VALUE CHAIN ANALYSIS FOR CASSAVA IN THE EASTERN ZONE OF TANZANIA

BY

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ABSTRACT

A study was conducted in the Eastern zone of Tanzania to evaluate the existing value chain for cassava using the Profit Margin and Sustainable Livelihood Approaches. Data were collected using a structured questionnaire and Participatory Rural Appraisal (PRA). The results of analysis showed that cassava was marketed mainly as a fresh root, dry roots/chips and cassava flours. The analysis of livelihood assets revealed that PANTIL project farmers had more favourable livelihood portfolios than their counterpart non-PANTIL project farmers. The former owned significantly larger land holdings than the latter farmers ($P \leq 0.05$), averaging at 2.4 versus 1.7 ha, respectively. When human capital was evaluated using the proxy of average years of schooling for family members aged 25 to 64 years, the results showed statistically significant higher portfolios of human capital for PANTIL project farmers than non-PANTIL project farmers ($P \leq 0.05$). The difference in human capital measured in terms of Adult Labour Equivalent was not significant ($P \leq 0.05$). The PANTIL farmers had also adopted more cassava processing technologies than the non-PANTIL farmers ($P \leq 0.05$). The former farmers obtained higher net margins than the latter (a mean difference of Tshs 129 919 which was significant at $P \leq 0.05$). The study recommended that the government should help facilitating the introduction and adoption of appropriate technologies that can reduce labour bottlenecks and enhance cassava production, processing, marketing and utilization. The opportunity for processing enterprises must be identified based on the existence of viable market opportunities and the financial aspects of technology acquisition (affordability) and operation should be taken into account.

DECLARATION

I, Pudensiana Hipolity Njau, do hereby declare to the Senate of Sokoine University of Agriculture, that this dissertation is my own original work and has not been or concurrently being submitted for a higher degree award in any other University.

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ACRONYMS AND ABBREVIATIONS

AALE	-	Average Adult Labour Equivalent
COSCA	-	Collaborative Study of Cassava in Africa
EEC	-	European Economic Community
FGD	-	Focus Group Discussion
GM	-	Gross Margin
IITA	-	International Institute of Tropical Agriculture
ILCA	-	International Livestock Centre for Africa
Kg	-	Kilogramme
N	-	Sample size
NGO	-	Non Government Organization
OECD	-	Organization for Economic Co-operation and Development
PANTIL	-	Programme for Agricultural and Natural Resources Transformation for Improved Livelihoods
PRA	-	Participatory Rural Appraisal
SLA	-	Sustainable Livelihood Approach
SME	-	Small and Medium scale Enterprises
SPSS	-	Statistical Package for Social Science
SUA	-	Sokoine University of Agriculture
TCE	-	Transaction Costs Economics
TLU	-	Tropical Livestock Units
Tshs	-	Tanzanian Shillings
VCM	-	Value Chain Management

CHAPTER I

1.0 INTRODUCTION

1.1 Background

Cassava (*Manihot esculenta* Crantz) is a staple food crop cultivated in several parts of developing countries. Globally cassava is grown in an area of about 18.51 million hectare with an annual production of 202.65 million tonnes and productivity of 10.95 tonnes per hectare (Srinivas and Anantharaman, 2005).

Cassava is renowned for its very high starch content and it can grow even in areas with marginal rainfall with possibility of contributing greatly to household food security and improvement of livelihoods of the rural poor. Recognising this, policy makers and other governmental and non-governmental bodies have insisted in the past to grow cassava as a food security crop. Yet, there exists disgrace for some people in the country to look upon cassava as a poor man's crop and hence, little appreciation is given to its role in poverty alleviation. Little research has been done to identify the "opportunity windows" for adding value in the supply and marketing chains for the crop, particularly in the rural areas of Tanzania. The available processing technologies for cassava are generally poor for most parts of the rural areas in the country, which is considered a stumbling block to value addition.

Processing is important and can generally be an indispensable intermediary intervention not only for increased cassava production but also increased utilization

and marketing of cassava products. The entry point in improving production and marketing of cassava in the country is therefore that of undertaking research to assess the performance of the existing value chain for the crop. Alongside with this is the analysis of the extent to which cassava products are differentiated along the chain (e.g. through processing) and an identification of the factors that influence the performance in the value chain.

1.2 The study area and origin of the research idea

This study was conducted in Kibaha, Muheza, and Handeni districts covering the villages of Mkongeni, Tongwe, and Kabuku Nje respectively. The three villages were among the four villages covered by the PANTIL (Programme for Agricultural and Natural Resources Transformation for Improved Livelihoods) project entitled "Improvement of Cassava Production, Processing, Utilization and Marketing for Economic Growth and Improved Livelihood in the Eastern Zone of Tanzania" – the project which funded the fieldwork in this study. The overall goal of this project was to increase economic growth, reduce poverty and improve the wellbeing of Tanzanians through transformation of cassava production, processing, utilization and marketing. The main objective was to improve and scale-up cassava production, processing, utilization and marketing in the Eastern zone of Tanzania through the use of existing and improved technologies. The specific objectives were to: a) assess existing village-level livelihood strategies and plan with farmers the entry levels of research and dissemination, b) improve production of cassava, c) introduce and popularise the requisite post-harvest technologies in collaboration with farmers, extension agents and other stakeholders on use of various production and post-harvest

technologies for cassava in order to improve household food security and commercialisation.

One of the activities that the project undertook include the introduction of suitable and appropriate versions of chipping and grating machines for the production of chips for both food and livestock uses, grates and starch, as well as the introduction of the accompanying drying, packaging and storage methods.

PANTIL is a programme which was launched in November 2005 and is funded by the Norwegian Government under an agreement between the Governments of the United Republic of Tanzania and the Kingdom of Norway. The development objective (goal) of the project is stated as: "contribution of Sokoine University of Agriculture (SUA) to attain increased economic growth, reduced poverty and improved social wellbeing in Tanzania through transformation of the agricultural and natural resources sectors". The project purpose is to "target beneficiaries, including small and medium scale producers, the rural poor, women and SUA graduates to ensure that they have better access to agricultural and natural resources knowledge and technologies for increased income and other benefits.

The MSc research idea (evaluation of the existing value chain for cassava in the Eastern zone of Tanzania) originated from the recognition that for sustainability of cassava production and the subsequent activities, a favourable marketing situation is required. This study was therefore done in order to evaluate the performance of the value chain for the crop, identify the weaknesses and suggest ways to improve them and help establishing or strengthening linkage between farmers and

consumers/processors within and outside the country.

1.3 Problem statement and justification of the study

Cassava, by virtue of its diversified uses, may serve as an important commercial crop of the agrarian economy in the tropics and in most other developing countries if the drawbacks (inefficiencies) in the current value chains are addressed. An unorganised (inefficient) value chain often results in low producer prices, exploitation of producers by middlemen and low market share for farmers. The need of the hour is therefore, to undertake research to assess the performance of existing value chains for cassava, identify weaknesses and pinpoint the sources of imperfection in these value chains.

Generically, the marketing chains for cassava and its value added products are very often viewed as poorly organized in developing countries (Griffon, 1995) and they have not received much attention from the research and development agenda (Nweke, 1994; IITA, 1997). Closely encompassed in this snag and possibly more important with regard to the generic phenomenon of modernised agriculture is the current insistence on production of high value crops to improve farm income and living standards of the rural poor.

Knowledge on how the markets for cassava and its value added products are structured, how different functionaries are carried out in channelling the products from producer to consumer, price spread, marketing efficiency, demand-supply gaps and trade opportunities is important for informing effective policy making. Currently,

this knowledge is not readily available. Little is known about the performance of the different actors in the value chain for cassava and the extent to which the crop is differentiated into different products along the chain, particularly in Tanzania. Just as important, little is also known about the factors that influence the performance of various actors in the value chain. Research is therefore needed to inform policies and strategies to promote cassava production, processing, marketing and utilization. This study was therefore an attempt to fill this gap using the case of the Eastern zone in Tanzania.

1.4 Objectives of the study

1.4.1 General objective

The main objective of this study was to analyse the performance of existing value chain for cassava in Tanzania using the Eastern zone of Tanzania as a case.

1.4.2 Specific objectives

The specific objectives of the study were:

a) To evaluate the operation of existing cassava value chain in the study area,

b) To evaluate livelihood assets and types of cassava processing technologies adopted by PANTIL and non-PANTIL project farmers,

c) To evaluate marketing efficiencies for different participants in the value chain for cassava in the study area, and

d) To identify the major problems and constraints facing the actors in the value chain for cassava in the study area.

1.5 Hypotheses

The following hypotheses were put forward for the study:

a) There is significant difference in the value of livelihood assets between PANTIL and non-PANTIL project farmers,

b) There is significant difference between the use of improved technologies (type of technology) by the PANTIL and non-PANTIL project farmers, and

c) There is significant difference in the marketing efficiency (profit margins) between the PANTIL and non-PANTIL project farmers.

1.6 Organisation of the remainder of the dissertation

The remainder of this dissertation is organized into four main chapters. The next chapter presents a review of different literature related to the subject under study. This is followed by the conceptual framework of the study and methodology used in the study. Following the conceptual framework and methodology is the result and discussion chapter which presents and discusses the results of analysis. The dissertation winds up by summarizing the key findings, concluding remarks and recommendations emanating from the study.

CHAPTER II

2.0 LITERATURE REVIEW

2.1 Overview

This chapter presents a review of literature related to the concept of value chain, including the concepts of value chain analysis, performance and development of value chains, as well as market performance. The chapter also provides a review of the origin of cassava in Africa, cassava production, marketing and utilization and human capital.

2.2 The concept of value chain

The concept of "value chain" is defined differently by different authors. Kaplinksy and Morris (2000) define "value chain" as the "full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers and final disposal after use."

Steven and Pirog (2006) define the term "value chain" from a food supply chain perspective (i.e. value added) or viewpoint of a food product which has been converted from raw product, through processing resulting in a different product form and hence incremental value in the market place.

A different definition is provided by Kaplinksy and Morris (2000) who define the 'value chain' as the "full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services). delivery to final consumers and final disposal after use."

Another definition is given by Sturgeon (2001) who defines 'value chain' as a "chain of productive activities - the vertical sequence of events leading to a delivery. consumption and maintenance of goods and services." Sturgeon (2001) argues further that various value chains often share common economic actors and vary according to the organizational scale of activities. Bringing in the aspect of organizational scale, Sturgeon (2001) redefines 'value chain' as "the sequence of productive (i.e. value – added) activities leading to and supporting end use." According to Sturgeon (2001). value chains have three dimensions, which are organizational, spatial and the type of actors involved (production actors).

From the organizational viewpoint, value chains are either - complex and dynamic or simple depending on their sustained supply of a variety of critical inputs (i.e. human resources requirements, capital equipment and services) (Sturgeon, 2001). The second dimension (spatial) springs from an understanding that some value chains have wide coverage – some may operate at international levels. These latter chains are sometimes referred to as 'global commodity chains' (Gerreffi, 1999). The third dimension of the value chain involves the production actors or firms that participate in the chain. According to Sturgeon (2001), these actors can be producers (in case of agricultural production value chain), suppliers, retailers/wholesalers, or lead firms.

The term 'value chain' can also be defined from a food supply chain's perspective: 'value added' considered as a food product which has been converted from raw product, through processing resulting in a different product form and hence incremental value in the market place (Steven and Pirog, 2006). Furthermore, the words 'value' and 'values' are used to characterize the nature of business relationships among interacting food business enterprises and these value-based relationships are then called 'value chains' (*ibid*).

2.2.1 Value chain analysis

Due to the current changes in the global economic situations resulting from the development of biotechnology, information and speed of communication and technological development, agility and value creation are increasingly becoming the critical components of industrial and business competitiveness (Mudimigh *et al.*, 2004). Consequently, business organizations have to make quick decisions and find ways to minimize production costs. Producers, for example, are forging relations with suppliers to make sure that they minimize costs and hence adopt the new concept of 'value chain management (VCM)' in order to remain competitive (*ibid*). According to Kristen *et al.* (2004), value adding and cost reduction processes are key variables in contributing to a competitiveness of an entire value chain.

The concept of 'value chain management (VCM)' refers to an organized system of exchange from production to consumption and it is also about linkages generating value for the customers (Asian Development Bank, 2006). According to the Asian Development Bank (2006) the features of a value chain include coordination,

governance, meeting consumer demand and becoming competitive. From the competitive point of development and sustainability, VCM can be explained by theories of the firm such as the 'transaction costs economics (TCE)', 'resource dependency theory', 'organizational theory and relationships marketing (Das and Teng, 2000; Kristen, *et al.*, 2004).

2.2.2 Performance and development of value chains

The performance and development of value chains are reflected in how best these chains are operated. According to Mulani and Lee (2002) the best practice in supply chains depends on the ability of the chain leader to win the loyalty of customers and use modern/appropriate technology to meet their demands. As clearly explained by Hilderbrand (1998), the performance of value chains is mainly attributed to the way in which the chain is governed – including issues related to institutional arrangements and relationships that are built between the buyers and suppliers.

In nutshell, technology, chain governance, chain organization, knowledge management and marketing relationships are important factors that influence the performance and development of value chains.

2.2.3 Market performance

Market performance refers to the impact of structure and conduct in terms of variables such as prices, cost and volume of outputs (Hilderbrand, 1998). By analysing levels of marketing margins and their cost component it is possible to

evaluate the impact of the structure and conduct characteristics on market performance. It is generally acknowledged that a distribution system displaying acceptable performance is the one that allows technological progress, has the ability to adopt, innovate and utilize resource efficiently and to transmit prices that reflect costs (OECD, 1982).

Common indicators of performance are trends in retail prices, level of stability of farm prices and income spread of marketing margins, marginal propensity to consume and farmers' share of the consumers' shilling or profit. Analysis under this concept normally includes evaluation of operational, technical and pricing efficiency.

2.2.4 Marketing efficiency

An efficient farm marketing system is an important means for raising the income levels of farmers and for promoting the economic development of a country. The farmers allocate their resources according to their comparative advantage and invest in modern farm inputs to obtain enhanced productivity and production. This in turn, contributes to increased market surplus of farm products and increased interregional trade. Hence policies to improve the efficiency of cassava marketing would have a self-accelerating effect on productivity of cassava. However, as argued elsewhere in the literature (Raju and von Oppen, 1982), before formulating any such policies, it is necessary to find out the degree to which the existing value chain can be "efficient" and also to identify and quantify the impact of relevant factors that determine efficiency of marketing system, so that improvements can be directed towards factors which are crucial in determining efficiency.

2.2.5 Measures of marketing efficiency

Generally marketing efficiency is measured in two ways: a) operational efficiency and b) pricing efficiency. Operational efficiency is measured in terms of marketing costs and marketing margins. It should however be noted that these measures do not provide an absolute measure of overall market efficiency.

Pricing efficiency is measured in terms of correlation of price movements of the same product in separate markets. While such correlations give indications of the degree of integration between markets, they too do not provide an absolute measure of market efficiency. Generally it is accepted that the higher the correlation of prices between pairs of markets for a particular product, the better integrated the markets are for that crop and hence, the more efficient they are operating in terms of price.

2.2.6 Marketing margins as measures of marketing efficiency

Price spreads can be calculated on the basis of two methods: first, by following any specific lot or consignment through the marketing system and then assessing the costs involved at each of the different stages (*time lag method*), secondary, by comparing prices at different levels of marketing at the same point in time (*concurrent method*) and deriving gross and net margins.

The first method (*time lag method*) provides a basis for the measurement of the marketing margin as marketing involves an element of time. However, because it is very difficult and time-consuming to pursue a particular lot through various stages of marketing, and because a single saleable lot at the final stage of marketing is divided

into a series of purchases at different times, at different rates and sometimes of varying qualities, the time lag method is not practical.

The second method (*concurrent method*) commonly used is not always reliable as it does take into account the time lag between purchase and sale of the produce and therefore it does not measure separately the profits earned by traders on account of their arbitrage operations over time.

For this study the concurrent method was used. The survey was conducted in selected markets where the marketing channels for cassava and its value added products were found to run from producer to consumer, through middlemen (i.e. wholesalers and retailers).

The net price received by the farmer was calculated by deducting the marketing costs from the original price paid to the farmer by the middleman (wholesaler trade). Net margins were calculated by subtracting the sum of all operating costs from gross margins.

2.3 Description of the product under study

2.3.1 Origin of cassava

Cassava is one of the most important food crops of sub-Saharan Africa. It is grown throughout the tropics including Asia and Latin America. The five main producers are Nigeria, Brazil, Thailand, Zaire and Indonesia, which together account for 63% of the total world production of 120 - 130 million tons of fresh roots per year (Ihemere,

2003). The roots are the primary plant part consumed and store abundant amounts of starch. They provide a valuable source of cheap calories for about 500 million people, many of whom are subsistence farmers (*ibid*). In addition, cassava leaves and tender shoots are eaten as a vegetable in many parts of Africa and are an excellent source of vitamins, minerals and protein. Although most cassava is consumed by humans, it is also used in the production of ethanol for fuel, for animal feed, and as a raw material for the starch industry.

Cassava's high photosynthetic rate, ability to grow on poor soils and its resistance to many pests and herbivores due to the presence of cyanogens make it an ideal crop for subsistence farmers. Furthermore, cassava is largely propagated clonally making it an ideal plant for improvement through genetic engineering.

Botanical, genetic and archeological evidence supports the South American origin of cassava, pointing to the Amazon region as the center of cassava domestication (Olsen and Schaal, 1999). Scientists have attempted to determine the geographical and evolutionary origin of cassava by taking advantage of the high DNA sequence variation in the non-coding regions (introns) of the glyceraldehyde 3-phosphate dehydrogenase (*G3pdh*) gene (Ihemere, 2003). Olsen and Schaal (1999) used this technique to demonstrate that cassava was domesticated from wild *M. esculenta* populations along the southern border of the Amazon basin.

Portuguese navigators took cassava with them from Brazil to West Africa in the 16th century (Jones, 1959) then later to East Africa (Jennings, 1976). Even though cassava was grown in Fernando Po in the Gulf of Benin and around the Congo River in the

16th century, cassava's dispersal into West Africa did not take place until the 20th century (Ihemere, 2003). Cassava was initially grown mainly in the coastal areas of Africa. The inland spread of cassava cultivation was by African traders who were drawn to cassava for its fabled characteristic of providing security against famine. Cassava is now grown in most African countries especially south of the Sahara desert.

2.3.2 Importance of cassava

Cassava and its products have a significant social and economic role in most developing countries, including Tanzania. The crop is perceived as a catalyst for development because of its contribution to food security, poverty alleviation, improvement in income distribution and gender equity (Ihemere, 2003). It 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 crops.

The development of the value chain for cassava is considered as an effective means to promote social and economic development, especially in developing countries for a number of reasons. Firstly, the cassava market is generally perceived to be attractive. Cassava is a competitive crop especially for the production of starch and animal feed (Ihemere, 2003).

Secondly, the productivity of cassava can be increased significantly since the potential yield and value of cassava have not been fully achieved. By using better planting material and improving input management, the productivity of cassava could be doubled. Moreover, improvements in quality, processing and product marketing

could increase the value of cassava products by about 20% (Ihemere, 2003).

Thirdly, cassava is well known as an endurable crop, especially towards climate and soil conditions. It can grow in places where cereals and other crop do not grow well. It can tolerate drought and can grow in low nutrient soil (*ibid*).

In a nutshell, cassava is a potential crop for farmers, particularly in developing countries because:

a) Cassava can be grown in difficult environmental conditions characterized by low or extreme rainfall and infertile, poor, sandy soil.

b) Cassava is a simple crop to maintain as it has no definite maturation point and can therefore be left in the ground from seven months to two years after planting and then harvested as needed. In addition, it can recover from pest damage and diseases.

c) Cassava provides an opportunity to improve rural dwellers income by opening up marginal lands for cultivation.

d) Cassava provides farmers with flexibility to opt for more capital intensive, efficient practices can be completely manual, partially mechanised or animal powered, especially mechanized or animal powered, especially in terms of land preparation

e) Cassava is a labour intensive crop to harvest and as a result can provide employment to unskilled labour in rural areas.

f) Cassava is highly perishable, bulky crop and must therefore be processed before it is transported, which opens up opportunities for small scale farmers to get involved in producing simple, value added products.

g) Cassava has a wide range of applications, ranging from food products to industrial starches. The processes required to produce the products vary in complexity, which gives different parties the flexibility to pursue markets that suits their skills and resource base.

2.3.3 Cassava production

Although cassava is native to the Amazon region, Africa now produces more cassava than the rest of the world. Africa's largest producers of cassava are Nigeria (35%), Democratic Republic of Congo (19%), Ghana (8%), Tanzania (7%) and Mozambique (6%) (Ihemere, 2003). IITA (1997), cited by Ihemere (2003) reports that the top producers in Africa have increased their production greatly in the past two decades especially Nigeria (22% - 35%) and Ghana (4% - 8%). Other countries are on the decline.

The increase in production of cassava has come as a result of an increase in the area of land cultivated as opposed to an increase in yield per hectare. Total yields have increased by 33% in the past two decades while the cultivated land for cassava increased by 70% during the same time period (*ibid*). In Africa, cassava yield per hectare declined 1.2% to 0.6% in the past decade. Only Ghana has increased yield in the early to mid 1990s. According to the survey conducted by Collaborative Study of Cassava in Africa (COSCA), funded by Rockefeller Foundation, the main reason for the increase in cultivation is response to famine, hunger and drought (Kohl and Uhl 1990). This confirms the value of cassava as a security crop (*ibid*).

2.3.4 Cassava marketing

Cassava is often grown as a subsistence crop and little is currently supplied for marketing. Farmers have always been discouraged to produce more due to limited market outlets (Bruinsma, 1999). Stanton *et al.* (1994) identify a number of wholesale markets for agricultural products, but as also argued in Nweke (1994) the markets for root and tuber crops are generally not very well defined. In most cases these crops are marketed in local markets sometimes called local assembly markets or growers markets, which are found, close to the areas of production (Nweke, 1994).

In the local markets, cassava is sold at retail markets and roadside stalls under ambient conditions, often without packaging (Bruinsman, 1999). Operators in these markets are wholesalers, retailers and consumers. The assembling of agricultural products in local markets is the first step in concentrating them at the central wholesale market. This operation is necessary because it would be inconvenient and too expensive for most farmers to sell directly to the central wholesale markets.

The commercial marketing systems for cassava depend on the product form and the stage of development of the market economy (Bruinsman, 1999). The systems also depend on the consumers' preference for certain cassava products and their prices. The proportion of cassava marketed is directly related to remoteness from market centres (Tollens, 1992). Cassava roots are bulky and perishable and therefore are expensive to transport in the fresh form. This shows that cassava root processing is an important activity in marketing.

Processed cassava root marketing operations range from fresh roots sold or bartered for direct consumption to processed products. According to Berry (1993), there is little evidence that markets for processed cassava roots for human consumption are near saturation.

Cassava has two distinct markets, which are the domestic market, mainly for human consumption and the export market for animal feeds and starch (Gosh *et al.*, 1988). Substantial quantities of processed cassava roots (chips and pellets) are traded worldwide for the manufacture of animal feeds. Starch is also traded in the world markets for making adhesives, paper sizing, laundry, sugar syrups and alcohol.

The principal markets for cassava products are in the European Economic Community (EEC) (Bruinsman, 1999). The main importers for starch as reported by Ghosh *et al.* (1998) include the United States, United Kingdom, Canada, France and Japan. The prices for these products follow the forces of supply and demand in that they are the lowest in the months of the year when shipments are at peak levels and vice versa (*ibid*). In addition to these prices, premiums are paid according to the quality and origin of the pellets or chips (*ibid*). Thus processing is an important aspect in enhancing marketability, particularly for perishable crops like cassava roots.

2.3.5 Cassava processing

There are many traditional methods for the preparation of cassava used around the world. In East Africa either sun drying or heap fermentation are used. Sun drying involves peeling the roots, followed by drying the whole roots or large pieces cut

longitudinally in the sun. The brittle dry material is then pounded in a wooden mortar and pestle and sieved to remove fibrous material, which produces white flour. Heap fermentation is more work intensive and time consuming. It involves peeling and cutting the roots and leaving them in a small heap for 3 - 5 days during which some fermentation takes place with liberation of hydrogen cynide (Dostie *et al.*, 1999). The roots are then sun dried, pounded and sieved to produce white flour. Flour produced by heap fermentation is slight dark coloured and contains only about one half of total cynide content of the white flour produced by sun drying (*ibid*). In times of drought when the total cyanide content of roots is high, heap fermentation is preferred over sun drying (*ibid*).

Due to its relatively lower cost and other advantages, cassava is considered as one of the best substitute for corn in feed and for molasses in the production of alcohol. Flour from cassava can substitute wheat flour to as much as 10 to 100% (Dostie *et al.*, 1999). Because of its characteristics, cassava flour or starch can be used as feed stock by industries, product making such as soup, candy, pudding, sausages and ice cream noodles. It is even used as binder by the pharmaceutical industry in making palletised medicine.

Moreover, due to its saccharification property, cassava flour-starch is also used in manufacture of food seasoning like monosodium glutamate, sweeteners (glucose and fructose), soft drinks and canned food.

Trade in cassava comprises mostly pellets and chips for animal feed, while the remainder is for starch and flour for industrial use. Trade in fresh cassava is generally

limited to exchanges between bordering countries due to the products bulkiness and perishable nature. Although cold chain management can improve the product shelf life, it complicates logistics which increases transportation costs that can not be passed on to the final consumer, unless the product is destined for a specialised market.

2.4 Human capital

Typically, human capital is broadly defined as a combination of individuals' own innate talents and abilities, and the skills and learning they acquire through education and training (OECD, 2007). Human capital measures the quality of the labour supply and can be accumulated through education, further education and experience. A distinction is made between *education*, which is an investment in human capital, and *learning*, which is a process of acquiring knowledge or skills through study, experience or teaching (Deutsche Bank Research, 2005). Knowledge is the awareness and understanding of interconnected facts, truths or information gained in the form of experience, learning or introspection (*ibid*).

Dess and Picken (2000) define human capital as consisting of the individual's capabilities, knowledge, skills and experience, as they are relevant to the task at hand, as well as the capacity to add to this reservoir of knowledge, skills, and experience through individual learning. It is argued in the literature that the most valuable capital is that invested in human beings (see, for example, in Deutsche Bank Research. 2005). Human capital is seen not only as a key determinant of growth and poverty alleviation, but also as critical for human development more generally (Squire, 1993;

Ravallion and Chen, 1997; Ventura, 1997; 2005; Sen, 1999; Romalis, 2004; Schultz, 1999).

It is argued further that higher human capital, acquired through better and longer education, allows an individual to perform higher value-added tasks more efficiently and more quickly (Deutsche Bank Research, 2005). This individual can also apply more new ideas and be more innovative. Higher human capital leads to more output per hour worked – productivity is generally higher (Barro, 1991; Benhabib and Spiegel, 1994; 2005; Kahn and Lim, 1998; Acemoglu, 2003; Caselli, 2005).

The best available proxy for human capital in rural communities in developing countries is the average years of education of the population aged 25 to 64 (Deutsche Bank Research, 2005). It is reported that one additional year of education boosts an individual's income by around 10 percent (Deutsche Bank Research, 2005).

The available labour for production activities in a household can be evaluated by considering the family size and the extent of contribution of each sex and age group in the family labour pool. Since different types of labour make different contributions to production depending on the nature of the task performed, the age and sex of the person performing it and the family size variable were used in this study to calculate a common denominator for all age and sex groups (the Adult Labour Equivalent).

The term Adult Labour Equivalent (ALE) can be defined as a multiplier used in converting man-hours into the number of full-time workers or employees needed to complete a job within a given time-frame, taking into account the type of sex and age

of the workers. Different coefficients have been used by different authors to convert child and female labour into Adult Labour Equivalent (ALE). A combination of ALE proposed by Due *et al.* (1982), Panin (1986) - cited in ILCA (1990), Ruthernberg (1976) and Swift (1985) were used in this study with minor modifications to suit the situation in the study area. The Adult Labour Equivalent for households in this study was calculated as follows: adult males and females 15 to 60 years were assigned 1, males above 60 years 0.67, females above 60 years 0.6 and children between 10 and 14 years 0.25. Children below 10 years were considered as contributing insignificantly to family labour. For family members who worked occasionally, the percentage of the year was used in quantifying their contribution to family labour.

CHAPTER III

3.0 THE CONCEPTUAL FRAMEWORK AND METHODOLOGY

3.1 Overview

This chapter comprises four main sections. The next section presents the conceptual framework for the study, followed by a section describing the sampling and data collection methods. The last section describes the methods/approaches used for data analysis.

3.2 The conceptual framework for the study

The conceptual framework for the study (Fig. 1) was adopted from the Sustainable Livelihood Approach (SLA) framework for cassava as conceptualised by the PANTIL's project entitled "Improvement of Cassava Production, Processing, Utilization and Marketing for Economic Growth and Improved Livelihood in the Eastern Zone of Tanzania" which funded the fieldwork for this study.

The project aimed at increasing involvement of small-scale and medium-scale processors to produce primary (chips, flours) and secondary (snacks, starch) niche cassava products. The project considers processing as an intermediary intervention for increased cassava production on one side and increased utilization and marketing on the other, in a complex value chain and marketing. However, this intervention may not affect production, utilization and marketing promptly without intervening on

them for sustainability. Therefore, an approach that looks in the whole production to marketing/utilization chain was adopted by the project (Fig. 1).

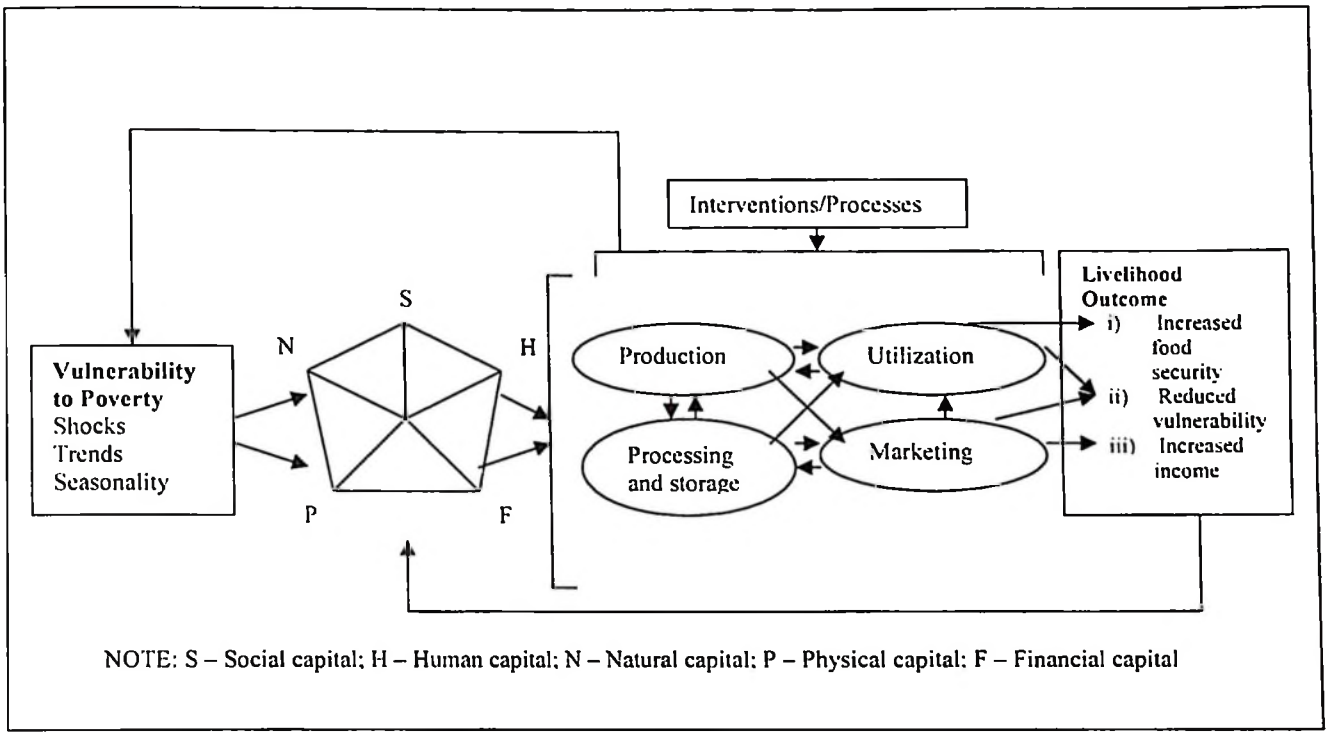

Figure 1: Conceptual framework for the study

Access to and effective utilization of livelihood/capital assets (natural, human, social, physical and financial capital) have direct influences on production, processing and storage, utilization and marketing of cassava and cassava products in the study area which in turn determine the livelihood outcomes such as increased food security, reduced vulnerability (from shocks, trends and seasonality) and increased income. The households will ultimately benefit directly or indirectly the livelihood assets for more positive interactions and dynamics of livelihood activities. Specifically, where farmers themselves perform household processing, great benefits are expected to trickle back to them. Since in most areas household processors are women and the children who are the most vulnerable social groups, such benefits will be more to

their advantages.

3.3 Sampling methods and data collection

Both purposeful and stratified random sampling approaches were used in this study. Households were selected randomly to represent various actors involved in the value chain for cassava. Then, a stratified random sampling was used in selecting sample households based on socio-economic status and on whether the household was a PANTIL project beneficiary or not.

A total number of 90 households were selected (including 60 agrarian households - 30 PANTIL project farmers/beneficiaries and 30 non-PANTIL project farmers/beneficiaries and 30 traders from local and regional markets in Coast and Tanga regions). The distribution of sample households per district and village is given in Table 1.

Table 1: Sample size by district and village

District	Village	N	%
Kibaha	Mkongeni	28	31.1
Muheza	Kabuku Nje	31	34.4
Handeni	Tongwe	31	34.4
Total		90	100.0

In addition, informal discussions were conducted with other key actors in the cassava

value chain including market masters, brokers and transporters, and customers coming to the markets to buy cassava and/or cassava products.

At the household level a detailed questionnaire (Appendix 1) including both close and open-ended questions was used to collect primary information (both quantitative and qualitative). The questionnaire was pre-tested prior to the actual fieldwork and was then administered to the sample households in the three villages and to traders in the central markets in Tanga and Coast regions.

General information about the subject under study was collected using Participatory Rural appraisal (PRA) approaches including Focus Group Discussions (FGDs). Livelihood Analysis, Scored Causal Diagrams, Resource Allocation and Resources Flow Diagrams.

3.4 Data analysis

The collected data were coded and entered into an SPSS spreadsheet ready for analysis. The analysis involved the use of both qualitative and quantitative approaches. The results were presented using mainly Tables summarizing descriptive statistics such as means, frequencies and standard deviations.

The performances of different actors along the value chain were evaluated using the Gross Margin (GM) approach as described in Hilderbrand (1998). The gross margins were analysed using the following model:

GM = TR – TOC

Where; **GM** = Gross margin (Tshs/kg)

TR = Total revenue (Tshs/kg)

TOC = Total operating/variable cost (Tshs/kg)

The hypotheses put forward for the study were tested statistically using a t-test.

CHAPTER IV

4.0 RESULTS AND DISCUSSION

4.1 Overview

This chapter presents the results of analysis and discussion of the performance of the value chain for cassava in the Eastern zone of Tanzania. The chapter starts with a presentation of the household profiles, description of the value chain for cassava in the study area and an analysis of livelihood assets and profit margins. In addition, the chapter also presents a discussion of the problems and constraints facing the cassava sub-sector in the study area.

4.2 Household profiles

4.2.1 Sex and ethnic groups of the heads of household

Of the total number of households sampled, about 57.8% were male-headed households and the remainder 42.2% were female-headed households. The most dominating ethnic group was Wazigua 32.2% followed by Wasambaa 21.1% and the remaining 46.7% constituted other tribes such as Wanyamwezi, Wasukuma, Wabondei, Wasambaa, Wachagga, Wapare, Waluguru, Wangido, Waha, Wangazija, Wandengereko, Wamwele and Wakwere.

4.2.2 Education level of the heads of households

Education is an essential factor for effecting desirable changes in attitudes, skills, and knowledge of individuals. About 13%, 20% and 7% of PANTIL farmers, Non-PANTIL farmers and traders had no formal education respectively (Table 2). Other farmers and traders acknowledged having gone to school with at least a primary school education.

Table 2: Number of years in school for the heads of household

Years	PANTIL Farmers		Non-PANTIL Farmers		Traders	
	N	%	N	%	N	%
Not attended any formal school	4	13.3	6	20.0	2	6.7
2 – 6 years in school	5	16.7	5	16.7	6	20.0
7 years in school	17	56.7	15	50.0	13	43.3
More than 7 years	4	13.3	4	13.3	9	30.0
Total	30	100.0	30	100.0	30	100.0

4.2.3 Age distribution of the heads of households

Table 3 depicts the age distribution of all sampled PANTIL farmers, non-PANTIL farmers and traders. It determines the availability of able-bodied people for agricultural production, processing and marketing, ease of use of innovations and level of risk aversion, all of which have been formed to affect the rate of agricultural transformation and capable of taking risks and using innovations. A large proportion of the PANTIL farmers in the study, fall within the age range of 31 to 50 years.

The age-range can be regarded as the youthful age when farmers can make vital impact in agricultural production, including cassava production, processing and development in general. Only 16.7 percent of the PANTIL and non-PANTIL farmers are 60 years and above in age. The mean age for the PANTIL farmers was 37.7 years while that of the non- PANTIL farmers was 36.3years.

Table 3: Distribution of heads of household according to age

Age group	PANTIL Farmers		Non-PANTIL Farmers		Traders		Pooled	
	N	%	N	%	N	%	N	%
21 – 30	4	13.3	5	16.7	3	10.0	12	13.3
31 – 40	6	20.0	7	23.3	5	16.7	18	20.0
41 – 50	9	30.0	5	16.7	12	40	26	28.9
51 – 60	6	20.0	8	26.7	8	26.7	22	24.4
61 and above	5	16.7	5	16.7	2	6.7	12	13.3
Total	30	100.0	30	100.0	30	100.0	90	100.0

4.2.4 Marital status of the heads of household

About 87% of PANTIL farmers and 83% of non- PANTIL farmers were married. The percentage for singles, divorced/separated and widows are as given in Table 4.

Table 4: Marital status for the heads of household

Status	PANTIL Farmers		Non-PANTIL Farmers	
	Frequency	%	Frequency	%
Married	26	86.7	25	83.3
Single	1	3.3	2	6.7
Divorced/separated	2	6.7	1	3.3
Widow	1	3.3	2	6.7
Total	30	100.0	30	100.0

4.3 The value chain for cassava in the study area

4.3.1 Market organization

This section describes the organization of production and distribution system in the study area, covering in particular, the main functions of the marketing chain, its participants and its channels.

4.3.1.1 Functions

The functions of marketing chain describe the different stages between production and final consumption. The cassava market in Eastern zone consists of eight main functions: production, drying, collection, stocking, wholesaling, grinding, retailing and exporting (mainly to neighbouring countries through both formal and informal trade) (Fig. 2).

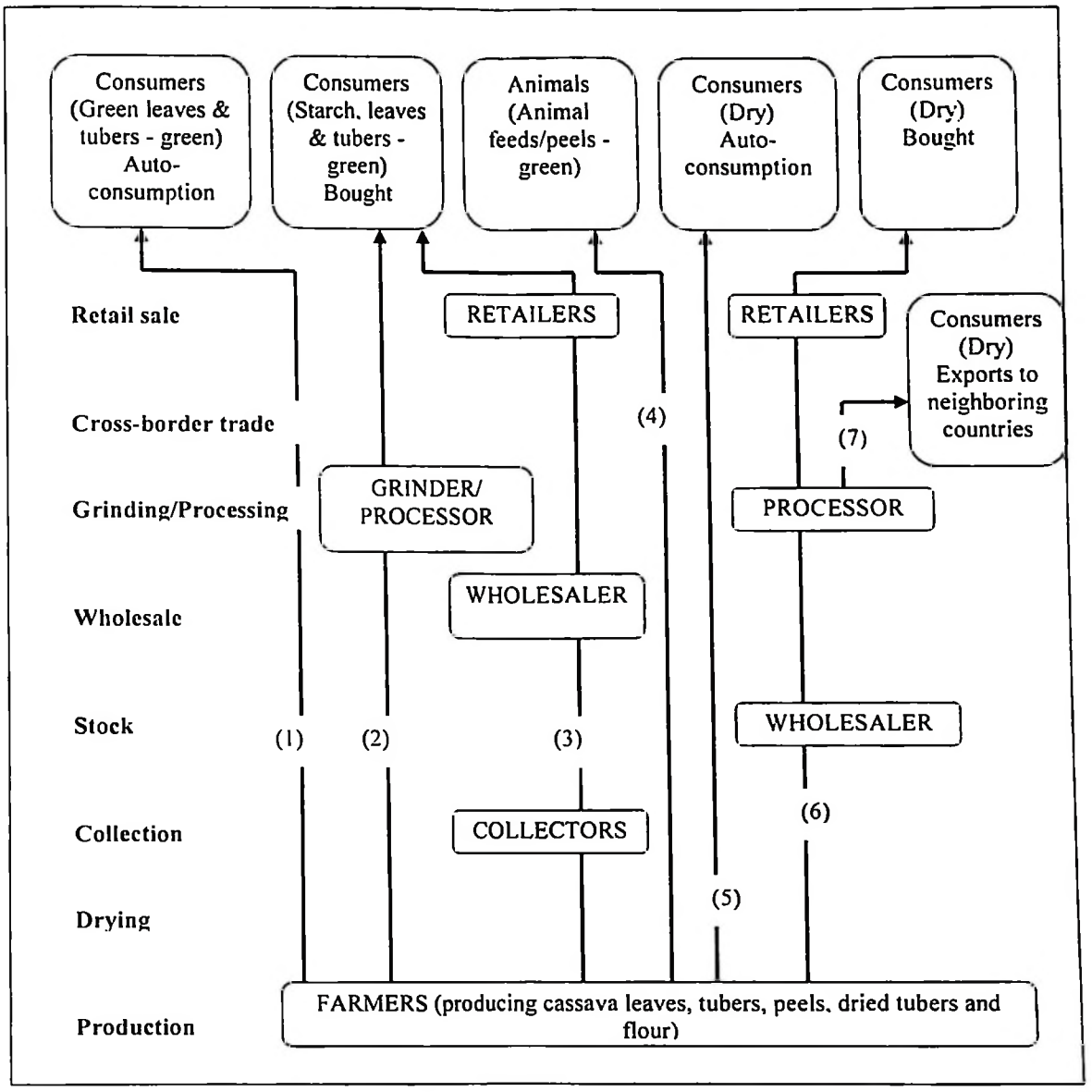

Figure 2: The value chain for cassava in the study area

4.3.1.2 Participants

Key participants in the cassava market are the producers who dry part of the production themselves, the collectors who can also be stockers and wholesalers when dealing with dry cassava, processing mills and retailers.

4.3.1.3 Distribution channels

As shown in Fig.2, seven channels constitute the cassava market in the study area. In channels 1 to 4, fresh cassava is used directly by the producer for human consumption. In channels 2 and 3, fresh cassava goes through some supplementary stages before consumption. In channel 3, fresh cassava is distributed either by retailers or through collectors or wholesalers who supply retailers.

Channels 5 to 7 include drying. Channel 5 represents auto-consumption (household own consumption) of dry cassava. In channel 6, dry cassava goes through collectors then wholesalers or through collector/wholesalers before reaching the retail market. Dry cassava going through channel 7 is for cross-border trade (both formal and informal).

4.3.1.4 Cassava products

In the study area, cassava is marketed mainly as a fresh root, dry tubers/chips and cassava flours. The marketing of the cassava root is through village markets situated in the areas of production. Some of it is transported to larger markets situated in the district and regional centres. Processed cassava products are also sold at the markets centres and at residential areas. These processed products include a variety of sun-dried and fermented cassava tubers/chips. In the market areas the cassava is marketed as heaps or in bags.

Cassava tubers are used mainly to produce other products such as chips and flour. Traders and middlemen tend to buy from farmers directly from their farm at very

cheap farm gate price.

Chips are used mainly to produce chip flour in making different food items. Farmers tend to produce chip flour by grinding pellets, but also millers procure chips from farmers either directly or through middlemen. The agents of flour millers will make a small survey around villages where dried cassava tubers/chips are produced and then identify the places where good quality processed tubers/chips can be obtained.

Millers purchasing processed tubers/chips directly from farmers have to bear expenses of transport, bagging, loading, weighing, bags, twine etc. Some hoarders purchase processed tubers/chips directly from farmers and stock them in anticipation of higher prices during the off - season. Prices of processed tubers and chips depend on factors like quality of tubers/chips, competitiveness from miller's artificial scarcity created by stockiest and market demand. Cassava flour is prepared mostly by millers and traders by grinding dried cassava tubers/chips, and then selling flour in small bags at high prices.

4.4 Livelihood assets

In analysing the performance of different actors/participants in the value chain for cassava, it is important that attention is also given to the assessment of the assets that the actors can draw upon for their livelihoods. Variation in household access to assets is one of the determinants of capacities to cope with crises (DFID, 1999). Assets interact with other factors (e.g. interventions/processes) to shape the choice of

livelihood strategies and the livelihood outcomes. The asset base upon which the actors in the cassava value chain build their livelihoods includes a wide range of natural, physical, financial, human and social capital. This section presents an evaluation of selected livelihood assets owned by cassava farmers in the study area.

4.4.1 Land holdings

Land underpins the socio-economic fabric of farming communities and influences access to other livelihood assets. Access to land therefore has direct impacts on the pace and nature of the economic growth of farming communities, contributing to the emergence of great divergence in household incomes (Deininger and Squire, 1998).

In terms of land ownership, the determining factors in relation to livelihoods of rural communities in developing countries include total area owned and total area cultivated (farmed land).

Table 5 presents a summary of the results of analysis of land-ownership for the PANTIL project and non PANTIL project farmers.

Table 5: Land holdings for cassava farmers

Group Statistics	PANTIL Farmers	Non-PANTIL Farmers	Total
N	30	30	60
Mean	2.4	1.7	1.88
Std. Dev	1.88	1.67	1.84
Mean Difference			0.70**
95% Confidence Interval of Difference	Lower		0.26
	Upper		1.14

**Significant at $P \leq 0.05$ level.

On average, PANTIL project farmers owned relatively larger land holdings than their counterpart non PANTIL farmers ($P \leq 0.05$), averaging at 2.4 versus 1.7 ha respectively (Table 5). The average size of land owned for all households was 1.88 ha. This implies that the former are in a relatively better position to build up their livelihood portfolios using the relatively larger land resource base they own than the latter. Farm size has direct implication for some policy issues such as agribusiness, income, profit, and structural organization of the agricultural sector as well as use of innovations. The results show that PANTIL project farmers have greater potential to expand their production capabilities.

Overall, land acquisition through purchase constituted only 11 percent, whereas inheritance and bequest constituted the major types of land acquisition (53 percent),

followed by land clearing (19 percent) and village government allocation (17 percent).

4.4.2 Livestock ownership

As for land, livestock constitutes one of the most important assets that the cassava farmers can draw upon for their livelihoods. Its central role in natural resource-based livelihood strategies is well acknowledged in the literature (Horne *et al.*, 2005; Ashley *et al.*, 1999; Delgado *et al.*, 1999; Parthasarathy *et al.*, 1999). Livestock keeping contributes to livelihoods in many ways: income from products, insurance against drought, emergency cash requirements for farming activities and other needs, tenancy for share-cropping, household nutrition, fuel for cooking, manure for crops and draught power for farming, to mention just a few (see Ashley *et al.*, 1999 for a detailed discussion of the contribution of keeping livestock to rural livelihoods).

The results of analysis for the number of livestock owned by PANTIL and non PANTIL project farmers are presented in Table 6.

When tested statistically using the T–test, the difference in livestock holdings between PANTIL and non PANTIL project farmers was insignificant at $P \leq 0.10$ significance level. This implies that, although important in most rural areas in Tanzania, livestock ownership could not be the main factor determining the differences in asset portfolios between PANTIL and non PANTIL project farmers. But as already argued there is an inter-linkage between livestock holdings and other household livelihood assets. Those farming households who diversify crop farming

with livestock keeping are more likely to be successful than those who do not. Livestock, can be sold in order to make some investments in crop farming (e.g. purchase of production and processing technologies) or in small businesses. and the income obtained from these latter activities can be used to build up herds. The ordering of these sequences, however, will depend on personal and market opportunities that prevail over a given period of time.

Table 6: Livestock ownership for cassava farmers (TLUs)*

Group Statistics	PANTIL Farmers	Non-PANTIL Farmers	Total
N	30	30	60
Mean	3.7	3.8	3.7
Std. Dev	0.493	0.4028	0.4688
Mean Difference			-0.1006
95% Confidence Interval of Difference	Lower		-0.3611
	Upper		0.1599

*The average number of livestock owned was converted into Tropical Livestock Units by applying the Tropical Livestock Units (TLUs) conventionally used for Sub-Saharan Africa. According to the International Livestock Centre for Africa (ILCA) (1990), Jahnke (1982) and Williamson and Payne (1978) the units are given as follows: adult cattle is equivalent to 0.7 TLU, a donkey to 0.5TLU, a pig to 0.3 TLU, goats and sheep to 0.1TLU, and poultry 0.01TLU.

4.4.3 Human capital

The results of analysis for the differences in level of human capital between PANTIL and non PANTIL project farmers are presented in Table 7 and Table 8.

Table 7: Average years of education for family members aged 25 to 64 years

Group Statistics	PANTIL Farmers	Non-PANTIL Farmers	Total
N	30	30	60
Mean	6.8	6.1	6.6
Std. Dev	0.9428	1.1093	1.0305
Mean Difference			0.6879**
95% Confidence Interval of Difference	Lower		0.26
	Upper		1.1

**Significant at $P \leq 0.05$ level.

When human capital was evaluated using the proxy of average years of schooling for family members aged 25 to 64 years (Table 7) the results showed statistically significant higher portfolios of human capital for PANTIL project farmers than for non PANTIL project farmers ($P \leq 0.05$). However, the difference in human capital measured in terms of Adult Labour Equivalent was insignificant at $P \leq 0.05$ (Table 8) below.

Table 8: Average Adult Labour Equivalent (ALE) as the percentage of household size

Group Statistics	PANTIL Farmers	Non-PANTIL Farmers	Total
N	30	30	60
Mean	51.1	51	51.1
Std. Dev	6.8887	5.5066	6.4934
Mean Difference			0.1028
95% Confidence Interval of Difference	Lower		-3.5223
	Upper		3.7279

4.4.4 Labour and time input on the farm

The analysis revealed that a large proportion of the participating farmers spend more time on the farm during the rainy season as would be expected and less time on the farm during the dry season. The mean number of hours spent on the farm was 4.2 hours and 3.7 hours during the rainy and dry season respectively.

This implies that farmers have more time for other activities such as trading during the dry season. Overall the analysis of labour and time input on the farm showed that much labour and time is used for land clearing, weeding, harvesting and processing operations on the farm. Any arrangement aimed at improving farm efficiency should pay particular attention on how to reduce intensity of labour use for these activities. These operations can constitute major bottlenecks and strain on farm labour supply.

4.4.5 Cassava processing technologies and sources of labour

The improved cassava processing technologies to which PANTIL project farmers have been introduced to include chipping and grating machines for production of chips for both food and livestock use, grates and starch (Plate 1 to Plate 4). When conducting this study however, the chipping and grating machines were still in their introductory stage and their economic performance could therefore not be assessed. Most farmers were using traditional cassava processing technologies.

Plate 1: PANTIL Project farmers in Tongwe village (Muheza District) carrying a cassava grating machine ready for installation, January 2008

Plate 2: A house for improved cassava processing built through the PANTIL project in Tongwe village in Muheza District

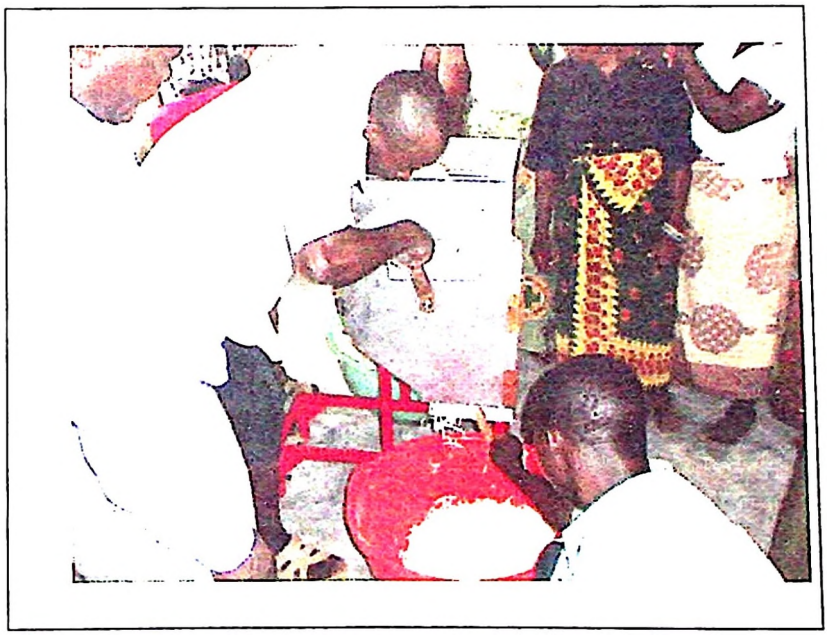

Plate 3: PANTIL Project farmers in Tongwe village processing cassava using a chipping machine, January 2008

Plate 4: Processed cassava products (grates and chips) are sun-dried on drying stalls (*vichanja*) built close to the processing facility in Tongwe village, January 2008

In general, cassava processing has many traditional technological pathways, which have been adapted by cassava farmers in the study area to take advantage of locally available processing resources or market opportunities.

The traditional processing cassava technologies have included the use of traditional peeler, grater, press or and local fryer and sieve. The major cassava products processed included cassava chips/pellets, cassava flour, boiled and fried cassava tubers. Cassava flour was produced using three main methods (Fig. 3).

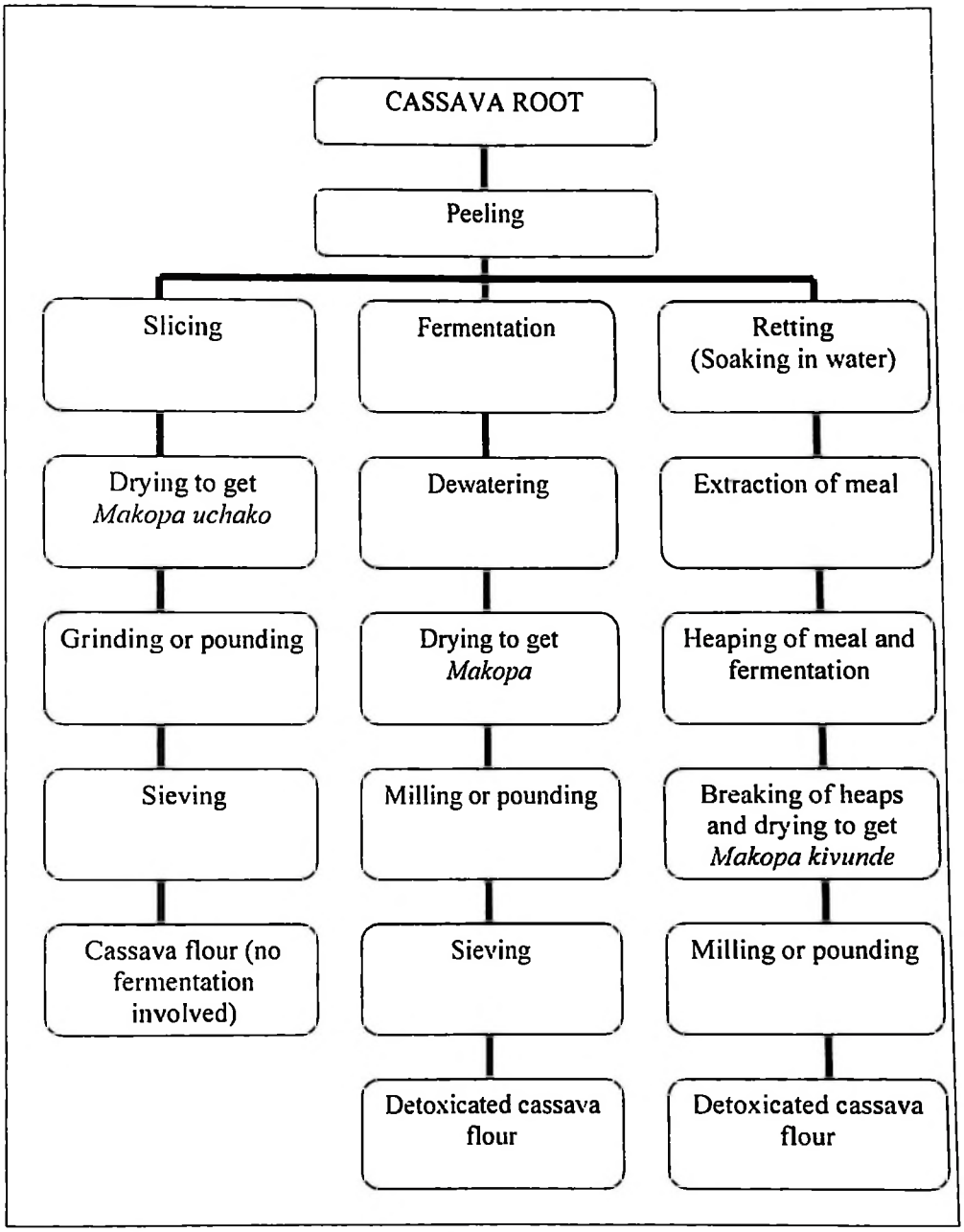

Figure 3: Flow diagram for production/processing of cassava flour in the study area

The analysis of cassava processing technologies presented in this dissertation is mainly based on traditional cassava processing methods, including the three methods for processing cassava flour as presented in Fig. 3. The number of cassava products

produced by the household was used as a proxy of the rate of adoption processing technologies. The results of analysis are summarized in Table 9.

Table 9: Adoption of cassava processing technologies

Group Statistics	PANTIL Farmers	Non-PANTIL Farmers	Total
N	30	30	60
Mean	4	3.4	3.8
Std. Dev	0.5546	0.3668	0.5685
Mean Difference			0.5713**
95% Confidence Interval of Difference	Lower		0.26
	Upper		1.1

**Significant at $P \leq 0.05$ level.

Most of the processing operations were carried out by women. Other households relied also on other family members such as male or female children, hired labour or personal labour. Most PANTIL project farmers reported to depend on a combination of family and hired labour (59.4%). Some relied on household women labour (18.8%). Some on hired labour only (21.8%), while 3% of them depended on family labour alone.

The results of analysis showed significant difference between the mean adoption scores for PANTIL and non-PANTIL farmers ($P \leq 0.05$). Therefore, the null

hypothesis that there was significant difference between the use of cassava processing technologies by PANTIL and non-PANTIL farmers was accepted. In other words, PANTIL farmers have adopted more cassava processing technologies than the non-PANTIL farmers. This can be interpreted to mean that the readiness of PANTIL farmers to participate and try out new ideas is directly responsible for higher adoption scores.

4.5 Operating costs, prices and profit margins

The average farm gate prices for fresh cassava tubers and processed tubers/chips (*makopa*) were Tshs 167 and 450 per kilogramme respectively, while wholesale prices for cassava tubers, processed tubers and cassava flours were Tshs 383, 536 and 551 per kilogramme respectively and retailer prices were Tshs 416, 659 and 706 per kilogramme respectively. In general, wholesalers and retailers obtained better prices than farmers.

Table 10: Average selling prices for selected cassava products

Cassava commodity	Farm-gate Price	Wholesale Price	Retail Price
Cassava tubers	166.67	383.33	415.74
Cassava processed tubers/chips (*makopa*) (Tshs/kg)	450.12	535.79	658.65
Cassava flours (Tshs/kg)		550.9	706.08

As for selling prices, profit margins differed along the value chain. When the profit margins for PANTIL and non-PANTIL farmers were statistically compared for

significance difference using the T-test the results of analysis showed that PANTIL farmers obtained higher net margins than the non-PANTIL farmers (a mean difference of Tshs 129 919 which was significant at $P \leq 0.05$). Thus, the hypothesis which states that "there is significant difference in the marketing efficiency between PANTIL and non-PANTIL project farmers' was accepted. A detailed comparison of the gross revenues, operating costs and net margins for different actors in the cassava value chain is given in Table 11 to Table 13.

As shown in Table 13, cassava tubers and products contributed about 50% of the total household income in the study area. The crop is therefore a very important food security and income generating crop in the study area.

Table 11: Annual gross revenue, operating costs and net margins for cassava and cassava products (Tshs)

Category of actor	Gross Revenue	Operating costs	Net margin
PANTIL farmers (N = 30)	570 122.87	193 841.51	376 281.36
Non-PANTIL farmers (N = 30)	379 016.34	132 654.60	246 361.74
Wholesalers (N = 10)	5 372 163.15	2 134 879.12	3 237 284.03
Retailers (N = 20)	2 345 672.30	1 337 033.21	1 008 639.09

Table 12: Annual gross revenue, operating costs and net margins for other sources of income (Tshs)*

Category of actor	Gross Revenue	Operating costs	Net Margin
PANTIL farmers (N = 30)	750 134.18	412 573.80	337 560.38
Non-PANTIL farmers (N = 30)	695 785.92	431 387.27	264 398.65
Wholesalers (N = 10)	3 456 132.53	1 382 453.01	2 073 679.52
Retailers (N = 20)	4 566 987.16	2 511 842.94	2 055 144.22

*Other sources of income included crop farming (other crops than cassava), livestock husbandry, wages/salaries, remittance and other non-farm activities.

Table 13: Annual net income from cassava/cassava products as percentage of total household income

Category of actor	Net income from cassava (Tshs)	Total household income (Tshs)	Cassava Income % Total income
PANTIL farmers (N = 30)	337 560.38	713 841.74	52.7
Non-PANTIL farmers (N = 30)	264 398.65	510 760.39	48.2
Wholesalers (N = 10)	2 073 679.52	5 310 963.55	61
Retailers (N = 20)	2 055 144.22	3 063 783.31	32.9

4.6 Major problems facing the cassava sub-sector in the study area

When asked to rank the problems and constraints related to cassava production, processing and marketing most respondents ranked low producer prices, poor access

to lucrative markets/uncertain market environment and poor access to improved production and processing technologies as the most critical problems (Table 14). Other problems and constraints and their respective weighted percentages are as given in Table 14.

Table 14: Weighted percentages of the major problems and constraints to cassava production, processing and marketing in the study area

Problems/constraints	PANTIL farmers	Non-PANTIL farmers	Traders	Pooled sample
a) Low producer prices, poor access to lucrative markets/uncertain market environment	28	21	34	28
b) Poor access to improved production and processing technologies	25	12	35	24
c) Poor access to credits	12	23	12	16
d) Diseases and pests	11	21	8	13
e) High labour requirements	15	12	5	11
f) Change in climatic conditions	9	11	6	8
Total (N = 90)	100	100	100	100

The continuous existence of the disincentive of low prices of cassava fresh and products to farmers would certainly cause or prolong the impoverishment of some rural areas, often contributing to increasing rates of rural migration by people seeking alternative sources of income in towns. Improved access to markets would result to rapid spread of cassava relative contributions in the household. Poor access to improved production and processing technologies was reported as one of the major constraints to cassava production and processing.

Just as important improvement in the processing technology would have as much effect on cassava production expansion as improvement in yield. Access to improved cassava processing technology at any processing stage would reduce processing labour and would lead not only to an increased level of processing but also to increased production since labour released could be channelled into production activities. It would also improve product quality. Improved quality would make the product attractive to urban consumers thereby expand the market for the product.

Improved processing technologies are labour-saving (Inaizumi *et al.*, 1997; Nweke *et al.*, 2000). Availability of improved cassava processing technologies is likely to lead to more production and productivity. The improved processing technologies improve product quality, reduce bulkiness, and may extend shelf life and make it possible for quality cassava products to be transported at lower costs.

To increase productivity through land expansion farmers need access to agricultural extension, credit, land and livestock, labour and technology. As argued in Nweke (1996) access to better productive resources in cassava producing areas depends on cash income. Increasing farmers' economic resources through increased participation in income producing activities would improve farmers' affordability of available lands.

Farmers reported serious incidences of damage due to pests and diseases, particularly in the past few years when they were growing traditional varieties (e.g. *Mkumungu*

and *Mahiza*) which were very susceptible to diseases and pests. Most farmers have now adopted new varieties (e.g. *Kiroba* – Plate 5, a variety which was introduced in Tanga region from Kibaha. Other sweet varieties produced include the *Kibandameno*, *Busuu* and *Mamosi*. The common bitter varieties were *Tandika* and *Mwalimu Hamis*. Other varieties were *Kikombe*, *Mbiri*, and *Dide*. Most farmers reported to have adopted crop rotation as one way of plant disease management. Nweke *et al.* (2000) reported significant reduction of cassava pest when cassava was grown in rotation with other crops compared with continuous cultivation of cassava. However, the reasons for these correlations are not clear. The possible explanation could be that farmers may be able to cultivate continuously where pest and disease pressure are low but need to alternate cropping and fallows periods to break the pest/disease cycles where the pressures are high.

Plate 1: Farmers in Kabuku Nje village carrying *kiroba* variety of cassava with freshly harvested roots

High labour requirement was also reported as one of the problems/constraints facing cassava producers. This is in line with the findings reported elsewhere in the literature (Knipscher, 1980). Labour requirement in production of cassava roots and products is reported as the most important and costly requirement (*ibid*).

CHAPTER V

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

In the study area, cassava is marketed mainly as a fresh root, dry tubers/chips and cassava flours. A livelihood analysis revealed that PANTIL project farmers had more favourable livelihood portfolios than their counterpart non-PANTIL project farmers. The former owned relatively larger land holdings than the latter farmers ($P \leq 0.05$) averaging at 2.4 versus 1.7 ha respectively with the average size of land owned for all households of 1.88 ha. This implies that the former are in a relatively better position to build up their livelihood portfolios using the relatively larger land resource base they own than the latter. Farm size has direct implication for some policy issues such as farm business, income, profit, and structural organization of the agricultural industries as well as use of innovations. The results show that PANTIL project farmers have greater potential to expand their production capabilities.

However, when tested statistically using the T–test, the difference in livestock holdings between PANTIL and non PANTIL project farmers was insignificant at $P \leq 0.10$ significance level. This implies that, although important in most rural areas in Tanzania, livestock ownership could not be the main factor determining the differences in asset portfolios between PANTIL and non PANTIL project farmers.

When human capital was evaluated using the proxy of average years of schooling for family members aged 25 to 64 years the results showed statistically significant higher portfolios of human capital for PANTIL project farmers than for non PANTIL project farmers ($P \leq 0.05$). However, the difference in human capital measured in terms of Adult Labour Equivalent was insignificant at $P \leq 0.05$.

As for most livelihood assets, the results of analysis for technology adoption revealed significant difference between the mean adoption scores for PANTIL and non-PANTIL farmers ($P \leq 0.05$). PANTIL farmers have adopted more cassava processing technologies than the non-PANTIL farmers.

Prices and profit margins differed significantly along the value chain and between PANTIL and non-PANTIL farmers. When the profit margins for PANTIL and non-PANTIL farmers were statistically compared for significance difference using the T-test the results of analysis showed that PANTIL farmers obtained higher net margins than the non-PANTIL farmers (a mean difference of Tshs 129 919 which was significant at $P \leq 0.05$).

The analysis of the major problems and constraints facing the cassava sub-sector in the Eastern zone of Tanzania revealed that cassava producers, processors and traders are constrained mainly by low price of fresh and processed cassava products, poor processing technologies for cassava, poor access to lucrative markets, poor access to credits, diseases and pests, high labour requirements and change in climatic conditions for cassava farmers. The consequences of all these are reduced level of

cassava production and processing and low returns for the farmers, adversely affecting their general incomes and livelihoods.

In conclusion, cassava plays an important role as a safety cushion for vulnerable households. The potential for increasing farmers' returns from these activities or enhancing the relative importance of cassava as a source of increased rural household income depends on the possibility of addressing the existing problems and constraints which will ultimately lead to increased output and productivity, as well as improved cassava product qualities and expanded sales.

5.2 Recommendations

Based on the empirical findings in this study the following recommendations were drawn:

a) The government should help facilitating the introduction and adoption of appropriate technologies that can reduce labour bottlenecks and enhance processing.

b) Any improvements in upgrading cassava technologies must aim at production, processing and marketing facilitation. In general, processing remains a bottleneck in most parts of the Eastern zone. Its upgrading will contribute to process facilitation in production of high quality cassava products. In addition, collective endeavours in upgrading cassava processing must critically examine the state of the art in the traditional setting. This would make it possible to identify the areas that need upgrading to meet modern demands for agro-industrial processing in rural development. The processing of generally

acceptable cassava flour suitable for various forms of food utilization would be commendable.

c) Efforts should be made by technology developers in making new processing technologies and devices as close as possible to the existing traditional ones. This will facilitate acceptability.

d) The opportunity for processing enterprises must be based on the identification of viable market opportunities ('market orientation' or 'linking farmers to markets'). Assessments will need to be made of market size, supply requirements, quality characteristics and potential retail prices.

e) Government should make available labour-saving, simple, improved village technologies that are not crude, inefficient and backbreaking in executing farmers' tasks. This will enhance their income and improve their livelihoods.

f) The least successful interventions are usually those where the financial aspects of machinery purchase and operation are not taken into account. Farmers are not always able to set up linkages themselves and may need assistance. Small - and medium - scale enterprises (SMEs) can often play important roles in market chains. Some of the characteristics of successful SMEs necessary include: access to capital, processing facilities and commercial transport, relevant manufacturing experience, proven business record, proven record on quality, an understanding of marketing issues, and a willingness to support farmers and processors for mutual gain.

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APPENDICES

Appendix 1: The questionnaire administered to the sample households

A1: INTERVIEW AND BASIC INFORMATION FOR THE ACTOR

A1.1 DATE OF INTERVIEW	A1.2 NAME OF INTERVIEWER	A1.3 NAME OF THE VILLAGE/MARKET
		1 = Mkongeni, 2 = Tongwe, 3 = Kabuku Nje 4 = Chanika, 5 = Other (specify)

A1.4 NAME OF THE WARD	A1.5 NAME OF THE DIVISION	A1.6 NAME OF THE DISTRICT
		1= Kibaha, 2 = Muheza, 3 = Handeni 4 = Ilala, 5 = Other (specify)

A1.7 NAME OF THE ACTOR/ HHH	A1.8 ACTOR/HHH CODE	A1.9 AGE OF THE ACTOR/HHH (Years)

A1.10 GENDER OF ACTOR/HHH	A1.11 ETHNIC GROUP OF THE ACTOR/HHH	A1.12 ORIGIN OF THE ACTOR/HHH
1 = Male, 2 = Female		

A1.13 YEARS OF STAY IN THE CURRENT RESIDENT AREA	A1.14 YEARS OF (FORMAL) EDUCATION FOR THE ACTOR/ HHH	A1.15 MAIN OCCUPATION FOR THE ACTOR/HHH
		1 = Farmer, 2 = Government employee (specify, 3 Employee in a private sector (specify), 4 = Labourer - seasonal wage (specify), 5 = Labourer - regular wage (specify), 6 = Trader/Businessman (specify), 7 = Fisher (specify), 8 = Carpenter, 9 = Other (specify)
A1 16 ACTOR CATEGORY	A1.17 YEARS OF OPERATION IN CASSAVA RELATED ACTIVITIES	A1.18 TYPES OF CASSAVA PRODUCT PRODUCED/PROCESED/TRADED
1 = PANTIL - Cassava farmer, 2 = Non-PANTIL Cassava farmer, 3 = Small-scale processor of cassava products, 4 = Trader – village market, 5 = Trader – District market, 6 = Trader – interregional markets 7 = Trader - cross-border/export markets, 8 = Other (specify)		1 = Fresh cassava tubers/roots (indicate varieties), 2 = Cassava flour (specify how processed), 3 = High Quality Cassava flour (specify how processed), 4 = Cooked/boiled cassava/ugali/uji (specify how processed), 5 = Fried/roasted cassava (specify - how processed), 6 = Cassava leaves/cuttings (specify), 7 = Chips/pellets (specify), 8 = Animal feeds (specify), 9 = High quality cassava flour (specify), 10 = Other (specify)
A1.19 TYPE OF PROCESSING TECHNOLOGY USED	A1.20 SOURCES OF SUPPLY IF PROCESSOR/TRADER	A1.21 SOURCE OF INFORMATION
1 = Manual processing - peeling slicing/cutting into cubes, fermenting, sun-drying, grounding (by stone/kinu) (specify), cooking/frying/ roasting, 2 = Mechanization or use of improved technology – milling, grading, grating, improved frying, pressing machine (specify)	1 = Own farm, 2 = Producers in own village, 3 = Producers in nearby villages 4 = Producers in other districts/regions, 5 = Retailers in own village, 6 = Retailers in nearby villages, 7 = Retailers in other districts/regions, 8 = Wholesalers in own village, 9 = Wholesalers in nearby villages, 10 = Wholesalers in other districts/regions, 11 = Other (specify)	1 = Neighbours/relatives, 2 = Farmers, 3 = Traders, 4 = Radio broadcasting, 5 = Magazines, 6 = Internet, 7 = Others (specify)

A1.22 MEANS OF ACCESSIN MARKET INFORMATION	A1.23	A1.24
1= physical visit, 2 Asking trade who come to buy, 3 = listening t radios and watching televisions, = Reading magazine, 5 = Use of fixed telephone, 6 = Use of mobile phone, 7 = Others (specify)		

A1 25 MEMBERS OF HH CURRENTLY RESIDENT (Enter code and short description, as underlined)											
	Name	Age (Year	Sex		Relation to HHH		Education level		Main Occupation		
			1 = Male 2 = Female		1 = Head 2 = Wife 3 = Husband 4 = Child 5 = Other relatives 6 = Other permanent		1 = None 2 = Std IV 3 = Std VII 4 = Std VIII 5 = Std IX 6 = Form IV 7 = Form VI 8 = Higher		1 = Child 2 = Student 3 = House/farm 4 = Farmer 5 = Fisherman 6 = Govt Parastatal employee 7 = Private sector employee 8 = Self employed (non-farm)		
			Code		Code		Code		Code		

If more than 10 HH residents, continue on another sheet of section A1.19

Total Resident HH members.

A1.26 MEMBERS OF HH PERMANENTLY OR MOSTLY AWAY (Enter code and short description, as in A1.19)										
	Name	Age (Years)	Sex		Relation to HHH		Education level		Main Occupation	
			Code		Code		Code		Code	

If more than 5 family members permanently or mostly away, continue on another sheet of section A1.20
Total family members permanently or mostly away:

A1.27 MEMBERS OF FAMILY PERMANENTLY OR MOSTLY AWAY (same people as for A1.20)										
	When le	Years away	Current place of residence		Sends money home?		How often?		How much each time?	Year total
	Year pers left	No of years away	1 = In this district (name) 2 = In Tanzania (place) 3 = In Dar es Salaam 4 = Abroad (country)		1 = Yes 2 = No		1 = Each week 2 = Each month 3 = Few times (year) 4 = Occasionally		Amount each time	Calculate amount for year
			Code		Code		Code			

Total Estimated Remittances in the past year (period from.....to.....)

B: ASSETS 1: LAND, LIVESTOCK AND HOUSING

B1.1 CROPLAND OWNED AND OPERATED BY THE HOUSEHOLD

What is the current price to buy rainfed land in this area (Tsh per acre)?

Shambas and Gardens

Field ID	Area	Ownership	Rent In Land	Rent Out Land	Use of Field	Field Cultivated By
	Area of each field or plot (acres)	1 = owned (idle) 2 = owned (used) 3 = own (rented out) 4 = rented in 5 = borrowed	Amount paid (Tsh)	Amount received (Tsh)	Crop, mixture, idle, fallow, wet season irrigation (WSI), dry season irrigation (DSI), rainfed (RF)	1 = jointly 2 = women 3 = men
A						
B						
C						
D						
E						
F						
G						
H						
I						
J						
Sub-Totals (Rental Tsh)						

Total number of plots (Sum codes 1 – 3 under ownership)	Total area owned	Total area used for farming (including land rented in or borrowed)

B1.2 LIVESTOCK

(All data here refer to the past year up to the date of interview)

Type	Number now	Number year ago	Number born	Number d	Number bought	Number sold	Number gifts in	Number gifts out	Number eaten at home	Current price*
Cattle										
Goats										
Sheep										
Pigs										
Chickens**										
Ducks**										
Others...										

*Adult animal or bird, price that could be obtained by selling now

**Count only adult chicken, ducks or turkeys

Enter in Q sold column (section D2.5)

Enter in Q consumed column (section D2.5)

B1.3 HOUSEHOLD CONSTRUCTION

Wall construction	Roof construction	Piped water	Drinkable water	Electricity
1 = concrete 2 = brick 3 = wood 4 = mud & wattle	1 = tiled 2 = corrugated iron 3 = asbestos 4 = thatch	1 = Yes 2 = No	1 = Yes 2 = No	1 = Yes 2 = No

C: ASSETS 2: HOUSEHOLD ASSETS, CREDIT AND SAVINGS

C1 SELECTED FARM AND HOUSEHOLD ASSETS

Item	Number owned	Current price (Tsh)*
Hand hoe		
Spade		
Bush knife (panga)		
Wheel barrow		
Ox cart		
Ox plough		
Water container (jerrican)		
Cooking pot (sufuria)		
Bowl		
Bucket		
Hurricane lamp		
Torch		
Bed		
Watch		
Clock		
Radio		
Radio cassette		
Television		
Telephone		
Refrigerator		
Bicycle		
Sewing machine		
Motorbike		
Tractor		
Car or Jeep		
Pickup		
Truck		
Fishing equipment (specify)		
•		
Brick making equipment (specify)		
•		
Others (specify)**		

*If known, current typical purchase price of item from shop or store

**For assets not found on this list cross-out the assets listed but not owned by the household and substitute new assets

C2. SAVINGS AND CREDIT

C2.1 Does anyone in this household belongs to any credit group or scheme? (1 = Yes, 2 = No)

C2.2 If yes,

Name	Sex	Name/Type of scheme	Last amount borrowed	Purpose of loan	Interest rate	Loan Repayment Period	Grace period
	1 = Male 2 = Female						

C2.3 Does this scheme also allow for savings? (1 = Yes, 2 = No)

C2.4 If yes, is this regular saving? (1 = Yes, 2 = No)

C2.5 Amount (Tsh):

C2.6 How often?

C2.7 Aside from the scheme, do any members of the household have savings with a credit organization or bank? (1 = Yes, 2 = No)

C2.8 If yes, estimated total amount of savings at time of interview (optional) (Tsh):

D1: OUTPUTS AND INCOME: CASSAVA AND OTHER CROPS

D1.1 Cassava tubers/roots, leaves, flour, chips and other cassava products produced/marketed for the past twelve months

Cassava Product	Unit	Quantity Consumed		Quantity Sold		Total Produced	Avg price Tshs	Gross Income	Variable costs	Net Total Income	Net Cash Income
		Qty A	% B	Qty C	% D	E = A + C	F	G = E * F	H	I = G - H	J = I * D

Continue on another copy of this section if more room needed

D1.2 Working space for variable inputs (Cassava products including roots, leaves and other cassava products) produced/marketed) – include hired labour and other inputs.

Cassava/product	Name of Input (exclude family labour)*	Quantity Used K	Price per Unit L	Cost of Input M = K * L	Total Cost for each product (sum of M values

***For family labour spent in production/marketing of cassava/products show mandays separately for each output and activity in the table below**

Cassava/products	Activity	Mandays	Cassava/product	Activity	Mandays

Cassava/product markets

Cassava/products	Name of the market	Estimated distance from production to market destination (Km)	Cassava/product	Name of the market	Estimated distance from production to market destination (Km)

D1.3 Other crops/products produced/traded (other than cassava) for the past twelve months. Use the "Month" column to state the harvest month as 1 = January...12 = December. List each harvest separately for crops that had more than one harvest during the past year.

Crop*	Month	Unit	Quantity Consumed		Quantity Sold		Total Produced	Avg price Tshs	Gross Income	Variable costs	Net Total Income	Net Cash Income
			Qty A	% B	Qty C	% D	E = A + C	F	G = E * F	H	I = G - H	J = I * D
TOTALS												

Continue on another copy of this section if more room needed

D1.4 Working space for variable inputs used in production/marketing of other crops/products (include hired labour and other inputs)

Crop	Name of Input*	Quantity Used K	Price per Unit L	Cost of Input M = K * L	Total Cost for each Crop/product (sum of M values)

***For family labour spent in production/marketing of other crops/products show mandays separately for each output and activity in the table below**

Other crops/products	Activity	Mandays	Other crops/product	Activity	Mandays

Other crops/product markets

Crop/product	Name of the market	Estimated distanc from production market destinatio (Km)	Crop/product	Name of the market	Estimated distanc from production market destinatio (Km)

D2: LIVESTOCK OUTPUTS AND INCOME

D2.1 Livestock and livestock products

Type	Unit	Quantity Consumed		Quantity Sold		Total Produced	Avg price Tshs	Gross Income	Variable costs	Net Total Income	Net Cash Income
		Qty A	% B	Qty C	% D	E = A + C	F	G = E * F	H	I = G - H	J = I * D
Sub-Total Livestock and livestock products											

D2.6 Working space for variable inputs in livestock enterprises (include labour – mandays)

Activity	Name of Input*	Quantity Used K	Price per Unit L	Cost of Input M = K * L	Total Cost for each Livestock enterprise (sum of M values

***For family labour spent in production and/or marketing of livestock/products show mandays separately for each output and activity in the table below**

Livestock/product	Activity	Mandays	Livestock/product	Activity	Mandays

Livestock/product markets

Livestock/product	Name of the market	Estimated distance from production to market destination (Km)	Livestock/product	Name of the market	Estimated distance from production to market destination (Km)

D5: OUTPUTS AND INCOME FROM USE OF OTHER NATURAL RESOURCES (ONR)

D5.1 Output and income from other activities involving the use of natural resources (ONR)+

Activity	Quantity Consumed		Quantity Sold		Total Produced	Avg price Tshs	Gross Income	Variable costs	Net Total Income	Net Cash Income
	Qty A	% B	Qty C	% D	E = A + C	F	G = E * F	H	I = G – H	J = I * D
Sub-Total Other Sources of Income										

+Income-generating activities based on use of natural resources (activities other than the ones covered above, e.g. beer brewing, handcrafts manufacture, pot making, charcoal making, other forest products, etc.)

D5.2 Working space for variable inputs in ONR/products

Activity	Name of Input*	Quantity Used K	Price per Unit L	Cost of Input M = K * L	Total Cost for each source of income (sum of M values

***For family labour spent in production and/or marketing of ONR/products - show mandays separately for each output and activity in the table below**

ONR/products	Activity	Mandays	Other crops/product	Activity	Mandays

ONRs/product markets

ONR/product	Name of the market	Estimated distance from production to market destination (Km)	Crop/product	Name of the market	Estimated distance from production to market destination (Km)

D6: OUTPUTS AND INCOME FROM NON-FARM ACTIVITIES

D6.1 This section relates to wages, salaries, non-natural resources businesses such as trading, shop keeping, bicycle repair etc., pensions and other income sources not listed elsewhere). Each household member who has earned outside income during the past year should be interviewed. For example, if there are more than one HH members who have earned wages, salaries, self-employment incomes (i.e. own-business income), or have received pension payments during the year, then fill in this section of the questionnaire one for each person).

Code	Type of work	Amount Earned Last Month (Tsh)*	Amount Earned Past Yea (Tsh)**	Place of Work	Remarks
				1 = Nearby 2 = District 3 = Town (name) 4 = City (name)	
1	Wages – Seasonal				
2	Wages – Regular				
3	Salary – Govt Sector				
4	Salary – Private Sector				
5	Business Income***				
6	Pension Payment				
7	Other Non-Farm****				
YEAR TOTAL (Tsh)					

*Enter earnings for past month. For regular pay this should equal daily pay x number of days worked per month
**Enter earnings for year up to date of interview. For regular earnings, this should equal monthly x 12
***Net personal income from business (i.e. gross income – costs). Specify the activity/business (e.g. shop keeping) and the number of people employed in the business (how many people do you employ?)
****Examples: property rents other than land, insurance payments etc.

D6.2 Number HH members earning from non-Farm Incomes

D6.3 Total Non-Farm Income earned by household members (sum of years total for all non-farm earners in the household (Tsh)

G: TRANSFERS, FOOD SECURITY, LOSSES & RESPONSE TO SHOCKS

G1 Physical Transfers and Payment In-Kind (including gifts from relatives e.g. food, clothes, food aid from government, food-for-work etc.)

Description (and units)	How often (times per year)	Amount each time	Total amount	Approx. Value per unit	Approx. Total Value
Approx. Total Value for all Items					

G2 Regular Food Consumption of Household (main staple foods eaten during past week)

Main Staple Foods (Last Week)	Number of Days	Amount Eaten per Day		Current Pric per Unit	Cost of Main Foods	
		Unit (e.g. kg)	Quantity		Per Day (Tshs)	Per Week (Tshs)
Cassava						
Maize						
Rice						
Other						

G3 Food Stocks and Losses

	Date of Last Harvest	Total Stored Last Harvest	Amount in store now	When Store Run Out	Loss In store	Estimated Quantity Lost	% Loss	Main Reason for Loss
	Approx. date	Quantity	Quantity	Approx. date	1 = Yes 2 = No	Amount	Estimate proportion lost	To be coded latter

G4 Response to Shocks (last 3 years - enter here events such as drought, floods, theft of livestock, animal or crop pests or disease Go to section h for family illness shocks

Event (Describe event)	When Happened	Effects of Event*	Response to Event* (How Did the Household Recover from the Event)
	Date event occurred	E g hunger, crop loss (specify), house damage etc	E g sale of animals to raise cash (give details) HH member migrated for work (details), gift from relatives etc

*Write down accurate details (e.g. 4 cattle died, 1 acre of maize/paddy lost, 5 goats sold to buy food etc.

I: EXPENDITURE FOR OTHER GOODS AND SERVICES

I1 Goods and services purchased by the household for the past 12 months (not included elsewhere above)

Item	Quantity purchased K	Price per Unit L	Expenditure M = K * L
Cereals or cereal flour			
Pulses (e g beans)			
Fruits			
Vegetables (including tomatoes & onions)			
Milk			
Sugar			
Tea leaves			
Cooking oils			
Salt			
Drinks (e.g beers and soft drinks)			
Charcoal/firewood			
Fuel/kerosene			
Soap			
Clothes (textiles)			
Furniture (specify bed, chair, sofa)			
Poles/timber			
Corrugated iron sheets			
Thatch grasses			
Domestic utensils (e.g. bowls, plates, pots)			
Bricks			
School fees			
Development levy			
Taxes			
Village contributions			
House rent			
Electricity			
Others (specify)			
Total Expenditure for Other Goods/Services			