogens to safe levels. The processing methods involve combination of activities, which are performed in stages. Such activities are peeling, crushing, milling, slicing or granting, water expressing by pressing, decanting, sun or smoke-drying, or fraying, fermenting by soaking with water, heaping, stacking or sedimentation, sieving and cooking or steaming (Nweke *at el.*,1998).

2.7.1 Peeling

The first step in processing cassava roots is often to remove the peel. This results in a reduction of the cyanogenic potential of the raw material because the peel represents about 15 % of the weight of the root, and its cyanogenic contents are usually 5 to 10 times greater than that of the root parenchyma. However, the peel also contains large amount of the enzyme linamarase which is important in the detoxification of the cassava during processing (Adebayo *et al.*, 2008). Peeling is done with a sharp knife, peeling during dry season is more difficult because the skin adheres more strongly to the dry flesh of the roots and loss of the dry matter is high.

2.7.2 Soaking

It is a primary step in processing of roots, since it removes bitterness, improves flavor and softens the roots for subsequent grinding or pounding. Of these factors, removal of

bitterness is regarded as the most important .The process is affected by prevailing weather conditions, longer soaking being required in the cold season 7 to 10 days compared to the warm season 2 to 3days (FAO, 2009).

2.7.3 Drying

Traditionally, cassava is dried by spreading whole, sliced or pounded roots in the sun although during rainy season or period of cold weather, the cassava may be dried over a fire (Adebayo, 2006). To produce good quality chips, the roots must be sliced and dried as quickly as possible after harvest. The chips should be turned periodically in the drying period, usually two or three sunny days, until the moisture content reaches 13–15 %. The chips are considered dry when they are easily broken but too hard to be crumbled by hand. The thickness of the slices also has an effect on the quality of chips. Thick slices may appear dry on the surface when their internal moisture content is still high.

2.7.4 Grinding

Traditionally, in rural areas, cassava is pounded using a pestle and mortar to produce flour (FAO, 1997). This is common method used to prepared flour for home consumption.

2.7.5 Cassava granting

Fresh cassava roots are grated, pressed or squeezed to remove excess water and then dried a day (Guzman, 2004).

2.7.6 Fermentation

In Nigeria and Ghana, fermentation by soaking in water for two to five days is the most common method of preparing dried cassava roots. Only recently mechanized graters have also been employed in preparing dried cassava root flour which saves time and labour (Guzman, 2004).

Table 3: Most important cassava processing methods for food

Method	Countries of use	Estimate CNp removal (%)	Sources
Boiling of fresh roots	All country that use cassava as food	25-65	Cardoso *et al.* (2005)
Sun drying after chipping	Mostly African country	65-75	Mlingi *etal.*, (1994)
Soaking in water (fermentation)/sun drying	Malawi, Tanzania, Zambia, Uganda, Democratic Republic of Congo	97-98	Cardoso *et al.* (2005)
Heap fermentation/ sun drying	Uganda, Tanzania, Mozambique	83-95	Zvauya *et al.* (2002)
Grating/ferment-ation/roasting	West African countries, Mozambique	97-98	Cardoso *et al.* (2005)

Cyanogenic potential (CNp) is defined as the concentration of cyanogenic glycosides and their break down products (cyanohydrins and hydrogen cyanide)

2.8 Mechanized Processing

Through various interventions, by creating viable and sustainable opportunities for HQCF processing as a means of self-employment, income generation and wealth creation to reduce household poverty, for improved quality of life, there are three common types of mechanized cassava processing machines in use in Africa: graters, pressers and mills.

2.8.1 Mechanized grater

The traditional method of grating cassava was by pounding it in a mortar with a pestle. Later, artisans developed a manual grater in the form of a sheet of perforated metal mounted onto a flat piece of wood (Nweke, 2003). The mechanized graters were first introduced to the Republic of Benin by the French in the 1930s and later modified in Nigeria in the 1940s by welders and mechanics using local materials such as old automobile motor and scrap metal. Village entrepreneurs, who provide a grating service to farmers, own the mechanized graters. The mechanized grater operators allow the

farmers flexibility in terms of working time and quantity of cassava grated. The fee charged is a small fraction of the cost of grating by hand (Nweke, 2003).

2.8.2 Mechanized presser

Since cassava has high water content (70 percent), various methods have been developed to extract the water during processing. Traditionally, effluent is drained from grated cassava mash by putting it in a basket, covering it with leaves and placing a heavy object such as stone on top of it for three to five days (Nweke, 2003). Fermentation takes place at the same time. Nowadays, most commercial *gari* makers in Nigeria. Gari is a dry granular meal made from moist and fermented cassava is most commonly used in West Africa. Other forms of processed cassava consumption include a sun dried cassava known as "*foufou*". Other common flour from dried roots of chunks of roots, and consumed as flour product commonly named *attieke* and *chickwangue*, *attieke* makers in Côte d'Ivoire use a screw jack to extract the effluent(Cortes *et al.*, 2002). The mechanized presser is a simple hand-operated machine, which is made from wooden plates and a used automobile jack, both of which are available in villages (Nweke, 2003).

2.8.3 Mechanized mill

The traditional method of preparing cassava flour from dried cassava roots is to pound the roots in mortar with a pestle. Today, mechanized mills are common place in the urban centers in the six Collaborative Study of Cassava in Africa (COSCA) study countries. The mills were also observed in several COSCA villages in Ghana, Nigeria and Uganda but in only a small percentage of the COSCA villages in the Congo, Côte d'Ivoire and Tanzania (Nweke, 2003). The components of the mechanized mill are also fabricated locally from scrap materials.

2.9 The Value Addition Concept

Amanor-Boadu (2002) applied the concept of value addition to agriculture indicating that value-added agriculture occurs whenever a change in the physical state or form of an agricultural product or the adoption of a production method or handling process leads to an enhancement in the customer base for the product and a greater portion the consumer's expenditure spent on the product accruing to the producer. According to Ja'afar-Furo *et al.* (2011). The concept of value addition in agriculture in the developing economies is widely becoming an acceptable strategy adopted by both government and non-governmental organizations towards improving the income generation of the rural communities.

Boland (2009) explained value-added agriculture to mean the process of increasing the economic value and consumer appeal of an agricultural commodity. It is an alternative production and marketing strategy requiring the understanding of food safety issues taking cognizance of the consumer preferences. Similar opinion expressed by Cowan (2002) simply puts value-added agriculture as a phrase that expresses the difference between the value of agricultural goods sold and the cost of inputs used in producing them.

The presence of high level of hydrogen cyanide (HCN) in roots of bitter cassava makes processing indispensable before cassava can be consumed by human being. Furthermore, processing operation in cassava has essentially created array of opportunities for enhancing the worth, quality and usefulness of primary products of cassava. Thus, the processes of enhancing cassava's worth, quality and usefulness are called value addition. Hence through processing and diversification of uses cassava can be transferred into wide range of food forms in order to increase its consumption, increase the shelf life of the

products, improve product palatability enhance market value, reduce post harvest losses, facilitate transportation and provide raw materials to cassava based agro industries (IITA, 2007).

2.10 Uses of Cassava

More than two-thirds of the total production of cassava is used as food for humans, with lesser amounts being used for animal feed (Nwakor *et al.*, 2002) and industrial purposes. The future demand for fresh cassava may depend on improved storage methods, but the markets for cassava as a substitute for cereal flours in bakery products and as energy source in animal feed rations are likely to expand.

2.10.1 Human food

Cassava is the basic staple crop for 500 million people in tropical and sub-tropical parts of the world and one of the most reliable and cheapest sources of food (IFAD and FAO, 2000). World consumption of cassava for food (fresh or processed) is concentrated in the developing world. In Africa, about 70 % of cassava production is used as food (Cortes *et al.*, 2002) in the early 200s 95 % of the total cassava production after accounting for waste was used as food in Africa. By contrast 55 % of total production in Asia and 40 % in South America are used as food.

Both cassava roots and leaves are suitable for human consumption. The first are an important source of carbohydrates and the second, of proteins and minerals (IFAD, FAO 2000). Cassava is used in a large variety of dishes. There are five common groups of cassava food products marketed by farmers and food processors in Africa, fresh roots, dried roots, pasty products, a granulated product and cassava leaves (Nweke, 2003). Dried cassava roots are also stored or marketed as chips and flour. If it is properly

processed and marketed, cassava can become a good source of balanced diet protecting millions of African children against malnutrition and a good income generator for millions of people in rural areas in many African countries.

In America, cassava replaced abaci (a large herbaceous Asian plant of the banana family) daily sources of dietary energy. Cassava roots are processed into a wide variety of granules pastes, flours, .etc. or consumed freshly boiled or raw. In most of the cassava growing countries in Africa, the leaves are also consumed as a green vegetable, which provides proteins and vitamins A and B (IITA, 2007).

2.10.2 Animal feed

Of total production of 87 million tons annually in Africa, only six percent is used in livestock production mainly in traditional systems. (IFAD and FAO, 2000) By contrast, in Latin America, 32.4 % of its cassava is used for livestock feeding while in Asia, over 40 % of its products are exported in the form of chips and pellets for the Europeans Union livestock industry with another 2.9 % used for domestic livestock production (IFAD and FAO, 2000).

2.10.3 Medicinal uses

Cassava has many folk medicine uses in tropical and sub-tropical countries, where it has been a staple food for millions of people. Leaves and roots have been a folk remedy for tumors and cancers, which may be due to the vitamin B_{17} content, also known as laetrile (Badrie and Mellowe, 2007). It has been reported that cassava may have anti-cancer properties. Genes isolated from the plants have already been used to eradicate brain tumors in laboratory rats. The killer-suicide system linamarase/linamarin (lis/lin) uses the plant gene linamarase to convert the cyanogenic glucoside substrate, linamarin into

glucose and cyanide. This mechanism does not preferentially kill toxic metabolite producer cells compared to the bystander cells, thus allowing production of sufficient cyanide to cause tumor regression. Glucose and Cyanide can diffuse across the membrane (Cortes *et al.*, 2002).

2.10.4 Industrial starch

Cassava is also an important raw material in starch production. Starch from different cereals and tubers including cassava, is widely used in the food industries (Cock, 2001). Starch can be used in the form of cooked starch foods, e.g. custard. It can be used as a thickener in soups, baby foods and sauces due to its paste formation properties. According to Akoroda (2007) the use of starch as the filler material contributes to solid content of soup and ice cream. Starch can also be used as a binder especially in sausages and processed meats. This helps to consolidate the mass and stops it from drying out during cooking. Due to its high water- holding capacity, starch can be used as stabilizer especially in ice cream. Starch is also used in the manufacture of candies, boiled sweets, gums and pastes.

Also it is sprinkled on sweets to prevent them from sticking together. In addition starch is widely used in the manufacture of monosodium glutamate (MSG) in Far East and Latin American countries. On fermentation by yeast, starch produces alcohol because cassava contains 30% starch and 5% sugar. When dried, the roots have an approximately 80 % fermentable substances. Roots are washed, crushed into thin pulps and screened. For alcohol production, suphuric acid is added to the pulp to allow saccharification. When total reducing sugars reach 15-17 % of the content, fermentation by yeast is allowed to take place for about three to four days. Sodium carbonate is used to adjust the soil pH. Distillation is carried out to separate the alcohol. A ton of cassava can produce

between 70-110 litres of absolute alcohol. This alcohol is mainly used for industrial purposes such as in cosmetics and solvents (Cock, 2001).

2.11 Marketing for Cassava

Marketing is a social process by which individuals and group obtain what they need and what through creating and exchanging products and value with others (Akoroda, 2007). Marketing is the process whereby society supplies its consumption needs, evolves distributive systems composed of participants who are interacting under constraints technical (economic) and ethical (social) creating the transaction or flows which resolve market separations resulting to exchange and consumption marketing (Akoroda, 2007). Usually cassava is marketed as fresh which makes its demand relatively inelastic and seasonal.

Cassava has played various important roles in Africa development according to the stage of the cassava transformation in particular country (Nweke, 2003). For example, these include the role of cassava as famine reserve crop, rural food staple ,cash crop and urban food staple ,industrial raw material and livestock feed .Currently, the first three roles are dominant in all cassava producing countries in Africa. Yet, high cost, poor infrastructure, lack of access to market and the low quality output due to inefficient processing method are the main factors which are still limiting the ability of the Africans cassava to compete for industrial and livestock feed industries (Nweke, 2003).

2.12 Poverty Reduction

2.12.1 Poverty

Poverty is a broad phenomenon. However; researchers have attempted to describe using monetary and non monetary measures of welfare. The terminology 'poor' and 'poverty'

have been described as a monolithic group and issue (World Bank, 2002). Section on poverty profile still differentiates between subgroups of poor as rural, urban, women or minorities. Poverty may be defined as a state of deprivation of decent life that results from many mutually reinforcing factors, including lack of productive resources to generate wealth, illiteracy, prevalence of diseases, discriminative social –economic and political systems and natural calamities such as drought, floods, HIV/AIDS and wars (URT, 2005). Poverty also conceptualized as a standard of living where by one lives below a minimum acceptable level.

2.12.2 Value adding as poverty reduction tool

The increasing urbanization and consumer demand for convenient food products in Africa has stimulated the urban demand for cassava products such as *gari* and *attieke.* To meet the expansion in demand, cassava has emerged in many countries as an important cash crop for farmers and as an urban food staple (Nweke, 2003). Cassava has intrinsic developmental traits. It has low maintenance costs in terms of farm inputs and labour, and thrives on nutrient-poor soil; hence suitable for marginal and capital-poor farmers. The roots could be kept underground for up to two years without losing nutritional values, making it an important food security crop (Vessia, 2007).

A recent study on the impact of non-traditional crops on the livelihoods of rural producers in Mexico reports that improved market links and product diversification increased incomes by 58 % while value adding activities accounted for a 350 % increase in farmer income (Ramírez 2001). In addition, value adding could prove useful as a poverty-reduction tool if it leads to increased on and off farm rural employment and income. Gottret *et al.* (1999) highlight the poverty reduction potential of post-harvest and value added activities noting that gains in rural income and employment are complemented by

reductions in food prices for urban dwellers. Furthermore, reported that improvements in processing and market chains that reduces traditional food preparation times, releases time for more productive activities. The net result, therefore, may be positive for both the rural and urban poor. A method for achieving both value adding and poverty reduction is the strengthening of the rural enterprise sector. Rural household processing enterprises exist in a wide variety of products (and are feasible in a great many more) generating added value and nonfarm employment opportunities for rural populations (Lundy *et al.*, 2006).

Agricultural and food policies have a crucial role in reducing rural as well as aggregate poverty in Africa, given that the bulk of the poor are in rural areas, and are employed in agriculture. Crucial among these policies are those that help increase incomes of the rural poor (Sarris *et al.*, 2006). Cassava has been identified as a very powerful poverty fighter by driving down the price of food to millions of consumers (Iheke, 2008). The widespread uses of cassava following the processing have added more value to the produce. This has assisted in stemming the spate of poverty (Ukpongson, *et al.*, 2011).

Full potential of cassava contribution to household food security and income has not been exploited due to a number of problems: these include poor traditional processing and preservation methods, high perish ability of the roots once harvested, lack of processed products that could improve commercialization of the crops, and lack of sustainable supply channels for the developed technologies to the end users (Johnsen, 2003). Several researchers are of the view that cassava processing and the value added products have tremendously led to sustainable poverty alleviation (Nnadi and Akwiwu, 2006).

The need therefore arises to ascertain empirically the effects of cassava processing and value-added products on sustainable poverty alleviation. The non-existence of scientifically verifiable data has given rise to poor assessment of the real impact of cassava on alleviating rural poverty. This has engendered knowledge gap which needs to be filled.

High quality cassava flour (HQCF) is of particular interest because it can be used as a substitute for 10 percent or potentially more wheat flour in pies, pastries, cakes, biscuits, and doughnuts and has some industrial applications (Akosua *et al.*, 2007). In Tanzania small milling companies report sales to supermarkets of a ton of HQCF daily. Several initiatives are underway to support the development of processed cassava products, including HQCF. These initiatives are focusing on a wide array of activities across the cassava value chain that affects production and adoption of processed cassava products. Supporting farmer organizations; deploying village-level processing units and other technologies; ensuring consistent quality; providing financial, business and technical support services; and, increasing adoption of processed cassava products.

Therefore, investing in cassava will provide a means of targeting the poorest of farmers, offering both opportunities for income generation and for employment, especially if a processing sector is developed (FAO, 2007). Experience in other sub-Saharan African countries indicates that high quality cassava flour (HQCF), for example, can retail at up to three times the farm gate price of cassava (on an equal dry weight basis, considering 4kgs of dried cassava produces 1kg of flour) (FAO, 2007). In the balance between providing food security and generating income, it should be remembered that cassava is a source of food security, not only because it can be grown on less productive land, but also because it provides a source of income for producers and is generally a low cost source of food.

2.12.3 Measures of profitability (Gross margin)

There are various measures of profitability of the enterprises which are Gross Margin (GM), Return on Investment (ROI), Benefit-Cost Ratio (BCR or B/C), Internal Rate of Return (IRR), and Marketing Margin (MM) (Turuka *et al.*, 2002). A study by (Armstrong, 2006) for marketing exclusives and professional revealed that 68 % of marketing executives have difficulties in measuring profitability of investment and 73 % of them reported that there is an adequate profitability measurement tool.

Phiri (1991) reported that GM is still the most satisfactory measure of resource efficiency to Small and Medium Enterprises (SMEs). It gives a good indication of the financial health of enterprises and show the deep insight into trader' management efficiency of the enterprises. Thus, without adequate GM received by traders, their ability to pay operating costs and hence their business sustainability is jeopardized. Moreover, understanding GM across different enterprises is vital because traders tend to shift tied capital to more highly profitable enterprises or segments in the cassava marketing systems. Thus, the higher the GM earning enterprises warrant the traders' working capital to more profitable enterprises. Hence, working capital is switched off from low GM enterprises to highly GM earning enterprises.

2.13 Key summary

The above chapter was the literature of the study. Other researchers have great influence over the study, the following are their views about cassava value addition.Cassava is available to low-income rural households in the form of simple food products (for example, dried roots and leaves) which are significantly cheaper than grains such as rice, maize and wheat.

According to GoK (2004) one major hindrance to achieving food security is low level of value addition especially through agro-processing which can impact on food security by reducing food losses, increasing food availability and improving access to food. The processes of enhancing cassava's worth, quality and usefulness are called value addition (IITA, 2007). According to researcher knowledge; the crop has the tendency to have reduced quality if not processed soon after harvesting. Value addition facilitates transportability of processed products, reduces perish ability and toxicity, enhance edibility and nutritive quality, stabilizes the product for storage and guarantee higher prices for farmers (Onabolu, 2001).

Cassava transformation has arguably proven to be the most poverty fighter to date (Nweke, 2004). Value addition is also often synonymous with investments in high-value processing, however significant value can be added to raw produce without changing the physical form of the product by introducing activities including for instance, cleaning, grading or labeling (FAO, 2012 a). The value addition technology in cassava possesses enormous potential for increasing cassava consumption, diversifying its uses as well as using the same to enhance livelihoods of farm families through providing opportunities for employment; micro agro enterprises development income and boosting economy of rural households.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

The research was carried out in six villages of Yombo, Kongo, Kerege, Kiwangwa, Msata, Kikaro which are found in five wards of Yombo, Kerege, Kiwangwa, Msata and Miono in Bagamoyo District as shown on the study area location map (Fig. 2) below. These six villages based on the area where cassava is the main crop and majority of people (90 %) depend on cassava as a source of food and income and therefore they constitute an ideal choice for this kind of study.

Bagamoyo is one among the six districts in Coast region; others are Kibaha, Kisarawe, Mafia, Mkuranga and Rufiji. The district lies between latitude 38^0- 39^0 South and Longitude 6^0-7^0 East. It shares borders with the Indian Ocean to the East, Kinondoni Municipal Council to the Southern part and Kibaha District and Morogoro to the West, Pangani and Handeni District to the north. The district covers an area of 9842 square kilometers. 855 square kilometer area is covered with water (Ocean and River) while the remaining part which is 8987 square kilometers area is occupied by dry lands. The district is divided into six divisions, twenty two (22) ward, 96 registered villages and 467 hamlets. Bagamoyo Township is the district headquarters.

Major ethnic groups in the district are: Wakwere, Wazaramo, Wazigua, Maasai and Wadoe. There are also few people of Arabic decent and other people of different ethnicity are to be found in the trade centre areas especially in Bagamoyo Township. According to 2002 National Population Census, Bagamoyo District has 228 967 people of which 113

991 were males and 114 976 females. However the district population density is estimated to be 4.6 people per sq, km and number of households are 50 359.

The district has the humid tropical climate with seasonal average temperature ranging from 13 ^{0}C – 30 ^{0}C. There is two rainy seasons namely long and short seasons. Rainfall ranges between 800 – 1200 mm per annum. The long rain starts from February or March to June or March to June while the short rain season starts between July and October. The coastal strip receives relatively more precipitation than the up-country part.

991 were males and 114 976 females. However the district population density is estimated to be 4.6 people per sq, km and number of households are 50 359.

The district has the humid tropical climate with seasonal average temperature ranging from 13 ^{0}C – 30 ^{0}C. There is two rainy seasons namely long and short seasons. Rainfall ranges between 800 – 1200 mm per annum. The long rain starts from February or March to June or March to June while the short rain season starts between July and October. The coastal strip receives relatively more precipitation than the up-country part.

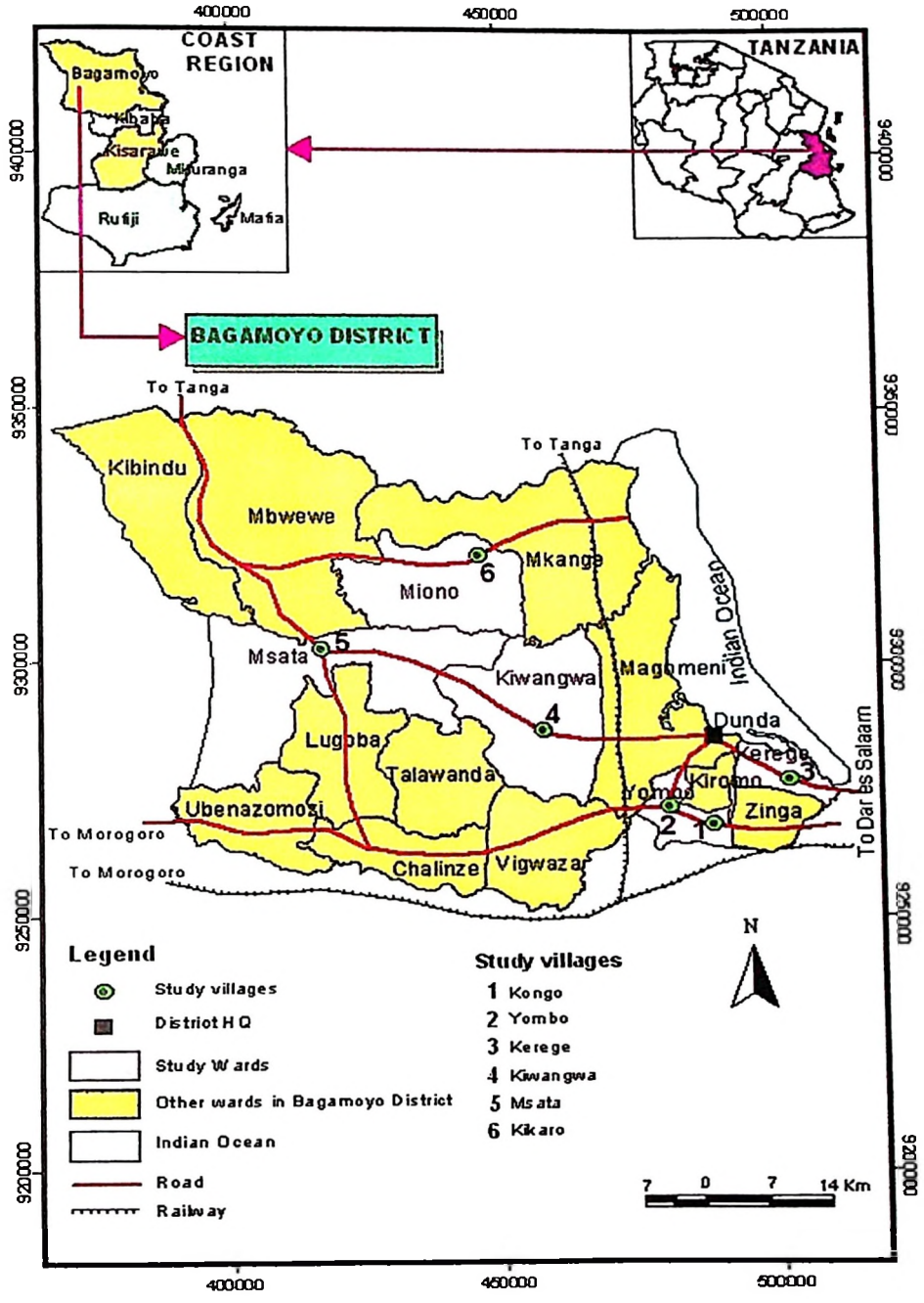

Figure 2: A Map of Coast Region with sampled wards in Bagamoyo District

3.2 Research Design

The survey used a cross-sectional research design. Under this design, data from household's respondents was collected at a single point of time without repetition from the representative population. The design was suitable for purpose of descriptive statistics and determination of relationships between variables (Bailey, 1998) this design is considered to be favorable because of the limited time available for data collection.

3.3 Sampling Procedure

3.3.1 Simple random sampling

The sampling frame for this study consisted of small scale cassava farmers. The sampling was done by simple random sampling of these small scale cassava farmers. The total sample size of 120 respondents was selected from six villages, 20 from each village (10 females and 10 males) basing on the following techniques.

3.3.2 Purposively random sampling

Purposive sampling technique was used in selecting a targeted village relevant to study in the specific areas namely Kongo, Yombo, Kerege, Kiwangwa, Msata and Kikaro villages deemed to provide the needed data. The villages were selected according to history of cassava production and processing. Thereafter selection was done randomly to pick farmers. Farmers were those who rely on cassava production and value addition as their major economic activity. This technique has been recommended in social research by Kothari (2004) as it focuses directly to the area intended to be studied.

3.4 Data Collection and Instrumentation

3.4.1 Preliminary survey

Preliminary survey was done so as to provide a general picture of the research area. The aim was to categorize the stakeholders and familiarize with the area under study. During the reconnaissance survey, the key issue was to select study villages. Given the

inadequate information on local settings; questionnaires were pre-tested (in one of the villages) and administered to 10 respondents. After the pre-testing exercise, ten respondents involved were not included in the actual total sample of size of 120 farmers for interviewing. Pre-testing helped to check the validity and reliability of the questionnaire items (Kajembe and Luoga, 1996).

3.5 Data Collection Methods

Both primary and secondary data were used to collect data for the study.

3.5.1 Primary data collection

Primary data were collected from different sources. During the process, primary information on age, marital status ,household size, education, occupation, cassava value addition activities, cassava on farm value adding technologies, profitability of value addition in cassava, contribution of value added cassava (product) to the household income, were collected.

(i) Questionnaire

Structured questionnaire was used to collect data about cassava value addition in the reduction of poverty. In order to elicit more information, open-ended and closed questions were used. Open-ended questions helped to get the respondent's views regarding the research, while in the closed- ended interviews, the respondents were provided with alternative answers (Appendix 1). This method of data collection provided enough information required for the study.

(ii) Participant observation

Participant observation is distinguished by the fact that the observer (researcher) becomes part of the situation being studied (Kajembe and Luoga, 1996). Participant observation

involved community activities (general farm activities, production systems, behavioral relationship) and perception towards cassava value addition.

Participant observation helped to get close to the people and facilitated respondents to feel free during interviews. Moreover, participant observation was used as a guide to asking questions where respondents failed to respond to questions. During fieldwork, constant interactions with villagers were part of the information collection process. The technique was used as an initial medium for learning about social and physical environmental interrelationship. Tools used was notebook, ballpen, pencil, and questionnaire.

(iii) Key informant interviews

A key informant is an individual who is accessible, willing to talk and has a great depth of knowledge about the issue in question (Mikkelsen, 1995). Key informants are not only members of the clientele, but are most often informed outsiders. Key informants in this study mostly included were District Agricultural and Livestock Development Officer (DALDO), Village Agricultural Extension Officer (VAEO). These people were interviewed to get their professional view on the issue to be researched by using checklist. This exercise was guided by a simple checklist of questions (Appendix 2- 6). Twenty five (25) key informants involved in the process of data collection include: Village Executive Officers, cassava processors, cassava traders and selected consumers.

3.5.2 Secondary data collection

These data obtained from literature sources or data collected by other people for some other purposes. Secondary data provide second hand information and include both raw data and published ones. Relevant secondary data on cassava value addition activities, profitability of value addition in cassava were obtained from Sokoine National

Agricultural Library (SNAL). Data were complemented by similar information from Bagamoyo District Agricultural Development Office and Kibaha Cassava Research Institute and Internet.

3.6 Data Processing

Data collected was edited, coded and summarized prior to analysis by using Statistical Package for Social Sciences version 16.0 (SPSS16 0 for windows).

3.6.1 Qualitative data analysis

Qualitative data were analyzed by the use of content and structural functional analysis. Content analysis was used to analyze the components of verbal discussion held with different respondents. The basic idea is to reduce the total content of communication to some set of categories that represent some characteristic of research interest (Singleton *et al*, 1993). In this way, the recorded dialogue with respondents was broken down into smallest meaningful units of information, values and attitudes of respondent. According to Kajembe and Luoga (1996), the technique helps the researcher in ascertaining values and attitudes of the respondents there by generating themes and tendencies. Structural – function analysis helped the researcher to distinguish between visible and hidden functions. Visible functions are those consequences which are intended and recognized by the actors in the system while the hidden functions are those consequences which are neither intended nor recognized by the actors.

Structural functional analysis was used to explain the way social facts relates to each other within a social system and the manner they relate to the physical surroundings. Data from focus group discussion or key informants were summarized picking the main points and conclusions reached by the group members themselves (Cooksey and Lokuji, 1995).

3.6.2 Analysis of quantitative data

Quantitative data analysis was done by using routine procedure of Statistical Package for Social Science (SPSS version 16). Descriptive statistics mainly measures of central tendency and measure of dispersion were used in the quantitative data analysis. Inferential statistics was also used to draw the relationship between independent and dependent variables. Inferential statistics help in providing an idea whether patterns described in the sample are likely to apply to the whole population under study.

In this study the descriptive analysis which is frequency, percentage and mean was achieved to answer objective number one, two and four, and summarizes the characteristics of actors along the cassava value addition. Also the gross margins for cassava was calculated from the total revenue obtained less total variable cost associated with processing, transport, packaging, loading, downloading storage and marketing cost of cassava. Variable costs are those cost that increase or decrease as output changes.

Gross margin was used to indicate who received more profit in the value added and raw cassava. Gross margin analysis is a simple, but in many cases a sufficiently powerful tool for economic analysis.

Gross margin = Revenue-Cost

GM= TR-TVC

GM=PQ-TVC

Where: GM –Gross margin (Tshs/kg)

TR – Total revenue

TVC – Total variable cost

P - Price of the product

Q – Quantity of product

Respondents, including producers, processors, traders and consumers of various characteristics. Moreover data was also collected from Bagamoyo District Agricultural offices, Sokoine National Agricultural Library (SNAL), and other sources relevant to the study and websites was explored. Primary data on specific issues of the study coincide with the secondary data.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic and Demographic Characteristics of Respondents

Table 3 shows the socio-economic characteristics of the sampled respondents, which are age, sex, marital status, education level, source of income and household income per month.

4.1.1 Age of respondents

According to Hoppe (2002), age affects both experience and decision making all of which affects how one works and hence influences individual productivity. Majority 56.6% of the respondents are between 31 and 50 years old, Furthermore23.3% of the sampled respondent are between the ranges of 51-60 years old, 12.5% are above 60 years old, lastly 7.5% of the respondents ranged 20-30 years old. This implied that the group ranged 31-50 was the one who owned farms and did agricultural activities, this is an indication that, the aspect of cassava value addition was an adult venture in the study area. Sarris *et al.* (2006) reported that an active labor can be household members of 15 years and above but less than 65 years old; this is due to physical fitness and ability to take risks.

4.1.2 Sex of the respondents

Regarding to sex the data revealed that 54.2% were male and 45.8% were female, it was easier to pick men than women because the latter were busy in cassava farms. Village executive officers (VEOs) from all study areas reported that women are the main producers and processors of cassava. Furthermore, women constitute the major source of labour they often buy cassava from the farms; they harvest, process and market. This increased earning opportunity enables them to purchase goods and services that

contribute positively to their livelihood. According to Joda (2010) females have been confirmed in various studies to be placed at the disadvantaged side both in terms of financial and educational status; their position in the pursuit for many economic empowerment ventures seems to be lagging.

4.1.3 Marital status

Furthermore study results showed that majority (72.5%) of the household respondents were married. women were obliged to take care of their family, and indicates that most of them were adults who can handle adult 'responsibility including cassava production, value addition and increased income for livelihood survival 12.5 % were single while 5.0 % were divorced and 10% respondents were separated.

4.1.4 Education level

Regarding to education level 53.3 % had primary education, 17.5 % of the respondents had no formal education, 13.3 % had secondary education, 12.5 % had attended adult education and finally 3.3 % had education level beyond Secondary education. Clearly, the level of education among respondents was low, although they know how to read and write. According the study, this has serious implications for the development of small-scale farm based enterprises in the study areas. Oluwasola, 2010 stated that the low level of education among the respondents could have serious implications on their ability to access information, use new technological innovations and even access or get credit from formal financial institutions. Education is believed to create a favorable mental attitude for the acceptance of new practices, especially information-intensive and management-intensive practices (Akudugu *et al.*, 2012), with educated farmers preferring to experience the benefits of new technologies.

4.1.6 Source of income

Study results also indicated that most of the respondents interviewed their sources of income is from different activities, crop farming (cassava production) 68.3 %, crop farming and business 17.5 %, and the rest of respondents 14.1 % engaged both in livestock keeping and crop farming, also employment in different government services and private sector. Livestock kept are goats, sheep and poultry. Each household at least owned 5-30 chicken which is reared for selling and home consumption.

The total household income was also investigated, results show that 62.5 % of sampled farmers earned 120 000 - 200 000 Tshs per month, (21.7 %) earned 200 000-400 000 Tsh per month, (13.3 %) earned below 120 000 Tshs per month and (2.5 %) earned 400 000-600 000 Tshs per month, this implies that majority in this area are generally low-income earners since their daily income is about 1500-4000 Tshs. The respondents said that the amount of money earned after sold both raw and value added cassava. According (Obisesan, 2013) as a cash crop, cassava generates income for the largest number of households, in comparison with other staples, contributing positively to poverty alleviation.

Table 4: Socio-economic and demographic characteristics of respondents

Socio economic characteristic	Frequency	Percent
Age in range (Years)		
20-30	9	7.5
31-40	34	28.3
41-50	34	28.3
51-60	28	23.3
>60	15	12.5
Marital status		
Single	15	12.5
Married	87	72.5
Divorced	6	5.0
Separated	12	10.0
Education level		
No formal education	21	17.5
Primary education	64	53.3
Secondary education	16	13.3
Adult education	15	12.5
Post secondary education	4	3.3
Sources of income		
Crop farming	82	68.3
Livestock keeping and crop farming	7	5.8
Crop farming and employment	10	8.3
Crop farming and business	21	17.5
Income per month(Tshs)		
Below 120 000	16	13.3
120 000-200 000	75	62.5
200 000-400 000	26	21.7
400 001-600 000	3	2.5

4.2 Land Availability and Use

4.2.1 Farm size

Land as an important resource was available and accessible to households. Analysis of total land revealed that 99.2 % of the respondents owned the farm in acres per household. Regardless of type of land tenure revealed that households possess on average about 2.0 acres each. About 39.2 % owned 2-4 acreage of land, 25.0 % owned 0.5-2 acreage of land, 4-6 acreage of land owned by24.2 % of respondents and 11.7 % owned 6 acreages and above.

Large land holdings per household signify the availability of one of the main factors of agricultural production. It offers a chance for farmers having more land to be in a good position to grow cassava among other crops compared to those with less land. This suggests that there is a possibility of increasing cassava production and value addition because land is not a limiting factor in the study area. However; farmers said that they used traditional tools, hand hoe which limit them to cultivate all land owned. Ruben *et al.* (2006) indicated that the majority of African smallholders cultivate less than two hectares of farm lands, use rudimentary tools and lack access to processing machines.

4.2.2 Cassava varieties

There are a number of cassava varieties grown in the area of study. The local variety which is known as *Mfaransa* was the main cassava variety grown by 71.7 % farmers out of 120 sampled farmers in the area of study during the 2011/12 growing season. The quality attributes of the variety are sweetness, early maturing taking six months to attain early and high yield of up to 4.5 tons per acre and preferred in the market, also can be processed to high quality cassava flour (HQCF). Both sweet and bitter varieties are grown by 27.5 % respondents, and the remaining 8 % grow the bitter varieties only.

Majority of farmers grow sweet varieties which is preferred for making flour, fried to chips, buns, boiled and roasted. Bitter varieties is grown for making flour only, bitter varieties are preferred by farmers because is not damaged by wild animals like pig and high yielding. Consumers said that bitter varieties should not be used unless processing methods are conducted correctly because can cause stomach pain and dizziness, while sweet varieties can be consumed without processing.

According to (Nkonya *et al.*, 2001) if farming experience is viewed in terms of accumulation of knowledge, then it stimulates improved technology use. Older farmers may have had the opportunity to experiment with other improved varieties of cassava and observed their superiority over local ones. They may also know better methods of seed selection than the relatively young farmers. Consequently, they will be quicker to accept new cassava technologies than younger farmers.

4.2.3 Number of Years cultivating cassava

The response further showed that 52.5 % of the households in the study area grew cassava more than six years, while another group of respondents 21.7 % grew the crop 3-4 and 5-6 years respectively. The remaining farmers 4.2 % cultivated cassava for 1-2 years. In the study area cassava are cultivated as a sole crop, few farmers grew it and intercrop with cowpeas, pineapple, and coconut. The source of planting material were neighbours and own farms. In both cases cassava production requires routine activities from land preparation to harvesting and occasionally, post-harvest processing at household level. Sewando (2012) reported that in Morogoro Rural District planting of cuttings is mainly carried out during short rain season (October – November) and are mainly planted at an angle, and the most important sources of cassava planting materials were the neighbors and own farms.

4.2.4 Harvesting

Furthermore survey results showed that 54.2 % of the sampled producer's harvested cassava in 3-4 days in a week, 18.3 % harvest cassava every day, this depend on the consumers and traders available. Another group of producers from the study area 17.5 % harvested the crop in 5-6 days in a week, minor group of producers10 % harvested cassava in 1-2 days in a week, this is due to small size of the land owned and planted.

Table 4 showed 64.2 % of producer's harvest 5-10 bags of raw cassava in a week, 15.0 % harvest less than 5 bags in a week, 12.5 % harvest 11-20 of raw cassava in a week and 8.3 % of the respondents harvest above 20 bags of raw cassava in a week. Harvesting of cassava is manual and carried out by household members, few farmers who harvest above 20 bags in a week hired 2-3 laborers. The harvested cassava are packed in bags of 50-70 kg each.

Plants are ready for harvest as soon as the tubers are large enough to meet consumer requirements. Roots can be harvested from six months up to 3 years after planting depending on the variety, enabling harvests to be delayed until market, processing, or other conditions are most favorable. However, as the roots age, the central portion becomes woody and inedible http://practicalaction.org/cassava-processing.

Majority (88.3 %) of cassava producers in this study don't store raw cassava after harvesting this is due to the fact that fresh cassava roots once harvested cannot be stored for a long time because they undergo physiological deterioration within two to four days. Only 11.7 % of respondents in the study area store raw cassava after harvest, 10.8 % of the producers store raw cassava less than 12 hours after harvest and 0.8 % store raw cassava 12-24 hours after harvest. (Akingbala *et al.*, 2005) stated briefly that physiological deterioration occurs in cassava roots 2-3 days after harvesting, followed by microbial deterioration 3-5 days thereafter.

The common method used to store raw cassava in the study area is to spread the crop on the coconut leaves or pack in polythene bags. Traditionally cassava has been stored by piling the roots into heaps that are kept watered to prevent the tubers drying out.

Sometimes cassava is stored in pits that are lined with straw or other vegetable material and kept watered (Noblen, 2002).

Table 5: (Land Availability and Cassava production)

Land Availability	Frequency	Percent
Farm size acreage		
0.5-2	30	25.0
2-4	47	39.2
4-6	29	24.2
6 and above	14	11.7
Acreage for cassava		
0.5-2	63	52.5
2-4	48	40.0
4-6	6	5.0
6 and above	3	2.5
Type of cassava grown		
Sweet variety only	86	71.7
Bitter variety only	1	.8
Both sweet and bitter variety	33	27.5
Years cultivating cassava		
1-2 years	5	4.2
3-4 years	26	21.7
5-6 years	26	21.7
Over 6 years	63	52.5
Amount harvested		
Less than 5 bags	18	15.0
5-10 bags	77	64.2
11-20 bags	15	12.5
Above 20 bags	10	8.3

4.3 Cassava Value Addition Activities in the Study Area

4.3.1 Value addition after harvesting

Table 6 study findings shows that farmers add value to the cassava after harvesting, farmers are primary processors. Majority of farmers add value at house hold level. In the study area cassava are peeled, chipped and sun dried for two to three days before processed to different cassava products. Result found out that 45.8 % of interviewed sampled producers lead to flour making, another group of respondents 40.8 % sun dried

cassava to reduce moisture content and the last group of respondents interviewed 13.3 % grade cassava. The roots are graded according to size, shape, and amount of faults. All cut, cracked, diseased and unattractive roots should be removed. Good quality cassava should be smooth, firm, fairly straight, and even in shape and size. In addition, the roots should be free from damage, decay, and streaking. Grading helps to set selling price to the consumers.

4.3.2 Value addition preferred in the study area

Cassava flour is the common value added product processed to the household level in the study area. Traditionally cassava is chopped, dried and grinded with stones, mortar and pestle to get flour. According to farmers all harvested cassava has to be processed within 24 hours to obtain high-quality flour. Furthermore result showed that 43.3 % of respondents interviewed prefer flour making, which is sold and has a higher market price than other value added products and the remaining flour is used for home consumption. About 39.2 % of respondents prefer to grade cassava in size, flour making, chopping and sun drying cassava respectively. Chopped and sun dried cassava also called 'makopa' are stored and used as a food security, being used as 'futari' during the holy month of '*Ramadhan*'. The remaining respondents (5 %) grade cassava in size, making flour and washing cassava, this implies that cassava is washed only during making buns and fraying chips due to shortage of water almost all the surveyed areas. Processors of buns and chips prefer sweet, medium sized cassava roots that deteriorate slowly and easy to peel.

Consumers interviewed said that they prefer value added cassava than raw cassava, because raw cassava stored more than two days undergo physiological deterioration, but flour and dried cassava can be stored up to one month and can used as food security and source of income. Addition to that value added cassava used as substitutes to other crops

like rice, maize, sweet potatoes etc. Consumers advised cassava producers/ processors to improve quality of cassava products.

The processing of cassava roots into HQCF as a primary industrial raw material has the potential to jump-start rural industrialization, increase market value of cassava and improve farmers' earnings and their livelihoods (Dziedzoave *et al.*, 2006). Moreover 100 % of the surveyed respondents sell value added cassava. Graded cassava is sold to the wholesalers, retailers and consumers at the field, homestead and road side or at the marketplace.

4.3.3 Means of transport

Transport is the important aspect in cassava production, processing and marketing. With respect to the transport function, survey found that 55.0 % of the respondents owned transport and 45 % did not own transport. The respondents owning cheap transport such bicycle were 44.2 % of the respondents, motorcycle 5 % respondents and 2.5 % of respondents owned hand-cart, motorcycle and bicycle. These in turn translate bicycle is more used to transport cassava from the field to the homestead and nearby local markets. The use of bicycle is more difficult during the rainy season when many parts of the rural area are inaccessible.

According to (CAADP, 2010) fresh cassava roots are usually transported by bicycle from the farm to the bulking site on the road. However, transporting cassava over long distances is often difficult, not only because of its perishable nature, but because of its bulk and low value. Cassava flour is easier to transport, as 70 % of the weight has been removed.

Table 6: Value addition activities

Value addition	Frequency	Percent
Value addition after harvesting		
Grading cassava in size	16	13.3
Flour making	55	45.8
Sun dried cassava	49	40.8
Value addition preferred		
Flour making	52	43.3
Grading cassava	15	12.5
Grading cassava ,flour making chopping cassava, and sun dried	47	39.2
Grading cassava, flour making and washing cassava	6	5.0
Own a transport		
Yes	66	55.0
No	54	45.0
Type of transport		
Bicycle	53	81.5
Motorcycle	6	9.2
Hand-Cart	3	4.6
Bicycle and motorcycle	3	4.6

4.4 Cassava on Farm Value Adding Technologies

The common cassava on farm value adding technologies identified in the study area is cassava grating and cassava grinding. Results found that 55.8 % of the respondents grated cassava into chips after peeling and sun drying to make flour. Forty four percent of the respondents grinded the cassava after peeling and sun-dried to make flour. The roots are peeled, chopped into small pieces about 0.5x 0.5x 0.2cm, and sun dried on coconut dried grass, reed mats or on the roof of houses. Then the sliced pieces are locally grinded using mortar and pestle and sieved through an 80 mesh sieve, also grits can be milled to get flour; the available processing methods reflect the diverse forms of utility added to cassava. The flour is used to make stiff porridge 'ugali' or used to make buns and cake (this can be mixed with small amount of wheat flour) the 'ugali ' which is eaten with pounded and cooked cassava leaves 'kisamvu', fish or meat. However the consumption of cassava leaves is higher in coastal areas. Processed flour, cakes and buns are either sold or

used for home consumption. These leave farmers with opportunities of choice in their menu, and increase in their earnings.

According to Omoaka *et al.* (1993) a method for producing high quality cassava flour suitable for baking was developed and this was adopted in Tanzania in 1993. The method involves peeling the roots, washing and chipping in a manually operated chipper and sun drying on a black plastic mat with a recommended loading density being 2 kg/m2 while the temperature at the mat surface could vary from 26.8 to 49.1°C and the drying time range from 4 to 8 hours. The dried chips are milled and sieved through a 25 mm mesh size sieve. The flour obtained has moisture content of 8 – 12 % and should be stored in air tight containers. With this kind of flour, a proportion of 20 % cassava flour could be added to 80% wheat flour to make composite breads indistinguishable from 100 % wheat.

4.4.1 Cassava processing machines

Two groups of 10-20 farmers own cassava processing machine from Kongo and Kikaro villages from the study area. Machines owned are cassava chippers which are operated manually. It was found that 18.3% of respondents from the surveyed areas owned cassava processing machines, and 81.7% do not own cassava processing machine. Bagamoyo District (Department of Agriculture and Cooperative) through District Agricultural Developments Programmes (DADP'S) 2008/2009 has established a cassava processing centre at Yombo village and the machines that have been installed are cassava chipper, cassava grater and cassava miller. The installed machines worth 39 000 000 Tshs, and electrically operated. The machines expected to work recently after finishing the process of supplying clean water. According to Ward Executive Officer the processing centre will serve members of the community and cassava producers from nearby villages. He insisted that the processing centre will open market opportunities to the farmers if linked to

market, also smallholder farmers will be given assistance through training in testing and adopting recommended technologies. Traditional tools used in processing cassava include: millstone, grinding stone, and pestle and mortar. These tools have low productivity and low hygienic conditions; these problems lead to the designing and construction of machines that can grate the cassava of high quality in a short period and reduce human drudgery. Some of the machines include: rollers crushing mill, hammer mill, bar mill, grater, etc.

According to (Van der Land, 2007) processing using low-cost machinery and processes for producing high quality intermediate products under small-scale rural conditions would be encouraged on-farm or as near the farm as possible to reduce transportation costs.

4.4.2 Means to own processing machines

According to Village Agriculture Extension Officer (VAEO) the group of cassava processors from Kongo received manual cassava chipper from Sokoine University of Agriculture as a loan worth 36 000Tsh in the year 2007/2008. Results showed that from the study villages for those with machines, 72.7% of respondent got the machine as a loan and 27.3 % hired them. It was found that other farmers/processors hired processing machines (cassava chipper) and paid 8000/per month. Village Extension Officers (VEO's) interviewed from the villages of Yombo, Kikaro, Kongo said that cassava production is carried out at large scale to their villages yet, value addition is done to small quantities this is due to unavailability of processing machine and majority of farmers use traditional tools such mortar and pestle, stones to process cassava into flour. Adeniyi *et al.* (2005) corroborated that the low level income of poor farmers prevents them from meeting the capital requirement of improved technology.

4.4.3 Farmers processing stage

It was found that 73.7 % of the respondents processed cassava into flour, 26.3 % of the respondents dried cassava 'makopa' to add value. This is the processing stage. The products are sold and used for human consumption. Other products such as buns, cake etc are processed in small quantity. The study found that processors organized to groups of 5-10 people, processed and packed flour to the paper bags weighed one kilogram's. The packed flour sold direct to consumers, retailers, hawkers and wholesalers, sometimes to Nanenane (Farmers' exhibition) Morogoro. Each packed flour sold at Tshs 1000-1500/bag, however the processors said that they process cassava to small quantities 30-60 bags per week due to capital constraint, which can helped them bought modern processing tools and machine, hired labor for different processing activities, transport product and buying packaging materials. According to them value added products is good due to profit available, and can be kept for a long period of time.

4.4.4 Packaging materials

It was observed that the materials such as paper bags, plastic bags and containers are used to pack flour in the study area. Cassava flour is packed in the paper bags weighed half to one kilogram, according to processors the packed units is more preferred by consumers. The paper bag showed important information to consumers such as product name, nutrient content contained in the flour, manufacture and expiry date.

Again Table 7 shows that 69.7 % of the respondents packed their cassava flour in the paper bags and the remaining respondents 30.3 % packed their flour in the plastic bags. The paper bags are packed to a half and one kilogram, which is sold at the price of Tshs 1000-1500 per bag; it was observed that the price is the same all the year round. Plastic bags used by retailers who sold flour at the road side and homestead. Plastic bags

are widely used by producers/processors because they are relatively cheap, readily available and durable. It was also observed that other hawkers and retailers sell flour in open containers, polyethylene sheets or mats spread on the ground. The problem is poor keeping quality, dust and unhygienic environments which lead to contamination; also the flour is also exposed to the very humid environment especially in the wet season.

According to Sailaja *et al.* (2001) polyethylene is widely used as a packaging material because of its good mechanical properties and low cost. However, these qualities have been overshadowed by its high non-biodegradable nature, this leads to waste disposal problems.

Table 7: Cassava on farm value adding technologies

Cassava on farm value	Frequency	Percent
On farm value adding technologies		
Cassava chipping	53	44.2
Cassava grinding	67	55.8
How do you get the machine		
Loan	16	72.7
Hired	6	27.3
Processing stage		
Flour	70	73.7
Dried cassava	25	26.3
Packing material		
Plastic bag	10	30.3
Paper bag	23	69.7

4.5 The Profitability of Cassava Value Addition

4.5.1 Mean gross margin of raw and value added cassava

4.5.2 Paired samples T-Test output

Paired samples T-test used to make mean comparison between two variables in order to see if there is significant difference. Table 8 show the mean gross margin of value added cassava which was 621 000 Tshs/ha while the mean gross margin of raw cassava was

275 000 Tshs/ha. The Gross Margin (GM) difference is 346 000 Tshs. This implies that cassava value added is more profitable than raw cassava. It was found that one bag of raw cassava weighed 50 kg sold for 18 000 Tshs, the same bag when processed to flour gives 30-35 kg, which was sold 1 200 -1 500 per kg.

Table 8 showed analysis of profitability of value added cassava and raw cassava. In the study, only farmers, traders, processors and consumers were considered in assessing the profitability of value added cassava that competes with raw cassava. Both the average operating costs and the net revenues accrued by farmers were calculated using gross margin analysis. Variables used was transport, loading, downloading and storage. The results show that farmers involved in value added cassava received the higher gross margin but also incurred higher operating costs per 50 kgs than involved in raw cassava (Table 8) the higher revenue among the value added farmers can largely be attributed to good price offered for value added products as opposed to raw cassava. Means comparison results using paired T-test in Table 8 shows that gross margin of farmers involved in value added cassava and involved in raw cassava differ significantly at $P<0.05$. Therefore, value added cassava is more economically profitable compared to raw cassava.

A focus on post-harvest activities, differentiated value added products and increasing links with niche or specialty markets would appear to be the strategy open to smallholders. Ramirez (2001) reported that a recent study on the impact of non-traditional crops on the livelihoods of rural producers in Mexico reports that improved market links and product diversification increased incomes by 58 % while value adding activities accounted for a 350 % increase in farmer income. In addition, value adding could prove useful as a poverty-reduction tool if it leads to increased on and off farm rural employment and income.

Table 8: Mean gross margin of raw and value added cassava

Profitability of value added cassava	Mean	N	Std. Deviation	Std. Error Mean	t	Sig. (2tailed)
Gross margin of value added cassava	6.21E5	120	244906.835	22356.833	25.836	.000
Gross margin of raw cassava	2.75E5	120	111950.488	10219.635		

4.6 Contribution of Value Added to the Livelihood

4.6.1 Market for the value added cassava

Table 9 shows that 66.7 % of the respondents sold their value added products at home place, 18.3 % of the respondents sold value added products at the roadside furthermore 11.7 % of the respondents from the surveyed areas sold value added products at the market place, lastly 3.3 % of the respondents sold value added products both at home and market place. The value added products processed and sold at home place are the one's which are processed in small quantities like dried cassava 'makopa', chips, buns and cakes. Another product which is sold at home place and road side is raw graded cassava which is boiled or fried into chips and eaten with porridge or tea as breakfast.

The markets enable the producer to exchange the products for income (credit/cash) which can be utilized to improve livelihood. Cassava processing provides employment to producers, transporters, processors, marketers and food vendors (Phillip *et al.*, 2004). The local cassava-marketing chain has aided the development of product marketing.

In Africa cassava is marketed in five common groups of cassava products. These are fresh roots, dried roots, paste products ("agblima" in Ghana, "akpu" in Nigeria), granulated product ("gari" in West Africa) and cassava leaves. Tanzanian market is dominated by dried roots 91 % and to lesser extent fresh roots6 %. Other products including fresh

cassava paste products comprise only 3 %. Although more research is needed, cooked cassava paste is a promising food for busy urban consumers and so is the improved kibabu (kibabu is a traditional, plain, deep fried cassava product prepared from cassava paste) in Tanzania (Laswai *et al.*, 2006).

4.6.2 Determination of selling price

Both raw and value added cassava are sold in the study area. Large amount of raw cassava is sold on farm, farmers harvest cassava in a piecemeal according to traders and consumers needs.

Result showed that majority (89.2 %) of farmers from the study areas determined selling price in advance and 10.8% of respondents determine selling price at the market place. A bag of 50-70 kilogram is sold at a price of 15 000 – 20 000 Tshs. Market price of processed product and raw cassava determined to other cost incurred such as transport, storage, loading and downloading etc.

4.6.3 Main products sold

Again, results from Table 9 showed that cassava flour is sold by 56.4 % of the farmers, 37.6 %of the farmers sold dried cassava *'makopa'* and 5.9 %of the respondents sold buns, biscuit and cakes. Both machine and traditional tools are used to process cassava at farm and homestead before sold.

Cassava flour is mixed with small amount of wheat flour before processed to buns, biscuits and cake in order to improve market quality. Silayo *et al.* (2006) reported that farmers are not aware that their cassava roots can be transformed into various products which are highly demanded in the urban market. Such products are Kababu, buns, 'chapati' chips and bread/cakes.

4.6.4 Buyers of value added cassava

Farmers sell the value added products directly to the consumers; the product sold is flour, dried cassava 'makopa', chips and buns. The kilogram of cassava flour sold for 1000-1500 Tshs, bun and cakes sold for 100-300 Tshs respectively, depending to the size. Table 9 indicated that 80.2 % of the farmers/processors sold the value added cassava to the consumers, 18.8 % of the respondents sold the value added cassava to the retailers and consumers and a small group 1 % sold value added cassava to the retailers. Lastly, farmers said that they sold flour, roasted and fried cassava to retailers and consumer this is done to the nearby market and road side.

Retailers of cassava products interviewed said that their source of cassava products (flour, dried cassava) is from producers/processors. According to them they spent almost 1-3 days to collect the cassava products from producers. The cassava products marketed directly to consumers and hawkers. There is profit from value added cassava, but sometimes transport and storage cost became challenge to their business.

Moreover, 32.0 % of the respondents pack their products after processing in order to add quality and obtain higher market price. The flour is packed in 1kg and sold at the price of 1000-1200 Tshs to the consumers. Gwera (2009) reported that high quality cassava flour (HQCF) can substitute wheat in bread and other bakery products by 10% or 20 %. The dried cassava 'makopa' from graded and standardized roots are sold at Tshs 500-700kg. At village level, although buyers negotiated price with producers on the price, the buyers had more market power and advantage of dictating the prices because producers find it uneconomic for an individual to transport one bag or few bags of cassava to the urban markets.

Table 9: Sell the value added cassava

Sell the value added	Frequency	Percent
Where sell value added .		
At home place	80	66.7
At market place	14	11.7
At the road side	22	18.3
At home place and Market place	4	3.3
Determine selling price		
In advance	91	89.2
At the market place	11	10.8
Main products sold		
Flour	57	56.4
Buns , cake and biscuits	6	5.9
Dried cassava makopa	38	37.6
Buyer of value added cassava		
Retailers	1	1.0
Consumers	81	80.2
Retailers and consumers	19	18.8

4.7 Reduction of Poverty for Smallholder Farmers

4.7.1 Indicators of poverty reduction

Again Table 10 results show that 72.5 % of the respondents said that value added cassava contributed to their income after selling flour, dried cassava, buns and cakes. The income helped them to increase acreages for cassava production, access health, education to their children, clean water, accommodation (type of houses) and improved their livelihood. About 17 % of the respondents said that value added cassava contributes to food security and their livelihood, 10 % respondents revealed that value added cassava contributed both to their income and food security. Raw cassava when peeled, chipped and sun dried can be stored more than six months, and helped the farmers at the time of food shortage.

VEOs from the villages of Kerege and Msata said that cassava is carried out at medium scale and majority of farmers add value to cassava for home consumption and sold small amount of products to get income. The amount of money obtained is used to increased

acreage cultivation, access clean water; improve quality of houses, education for children, health and food security as a basic need for all people and therefore one of the measures of household welfare. VEOs from all surveyed areas conclude that value added cassava is more profitable than raw cassava, but processed at small scale due to shortage of capital to buy processing machine and packaging material.

HQCF has contributed appreciably to cassava industrial revolution especially in Nigeria and Ghana (Sanni *et al.*, 2009), with enormous potentials in the other countries within the sub-region. The product has been found to be suitable for making a variety of pastries, whole or in the composite forms (cakes, cookies, doughnuts and bread) and convenience foods. It is also an acceptable raw material for the manufacture of industrial items such as textiles, plywood, paper, etc (Dziedzoave *et al.*, 2006). The processing of cassava roots into HQCF as a primary industrial raw material has the potential to jump-start rural industrialization, increase market value of cassava and improve farmers' earnings and their livelihoods.

4.7.2 Farmers access to credit

Farmers from the study area said that it is difficult to access credit because microfinance institution needs fixed assets such as houses, land, etc to be pledged with them as security for repayment of loan. From Table 10 results reviled that only 80.2 % of respondent acquired credit from informal savings and credit groups, 18.8 % acquired credit from microfinance institutions and, 1.0 % acquired credit from family and friends. From the findings the problem of accessing credit was due to credit institutions being found at district headquarters thus becoming difficult for the small holder farmers to access the credit. Also in order to have a loan the respondent was required to owned land, house or immovable assets to serve as collateral, which is difficult for many of them.

The respondents said that access to credit will help them to organize in groups and buy modern cassava processing machines, hence raise income and reduce poverty.

Okpukpara (2010) revealed that, in most cases the banks handling the credit fund are found in the city and larger towns, away from the farming community. Accessing such credit for agricultural purposes has proved difficult for small-holder farmers. Worse still, formal banking institutions also demand collateral as a prerequisite of giving loan to rural farmers. This collateral is often in form of land, house or title to some immovable assets. Smallholder farmers in many countries in the region often cannot afford any of the above requirements. The situation is often more difficult when it comes to the women, who in most countries, have no rights to ownership of property including housing and land (Okpukpara, 2010).

If credit is available but cannot be accessed by the smallholder farmers due to the existence of structural rigidities in credit administration, then the needed economic development will not be realized (Anyanwu, 2011).

Table 10: Reduction of poverty for smallholder farmers

Reduction of poverty	Frequency	Percent
Indicators of poverty reduction		
Food security	21	17.5
Income	87	72.5
Income +Food security	12	10.0
Acquire the credit		
Family and friend	1	1.0
Informal saving and credit group	81	80.2
Microfinance institutions	19	18.8

4.8 Food Losses

In the study area food losses occur at postharvest and processing in food supply. According to farmers /processors losses was mostly occurs to the flour than any other cassava products. Surveyed result found that 65.9 % of cassava farmers said losses incurred to the flour is due to spillage during handling, 30.6 % of losses caused by small animals (rodents) and 3.5 % is due to rotting and spoilage. Spillage of flour is a big problem due to the fact that many respondents in the surveyed villages were not able to buy large containers or polythene bags for storage of large quantities of processed flour. They used basket, mats, and plastic bags which is easily destroyed and contaminated with rodents. Another problem observed in the study area was small houses built with muddy and thatched with mats of coconut leaves, dusty floor was also the source of flour contamination.

Food losses take place at production, postharvest and processing stages in the food supply chain (Parfitt *et al.*, 2010). Food losses occurring at the end of the food chain (retail and final consumption) are rather called "food waste", which relates to retailers and consumers behavior (Parfitt *et al.*, 2010).

Table 11: Causes of food losses

Losses incur to the flour	Frequency	Percent
Spillage during handling flour	56	65.9
Rotting/spoilage	3	3.5
Animals (rat)	26	30.6

4.9 Summary

Majority of farmers add value at house hold level. Traditionally cassava is chopped, dried and grinded with stones, mortar and pestle to get flour. Some of the farmers own cassava processing machine, machines owned are cassava chippers which are operated manually.

The common cassava on farm value adding technologies identified in the study area is cassava grating and cassava grinding. Cassava grated into chips after peeling and sun drying to make flour.

Paired samples T-test used to make mean comparison and support full outcome that cassava value added is more profitable than raw cassava. Value added cassava contributed to farmer's income after selling flour, dried cassava, buns and cakes. The income helped them to increase acreages for cassava production, access to health, education, clean water, better housing and improved their livelihood.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The findings of the study indicate that cassava sold in fresh form and added value. At the same time there were markets of value added products in and outside the district. The cassava processing enterprises is profitable although operate on small scales. This suggests that the product was added value partly due to lack of knowledge (awareness) of the potential alternative products among the smallholder farmers, poor access to cassava markets, poor coordination and lack of appropriate technologies for value addition especially processing technologies.

Based on the profit indicators from the study, it can be concluded that flour processing is a profitable business. It is capable of ensuring steady income and employment generation. Moreover, the results indicate that farmers have negative attitude towards the availability market of value added products. In order to exploit these markets there is a nced to promote appropriate cassava processing technologies such as grating, chipping and crashing by educating farmers on these technologies and facilitate acquisition of processing equipment. Also youths should be motivated to participate in cassava production and value addition in order to have better livelihood.

5.2 Recommendations

Based on the fact that cassava crop is still an important staple food in Bagamoyo District whereby it plays an important role in food security and income generation to the rural household level, the following are some of recommendations to improve cassava value addition in the study area.

i) The district council should employ more extension agents so that they teach cassava value addition to smallholder farmers.

ii) Farmers should be motivated to organize themselves through their farmers groups to purchase simple cassava processing equipment.

iii) The district should be a link with financial institutions, Non Governmental Organizations and SACCOS so that smallholder farmers can get loans with low interest.

iv) Adult education should be encouraged and supported by the government to improve on the profit made in the study area since education was significant.

v) Adequate seminars and workshops should be organized for farmers/ processor in order to fill the gap created by inadequate extension services.

vi) Striving for an improved access to market information and transportation are important recommendation. Poor infrastructure, namely transport and communication services, gives rise to large marketing margins because of the high costs of delivering products to destinations. On the other hand, infrastructural development can play an important role in supporting the market of value added cassava, facilitating competition, encouraging investment, and allowing a more efficient allocation of resources.

vii) This is addressed to the local government (Bagamoyo district council)

REFERENCES

Adebayo, K. (2006). *Dynamics of the Technology Adoption Process in Rural-Based Cassava Processing Systems in Southwest Nigeria.* International Foundation for Science, Sweden. 26pp.

Adebayo, K., Lamboll, R. and Westby, A. (2009). Contextualizing environmental, social and behavioral issues in the cassava post-harvest system in Africa. *Anthropologist Special* 5: 137 – 146.

Adeniji, A. A., Ega, L. A., Akoroda, M. O., Ugwu, B. O. and Balogun, A. (2005). Global strategy for cassava development. Nigeria: Utilization potentials of cassava in Nigeria: The domestic and industrial products. *Food Reviews International* 22:29 – 42.

Akingbala, J.O., Oyewole, O.B., Uzo-Peters, P. I., Karim, R. O. and Baccus- Taylor, G.S. H. (2005). Evaluating stored cassava quality in gari production. *Journal of Food Agriculture and Environment* 3: 75–80.

Akinpelu, A. O., Amamgbo, L. E. F., Olojede, A. O. and Oyekale, A. S. (2011). Health implications of cassava production and consumption. *Journal of Agriculture and Social Research* 11: 1 – 118.

Akoroda, M. O. (2007). Cassava production, processing, utilization and technology transfer lessons Cameroon and Nigeria. *African Journal of Roots and Tubers* 40(12): 39 – 42.

Akosua, A. and Bani, R. (2007). Loss Assessment in the Production of Gari from Cassava (Manihot esculenta). *Journal of Food, Agriculture and Environment* 25: 55 – 57.

Akudugu, M. A., Guo, E. and Dadzie, S. K. (2012). Adoption of modern agricultural production technologies by farm households in Ghana: What factors influence their decision? *Journal of Biology, Agriculture andHealthcare2*(3): 1 – 13.

Amanor-Boadu, V. (2002). *Preparing for Agricultural Value-Adding Business Initiatives:* Department of agricultural economics agricultural marketing resource center. Kansas State University, Manhattan. 68pp.

Anyanwu, S. O. (2011). Production efficiency among farm credit and non farm credit users in the smallholder farming systems of Rivers State, Nigeria. *Journal of Agricultural Science* 2(2): 127 – 135.

Armstrong, J. S. (2006). How to make better forecasts and decisions: Avoid face-to-face meetings. *Foresight* 5: 3 – 8.

Ayoade, A.R. and Adeola, R. G. (2009). Constraints to domestic utilization of cassava in Osun State, Nigeria. *Ozean Journal of Social Sciences* 2(2): 83 – 87.

Babaleye, T. (2007). Can cassava solve Africa's food crisis? [http://www.highbeam. com/doc/1G1-139213453.html] site visited on 23/06/2012.

Badrie, N. and Mellowes, W. A. (2007). Cassava starch or amylose effects on characteristics of cassava (*Manihot esculenta* crantz) extrudate. *Journal of Food Science* 57(1): 103 – 107.

Bagamoyo, District Agriculture and Livestock Development Office (2008). *Bagamoyo District Profile*. Bagamoyo, District Council. 39pp

Bailey, D. K. (1998). *Methods of Social Research*. Macmillan Publishers, London.478pp.

BDALDO (2008). *Agriculture and Livestock Development Annual Report of Year 2006/2007*. Bagamoyo, Tanzania. 21pp.

Boland, M. (2009). What is value-added Agriculture? [http:// www.agmrc. org/business_ development/getting_prepared/valueadded_agriculture/articles/index.cfm] site visited on 15/12/2013.

CAADP (2010). Comprehensive Africa Agriculture Development programme. Design and Implementation. [http://www.nepad-caadp.net/pillar-2.php] site visited on 22/5/2013.

Cardoso, A. P., Mirione, E., Ernesto, M., Massaza, F., Cliff, J., Haque, M. R. and Bradbury, J. H. (2005). Processing of cassava roots to remove cyanogens. *Journal of Food Composition and Analysis* 18: 451 – 460.

Cassavabiz, (Undated). Postharvest Equipment. [www.cassavabiz.com] site visited on 15/5/2013.

Cock, J. H. (2001). *New Potentials for Neglected Crops*. Entertainment Co. Ltd., Colorado, USA. 231pp.

Cooksey, B. and Lokuji, A. (1995). *Research and Poverty Alleviation some Practical Research Guideline*. Inter Press of Tanzania Ltd., Dar es Salaam, Tanzania. 54pp.

Cortes, M. L., Garcia-Escudero, V., Hughes, M. and Izquierdo, M. (2002). Cyanide bystander effect of the linamarase/linamarin killer suicide gene therapy system. *Journal of Medicine* 4: 407 – 414.

COSCA (1996). *Production Prospects for Cassava in Tanzania*. COSCA Working paper No. 16. Collaborative study of cassava in Africa. International Institute of Tropical Agriculture and Ministry of Agriculture, Dar es Salaam, Tanzania. 65pp.

Cowan, T. (2002). *Value-Added Agricultural Enterprises in Rural Development Strategies*. The Congressional Research Service. USA. 42pp.

Dziedzoave, N. T., Abass, A. B., Amoa-Awua, W. K. A. and Sablah, M. (2006). *Quality Management Manual for Production of High Quality Cassava Flour*. (Edited by Adegoke, G. O. and Brimer, L. Eds.). International Institute of Tropical Agriculture, Ibadan, Nigeria.68pp.

Egesi, C., Okogbenin, E., Mbanaso, E. and Fregene, M. (2007). Induced mutations and marker-aided breeding for the improvement of root quality traits in cassava. NRCRI. *Umudike Annual Report* 15: 22 – 23.

Ekwe, K.C., Nwakor, F.N., Ironkwe, A.G. and Amangbo, L.E.F. (2008).Building farmers' knowledge in cassava value addition for improved rural livelihoods in abia state: Issues for policy consideration. National root crops research Institute Umudike, Nigeria. *Journal of Agriculture and Social Research* 8: 2 – 9.

FAO (1997). Constraints analysis of post-production sector in Zambia.[http://www. fao.org/News/1997/970508)-e.htm] site visited on 10/4/2013.

FAO (2000). *The World Cassava Economy:* In: Facts, trends and outlook. FAO, Rome, Italy. 46pp.

FAO (2007). FAOSTAT data food and agriculture organization, Rome. [http:www.fao stat.external.fao.org/default.jsp] site visited on 22/3/2013.

FAO (2009). Cassava production for countries by commodities: Food and agricultural commodities production. [www.faostat.fao.org]site visited on 16/04/2013.

FAO (2007b). *Approaches to Linking Producers to Markets.* Rome, Italy. 78pp.

FAO (2012a). *Out Grower Schemes:* Advantages of different business models for sustainable crop intensification, Rome, Italy. 44pp.

FAO (2007). *Cassava Development Strategy for Mozambique.* Research Working Paper No. 11. Commodity and trade Policy, Rome, Italy. 32pp.

FAO (2009). Cassava production for countries by commodities: Food and agricultural commodities production. [www.faostat.fao.org] site visited on 16/04/2013.

GoK (2004). *Strategy for Revitalizing Agriculture 2004-2014.* Ministry of Agriculture and Ministry of Livestock and Fisheries Development. Government Printer, Nairobi, Kenya. 77pp.

Gottret, M. V. and Raymond, M. (1999). An analysis of a cassava integrated research and development approach: *Has it really contributed to poverty alleviation? Paper Presented at CIAT Poverty Workshop. San José. Costa Rica*, September. Centro Internacional de Agricultural Tropical Cali, Colombia. 31pp.

Guzman, T. L. (2004).Cassava granting machine. [http://pdf.usaid.gov/pdf docs/PDA CA538.pdf] site visited on 10/4/2013.

Gwera, M. (2009). Bringing cassava flour to town. [http://www.dailynews.habarileo.co. tz/home/?id=9852] site visited on 17/03/2013.

Hahn, S. K. (2007). An overview of traditional processing and utilization of cassava in Africa. [http://agri.iiri.cgiar.org/library/docs/x5458E/x5458e05.htm] site visited on 16/4/2012.

Healy, M. and Perry, C. (2000). Comprehensive criteria to judge validity and reliability of qualitative research within the realism paradigm. *Qualitative Market Research* 3(3): 118 – 126.

Hoppe, R. (2002). Structural and financial characteristics of US. Family Farm Report. [http://www.ers.usda.gov/publications/aib768] site visited on 13/05/2013.

IFAD and FAO (2000). *Cassava Can Play a Key role in Reducing Hunger and Poverty.* Food and Agriculture Organization, Rome, Italy. 25pp.

Iheke, O. (2008). Technical efficiency of cassava farmers in South Eastern *Nigeria. Agricultural Journal* 3(2): 152 – 156.

IITA, (2002). *Cassava Processing Technologies for Farmers.* International Institute for Tropical Agriculture, Tanzania. 87pp.

IITA, (2004). *Annual Report and Research Highlights.* International Institute for Tropical Agriculture, Ibadan, Nigeria. 88pp.

IITA, (2007). Cassava Overview [http://www.iita.org/cassava] site visited on 26/5/2013.

Ja'afar-Furo, M., Bello, K. and Sulaiman, A. (2011). Assessment of the prospects of value addition among small-scale rural enterprises in Nigeria: Evidence from North-eastern Adamawa State. *Journal of Development and Agricultural Economics* 3(3): 144 – 149.

Joda, A. (2010). Women as agents for development as agricultural entrepreneurs in Adamawa State, Nigeria. *A Paper Presented at the 24th Annual National Conference of the Farm Management Association of Nigeria (FAMAN).* Held at Adamawa State University, Mubi. 11 – 14 October 2010. pp. 24 – 37.

Johnsen, F. H. (2003). *Using Gross Margin Analysis in the TARP 11 Projects.* In: Impact lessons learnt from farmers oriented research news letter. Sokoine University of Agriculture, Morogoro, Tanzania. 21pp.

Kaganzi, E., Engoru, P., Bisaase, D. and Luwandagga, D. (2006). *Sub-sector Analysis of Cassava in Uganda under the VECO-Uganda Atm Programme.* VECO Uganda, Kampala. 112pp.

Kajembe, G. C. and Luoga, E. (1996). *Social-economic Aspect of the Tree Farming in Njombe District.* Sokoine University of Agriculture, Morogoro, Tanzania. 99pp.

Kalu, B. A. (2003). Improving benue state economy on cassava production. A paper presented at the sensitization workshop on cassava production, processing and [Uthttp://www.cd3wd.com/cd3wd_40/cd3wd/Technical%20Briefs/Agro%20Processing%20-%20Crops%20and%20Food/KnO100192_cassava_processing.pdfutilization] site visited on14/3/2013.

Kaplinsky, R. and Morris, M. (2001). A Handbook for value chain analysis Ottawa. *International Journal of Technological Learning* 1(3): 283 – 308.

Kawano, K. (2003). Thirty years of cassava breeding for productivity –biological and social factors for success. *Journal of Crop Science* 43: 1325 – 1335.

Kothari, C. R. (2004). *Research Methodology:* Methods and Techniques (2nd Edition.), Wiley Eastern Limited, New Delhi, India. 468pp.

Laswai, H. (2006). *Improvements and Popularization of Diversified Cassava Products for Income Generation and Food Security.* A case study of Kibabu. In: AJFAND Online, Sokoine University of Agriculture, Morogoro, Tanzania. 10pp.

Laswai, H. S., Silayo, V. C. K., Mpagalile, J. J., and. Balegu, W. R. and Joh, J. (2006) *African Journal of Food, Agriculture, Nutrition and Development* 6: 1 – 5.

Lundy, M., Ostertang,C., Best, R., Gottret, M., Kaganzi, E., Robbins, P. and Ferris, S. (2006). *Rural Agro-enterprise Development Project.* International Center for Tropical Agriculture, Uganda, Kampala, 64pp.

Mikkelsen, B. (1995). *Methods for Development Work and Research.* A guide for practitioners. Sage Publications, London. 296pp.

Mkamilo, G. S. and Jeremiah, S. C. (2005). Current status of cassava improvement programme in Tanzania. *African Crop Science* 7: 1311 – 1314.

Mlingi, N. L. V. (1995). Cassava processing and dietary cyanide exposure. Thesis for Award of PhD Degree Faculty of Medicine, Uppsala University, Sweden, 69pp.

Mlingi, N. L. V. and Bainbridge, Z. (1994). Cassava processing, moisture levels, cyanogens removal. In: Bokanga, M., Essers, A. J. A., Poulter, N., Rosling, H. and Tewe, O. (Eds.), *Proceedings of the International Workshop on Cassava Safety*, 1 - 4 March 1994, Ibadan, Nigeria. pp. 233 – 240.

Mtambo, K. B. (2007). Status and potential of cassava and sorghum in food blending. In: *Proceedings of the National Stakeholders Workshop on Blending Technologies for Cassava/Sorghum with Other Cereal and Tubers*, Held at Kibaha from 13 – 14 pp. 67 – 69.

Nang'ayo, F., Omanya, G., Bokanga, M., Odera, M., Muchiri, N., Ali, Z. and Werehire, P. (2007). A strategy for industrialisation of cassava in Africa. In: *Proceedings of a Small Group Meeting African Agricultural Technology Foundation Ibadan, Nigeria*, 14–18 November 2005, Nairobi, Kenya. pp. 1 – 25.

Nkonya, E. M. and Kato, E. (2001). *Input Marketing in Uganda, Final Report*. IFPRI Mimeo, Washington, DC. 45pp.

Nnadi, F. N. and Akwiwu, C. O. (2006). *RuralWomen's Response to Selected Crop Production Techniques:* In: Global approaches to extension practice, Imo State, Nigeria. 55pp.

Noblen, N. (2002). Cassava Processing. [http://practicalaction.org/cassava-processing] site visited on 25/3/2013.

Nwakor, S. O., Orheruata, A. M. and Ordiah, P. I. (2002). Replacement of maize with cassava sievates in cockerel starter diets: effect on performance and carcass characteristics. Tropical *Animal Health and Production* 34(2): 163 – 167.

Nwakor, F. N., Ekwe, K. C., Amamgbo, L. E. F., Anyaegbunam, H. N. I. and Asumugha, G. N. (2007). *Annual Report of NRCRI.* Umudike, Nigeria. 95pp.

Nweke, F. I. (2003). New challenges in cassava transformation in Nigeria and Ghana. In: *Went, IFPRI, NEPAD, CTA Conference. Success of African Agriculture, Pretoria* 1 – 3 December 2003. 166pp.

Nweke, F. D., Spencer, S. O. and John, K. L. (2002). *The Cassava Transformation African's Best-Kept Secret.* International Institute of Tropical Agriculture, Ibadan. 188pp.

Nweke, F. L., Kapinga, R. E., Ugwu, B. O., Ajob, O. and Asadu, G. L. (1998). *Production Properties for Cassava in Tanzania.* IITA PBM 5320 Ibadan, Nigeria.175pp.

Obisesan, A. (2013). Credit accessibility and poverty among smallholder cassava Farming households in South West, Nigeria. *Greener Journal of Agricultural Sciences* 3(2): 120 – 127.

Okpukpara, B. (2010). Credit constraints and adoption of modern cassava production technologies in rural farming communities of Anambra State, Nigeria. *African Journal of Agricultural Research* 5(24): 3379 – 3386.

Oluwasola, O. (2010). Stimulating rural employment and income for cassava *(Manihot sp.)* Processing farming households in Oyo State, Nigeria through policy initiatives. *Journal of Development and Agricultural Economics* 2(2): 18 – 25.

Omoaka, P. and Bokanga, M. (1993). *Cassava in the Manufacture of Bread and Bakery Products.* International Institute of Tropical Agriculture, Ibadan, Nigeria. 35pp.

Onabolu, A. (2001). Cassava processing, consumption and dietary cyanide exposure. [ftp://ftp.fao.org/docrep/fao/009/x4007e/X4007E00.pdfworldcassavaeconomy] site visited on16/4/2013.

Parfitt, J., Barthel, M. and Macnaughton, S.(2010). Food waste within food supply chains Banbury, UK. *Quantification and Potential for Change* 365: 3065 – 3068.

Phillips, T., Taylor, D. S., Sanni, L. and Akoroda, M. (2004). *A Cassava Industrial Revolution in Nigeria.* The potential for a new industrial crop. IFAD/FAO, Rome. 45pp.

Phiri, C. D. (1991). *An Evaluation of Smallholder Farming System in Chiguluwe Settlement Scheme.* Issue of Africa Rural Development, Malawi. 104pp.

Practical Action, (2013). Cassava Doughnuts. [Error! Hyperlink reference not valid..

Ramirez, L. (2001). *Globalization and Livelihood Diversification Through Non-traditional Crops:* The Mexico case. Overseas Development Institute, London, UK. 4pp.

Ruben, R., Slingerland, M. and Nijhoff, H. (2006). *Agro-food Chains and Networks for Development.* Aad Van Tilburg, Wageningen University. 115pp.

Sailaja, R. R. N. and Chanda, M. (2001). Use of Melaic anhydride grafted polyethylene as compatibilizer for HDPE: - Tapioca starch blends: effects on mechanical properties. *Journal of Applied Polymer Science* 80: 863 – 872.

Sanni, L. O., Onadipe, O. O., Ilona, P., Mussagy, M. D., Abass, A. and Dixon, A.G.O.(2009).*Successes and Challenges of Cassava Enterprise in West Africa:* A case study of Nigeria, Benin and Sierra Leone. International Institute of Tropical Agriculture, Ibadan. Nigeria. 11pp.

Sarris, A., Savastano, S. and Christiaensen, L. (2006). The role of agriculture in reducing poverty in Tanzania: *A Household Perspective from Rural Kilimanjaro and Ruvuma. Paper Presented in CSAE Conference*, 21 – 26 March 2006, CTD/FAO, Rome. 17pp.

Sarris, A., Savastan, S. and Christiaensen, L. (2006). *The Role of Agriculture in Reducing Poverty in Tanzania:* A household perspective from rural Kilimanjaro and Ruvuma. 19pp.

Scott, J., Rosengrant, M. W. and Ringley, C. (2000). *Roots and tubers for the twenty-first* for the *21st century*: Trends, projections and policy options. Food, agriculture and environment Discussion Paper No. 31. International Food Policy Research Institute, Washington, DC.

Sewando, P. T. (2012). Urban markets-linked cassava value chain in Morogoro rural district, Tanzania. *Journal of Sustainable Development in Africa* 14: 3 – 7.

Silayo, V.C.K., Laswai, H.S., Mpagalile, J.J., Balegu, W.R., Mtunda, K.J., Chilosa, D.N., Nyborg, I.L.P. and Makungu, P.J. (2001).*Development and Promotion of Improved Processing, Packaging and Storage of Sweet Potato and Cassava for Diversification of Use and Commercialization of the Value Added Products Under Smallholder Farmer Conditions*. PRA Report for Participating Villages of Songabatini, Muheza, Magindu, Kibaha and Ihenje Kilosa. 67pp.

Singleton, R.A., Stait, B. and Straits, M.M. (1993).*Approaches to Social Sciences*. Oxford University Press, Oxford, UK. 572pp.

Stemler, S. (2001). An overview of content analysis. *Practical Assessment, Research and Evaluation*7: (17).

Tewe, O. O. (2004). The global cassava development strategy: Cassava for livestock feed in Sub-saharan Africa, FAO and IFAD [http://www.fao.org/docrep/ 007/j1255e/ j12 55e 04.htm#bm04.1] site visited on 12/6/2013.

Tivana, L. D. (2012). *Cassava Processing Safety and Protein Fortification*. Department of food technology, engineering and nutrition faculty of engineering. LTH Lund University, Sweden. 112pp.

Turuka, F., and M. Kilasara. (2002.) Determinants of Use In Smallholder Agriculture in Tanzania and Policy Implications. *In* Assessment of the Fertilizer Sub-Sector in Eastern Africa and the Strategic Planning of a Regional Project to Improve Availability, Acess and Utilisation, Workshop Report, East and Central AfricaProgramme for Agricultural Policy Analysis, Entebbe, Uganda.

Ukpongson, M. A., Chikaire, J., Anaeto, F. C., Nwakwasi, R. N., Aja., O. O and Ike, C. L. (2011) Effects of cassava processing and value added products on sustainable poverty alleviation in Ikwuano Area of Abia StateNigeria. *New York Science Journal* 5: 73 – 77.

URT (2005). *National Strategy for Growth and Reduction of Poverty.* Government Printer, Dar es Salaam, Tanzania 4pp.

Van der Land, H. and Uliwa B, (2007). Cassava sub sector/value chain analysis, match maker associates. [http://www.Thckilim otrust.org/option. com_ docman &doc_ vib ew&gid=11] site visited 20/04/2012.

Vessia, A. (2007).Cassava: the Food of the Poor for Future Food Security, http://www.newsfood.com/q/6333/cassava_the_food_of_the_poor_for_future_fo od_security/ site visited on 3/4/2013

Westby, A. (2008). *Cassava Utilization, Storage and Small-Scale Processing.* (Edited by Hillock, J. T. and Belloti, A. C.), *Cassava biology, production and utilization.* CABI Publishing, Oxon, New York.

World Bank (2002). Participation in interim poverty reduction strategy papers. A review by the participation and civic engagement group. [www.worldbank.org/ participation] site visited on 24/6/2013.

Zvauya, R., Ernesto, M., Bvochora, T., Tivana, L. and Francisco, J. C. (2002). Effect of village processing methods on cyanogenic potential of cassava flours collected from selected districts of Nampula Province in Mozambique. *International Journal of Food Science and Technology* 37: 463 – 469.

APPENDICES

INTERVIEW SCHEDULE FOR THE CONTRIBUTION OF CASSAVA VALUE ADDITION ON REDUCTION OF POVERTY FOR SMALLHOLDER FARMERS IN BAGAMOYO DISTRICT

Appendix 1: Farmers (producer's) questionnaire

Dear Respondent,

My name is Batuli Nyangassa, a Master student at Sokoine University of Agriculture. I am conducting a study on the contribution of cassava value addition on reduction of poverty for smallholder farmers. The purpose of this study is to investigate the extent to which cassava value addition is done. The ultimate goal being to understand the contribution of cassava value addition on reduction of poverty on which planners and policy makers will work on and recommending the way forward for the improvement of the quality of life. Any information collected will strictly be for the use of this study; your assistance is therefore highly appreciated. Please note that the information you provide will strictly be treated with the utmost confidentiality. Thank you.

SECTION A: BACKGROUND INFORMATION

(i) Questionnaire No.....

(ii) Date of interview.....

(iii) Interviewer's name.....

(iv) Farmer's name.....

(v) Village.....

(vi) Ward.....

(vii)Division .....

(viii) District.....

(ix) Region.....

SECTION B: RESPONDENT CHARACTERISTICS

1. Age of respondents ..... (Years).

2. Sex.....

1= Male 2= Female

3. Marital status.....

1= Single 2= Married 3= Separated 4= Divorced

4. Education level.

1= Primary school education 2= Secondary school education 3= Adult education

4= Post secondary education 5= College/University education.

5. What is the size of your household (Number).....

Household composition

Age group (years)	Male	Female	Total
Below< 5			
6---18			
19---50			
Above 50			

6. Occupation/Main source of income.....

1= Crop farming 2= Livestock keeping 3= Fishing 4= Employment 5= Business

6= Both 1&2 above

7= Others (specify).....

7. What is your estimated household income per month?.....

1= Below 120 000 2= 120 000-200 000 3= 200 000-400 000

4= 400 001- 600 000 5= 600 001-800 000 6 = Above 800 000

SECTION C: CASSAVA PRODUCTION

8. Do you own a farm.....?

1= Yes 2= No

9. If yes, how many (Farm size) hectares/acreage.....

10. How many hectares/ acreage for cassava production.....

11. What types of cassava do you grown? .....

1= Sweet variety only 2= Bitter variety only

3= Both sweets and bitter varieties

12. How long have you been cultivating cassava?

(1)= Less than I year (2)= 1-2 years

(3)= 3-4 years (4)= 5-6 years (5)= Over 6 years

13. How many days in a week do you harvest cassava?

(1)=1- 2 days (2) = 3-4 days

(3) =5-6 days (4) =everyday

14. What amount of cassava do you harvest in a week?

(1)=Less than 5 bags (2) =5-10 bags

(3)= 11-20 bags (4) Above 20 bags

15. Do you store raw cassava before selling?

(1) =Yes (2) = No

16. If yes, how many hours do you store raw cassava?

(1)= Less than 12 hours (2)= 12-24 hours

(3)=Above 24 hours (4)=Others specify

17. Which method do you use to store raw cassava?

(1) =Bury in the soil (2) = Store in the bags

(3) = spread on the open space (4) = others (specify)

18. At what price do you sell raw cassava according to the package?

(1) =Tshs.....per/kg

(2)=Tshs.....per/bag of.....kg

Objective 1: Cassava value addition activities in the study area

19. What Value addition activities do you carry after harvesting?

(1)= Grading cassava in size (2) =Flour making

(3) = Washing cassava before and after peeling

(4) = Chopping and sun dried cassava to reduce moisture content "Makopa''

(5)=Others (specify)

20. Which value addition activities do you prefer most?

(1).....

(2).....

(3).....

(4).....

21. Do you own any transport?

(1) = Yes 2 = (No)

22. If yes, which type of transport do you own?

(1) .....

(2) .....

(3) .....

Objective 2: Cassava on farm value adding technologies

23. What are the main on farm value adding technologies do you carry on cassava?

(1) = Cassava milling (2) = Cassava grating

(3) = Cassava grinding (4) = others (specify)

24. Do you have cassava processing machine?

(l) =Yes (2) = No

25. If yes, how do you own it?

1=As individual (2) = As group (3) = Specify (others)

26. How do you get the machine?

(1) = Purchasing (2) = Loan (3) = Gift

(4) = Hired (5) = Others(specify)

27. If purchased, how much does/did it cost you?

Tshs ....:.....per/machine

28. Which type of machine do you own?

(1) = cassava chipper (2) = cassava miller

(3) = cassava grinder (4) = others (specify)

29. Processing at what stage?

(1) = Flour (2) = cake and buns

(3) = chips (4) = Starch (5) = Other (Specify)

30. What cost incurred during processing

Items	Unit	Cost/Unit(Tshs)
Inputs (e.g. tools/equipments, packaging materials, drying material and water)		
Labour hired for processing cassava product		
Others (specify)		

31. Do you pack your cassava product?

(1)=Yes (2) = No

32. If yes, which packing material do you use?

(1)=Plastic bag (2)= Paper bag (3)= Polythene bag

(4)= Containers (5)=Others specify

33. Do you have access to credit?

(1)=Yes (2) =No

34. If yes, where do you acquire credit?

(1)= Family and friends (2) =Informal saving and credit groups

(3)= Microfinance institutions (4) = Commercial Banks

(5) =Others (specify)

Objective 3: The profitability of value addition in cassava production

35. Do you sell the value added cassava?

(1) =Yes (2) = No

36. Do you get any profit after selling cassava product?

(1)=Yes (2)= No

37. If yes, how much do you sell the bag of graded and standardized cassava?

Tshs.....per/kg

Tshs.....per/bag

38. At what price do you sell your packed product?

(1)= Tshs /per kg.....

(2)=Tshs/per bag of less than 5kg.....

(3)=Tshs /per bag of 10 kg and above .....

(4)=Others (Specify).....

39. If yes, what is the Total revenue?

(1)= Tshs.....per/week (2)= Tshs.....per/month

40. What other marketing costs do you incur?

Cost Item	Unit	Cost/Unit(Tshs)
Storage		
Transport		
Labour hired for loading cassava product		
Labour hired for downloading		
Others (specify)		

Objective 4: Contribution of value added to the livelihood

41. Where do you sell the value added cassava?

(1) = At the home place (2) = At the market place

(3) =At the road side (4)= Other (Specify)

42. How do you determine the selling price for the value added cassava?

(1) = In advance (2) = at the market place (3) = others (specify)

43. What other cassava based value added products do you sell?

(1) = Flour (2) = Burns and cake (3) =Dried cassava "Makopa''

(4)=None of the above (5) =Others (specify)

44. To whom do you sell the value added cassava?

(1) = Processors (2) = Wholesalers (3) = Retailers (4) Consumers

45. Indicators of poverty reduction

(1)= Access to education (2) =Access to health

(3) =Access to safe water (4)=Food security

(5) = Income (6) Accommodation (type of houses)

46 .What kind of losses do you usually incur to the cassava product?

(1) =Spillage during handling (flour) (2) =Rotting/spoilage (3) =Theft

(4)=Adulteration (5) = others (specify)

THANK YOU FOR YOUR TIME

Appendix 2: Checklist of cassava Processor's

Name of processor .....

Sex.....

Occupation.....

Village.....

Ward.....

District.....

Date.....

1. When do you start to process cassava?
2. What cassava products do you process?
3. Who is the consumer's of your product?
4. At what price do you sell your cassava product according to package?
5. What other marketing costs do you incur in marketing cassava product?
6. What are the main problems that you encounter in processing marketing?
7. Generally, how do you view cassava processing?

THANK YOU FOR YOUR TIME

Appendix 3: Checklist of cassava consumer's

Name of consumer .....

Sex.....

Occupation.....

Village.....

Ward.....

District.....

Date.....

1. Where/ from whom is the source of cassava?
2. At what price do you buy cassava Tsh..... / kg / bag.
3. Do you consider the buying price affordable?
4. What do you look for when buying cassava?
5. In your own opinion how is the quality of cassava that you buy?
6. Do you buy value added cassava?
7. What cassava value added product do you prefer?
8. Do you add value to the cassava?
9. Which cassava products do you make?
10. What are your main substitutes for cassava?
11. During which months does cassava become scarcity
12. In your own opinion what needs to be done to improve cassava quality, trade and processing .....

THANK YOU FOR YOUR TIME

Appendix 4: Checklist of Wholesaler/Retailer

Name of wholesaler/retailer.....

Sex.....

Occupation.....

Village.....

Ward.....

Region.....

Date.....

1. Are you wholesaler/retailer of cassava?
2. How long have you been in cassava trade?
3. Do you trade in this market only?
4. What is the source of your cassava?
5. At what price do you buy cassava? Tsh..... /kg/bag/tonne
6. How long does it take to collect cassava from your buying point?
7. What value added product do you sell?
8. Where/to whom do you sell your produce?
9. At what price do you sell your cassava presently?
10. What other marketing costs do you incur in marketing cassava?
11. Do you have access to credit?
12. What are the main problems that you encounter in cassava marketing?
13. Generally, how do you view cassava marketing?

THANK YOU, FOR YOUR TIME

Appendix 5: Checklist of Key Informants

Name of key informant.....

Sex.....

Occupation.....

Village.....

Ward.....

District.....

Date.....

1. For how long have you been in this village?
2. To what extent cassava production is carried out in this village?
3. What are the value addition activities carried by smallholder farmers?
4. At what extent cassava value addition contributes to reduction of poverty to household level?
5. Are there any groups or association of farmers concerning cassava value addition marketing in this area?
6. Do you think at what extent the government is fully supporting cassava small holder in value addition activities?
7. What causes leading to low cassava processing in this village?
8. What do you think is the better way to improve cassava value addition?

THANK YOU FOR YOUR TIME

Appendix 6: Checklist for DALDO's Office

Confidential

Research topic: the contribution of cassava value addition on reduction of poverty for smallholder farmers in Bagamoyo District.

Name of officer.....

Sex.....

Designation.....

District.....

Region.....

1. For how long have you been in this district?
2. To what extent is cassava production is carried out in this district?
3. What is the value addition activities carried out by smallholder farmer in this district?
4. To what extent does cassava value addition contribute to reduction of poverty at household level?
5. Are there any groups or association by farmers concerning cassava value addition and marketing in this district?
6. To what extent is the government fully supporting cassava smallholder in value addition activities?
7. What are the factors hindering cassava processing in the district?
8. What do you think is the better way to improve cassava value addition?

THANK YOU FOR YOUR TIME