FACTORS INFLUENCING ADOPTION OF IMPROVED CASSAVA PRODUCTION TECHNOLOGIES IN MKURANGA DISTRICT, TANZANIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION

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ABSTRACT

The main purpose of this study was to assess factors influencing adoption of improved cassava production technologies in Mkuranga District. The specific objectives were to: examine technologies used by cassava smallholder farmers, identify extension services provided to cassava smallholder farmers and cassava production constraints as well as identify factors leading to adoption of improved cassava production technologies. One hundred twenty respondents were randomly selected from the targeted village. Data were collected using a structured questionnaire, Focus Group Discussions (FGD) and Key informant interviews. Data were analysed by descriptive analysis and content analysis. The finding showed that 77.5% of cassava farmers used traditional technologies in cultivating cassava. However, the study shows factors that influence the adoption of cassava improved technologies are knowledge/skills through training and seminars (58.8%), availability of credit facilities (42.1%), market availability (46.5%), and availability of high yielding cassava varieties (45.6%). The study also shows majority of farmers do not have contact with extension officers. During FGD, farmers pointed out that shortage of extension service, land scarcity and unreliable market contributed to farmers not adopting improved technologies for cassava production. Moreover, pests and diseases, drought, inadequate planting materials, lack of knowledge and inadequate fund contributed to low cassava production. The study also observed that factors that influence farmers not adopting technologies were ignorance, difficulties in using it, unavailability of technologies and cost of technologies. The study thus recommends that effort must be made to motivate farmers through extension agents to implement improved cassava technologies which will increase cassava production and income to the farmers in Mkuranga District and Tanzania at large.

DECLARATION

I, Diana Stephen Nyanda, 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.

_____ _____

Diana Stephen Nyanda Date

(MSc. Candidate)

The above declaration is confirmed by

_____ _____

Professor Joyce Lyimo-Macha Date

(Supervisor)

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DEDICATION

This dissertation is dedicated to the Almighty God, the Creator and my Redeemer, thank you, as always, for keeping me strong and healthy throughout my study. It is all because of you I have been able to complete my studies.

To my parents the late Mr. Stephen Nyanda and my mother Mrs. Salome B. Nyanda who together laid the foundation of my education. May God rest you in Peace!

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LIST OF ABBREVIATIONS AND ACRONYMS

AMCOS	Agricultural and Marketing Cooperative Society
CBSD	Cassava Brown Streak Disease
CMD	Cassava Mosaic Disease
COSCA	Collaborative Study of Cassava in Africa
COSTECH	Tanzania Commission for Science and Technology
DADPs	District Agricultural Development Programmes
FAO	Food and Agriculture Organization
FDG	Focus Group Discussion
FFS	Farmer Field School
FINCA	Foundation for International Community Assistance
ICE	Institute of Continuing Education
MAFC	Ministry of Agriculture, Food Security and Cooperatives
PADEP	Participatory Agricultural Development and Empowerment Project
PRIDE	Promotion of Rural Initiative and Development Enterprises
VICOBA	Village Community Bank

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

The level of produced food over the last two decades has reduced dramatically in Sub Saharan Africa resulting in decline in the standard of living of the population (Liberio, 2012). The problem of food shortage in developing countries could be overcome through the use of modern agricultural technologies such as improved seeds, use of fertilizers, pesticides, proper spacing and agricultural mechanization (Liberio, 2012). Factors that have been observed to enable adoption of technologies were research efforts, the shift in the focus of advice, the trend towards better education and training of farmers, quicker and cheaper means of disseminating and sharing information, availability of financial resources, pressure from consumers, non-government organizations, the media and the public in general (CIMMITY, 1993). Many reasons have been given for the less impact of improved agricultural technologies such as low adoption of the technologies, abandonment of previously adopted agricultural technologies, gender differences and technological characters (Nweke *et al*., 2002).

Cassava (*Manihot esculenta Crantz*) is an important subsistence food crop in the semi-arid areas and sometimes considered as famine reserve when cereals fail due to its drought tolerance and the root can readily be stored under the ground (Kapinga *et al.,* 2005). 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 (Mtunda and Muhanna, 2002). The current cassava productivity in Tanzania is near the lower end of internationally reported yields. Among major constraints

contributing to low productivity include prevalence of devastating pests and diseases, shortage of planting materials, drought, poor soil fertility, use of varieties with low genetic potential, lack of improved seed systems and low adoption rates of research recommendations by farmers (Mtunda *et al.,* 2002). This is the case in Mkuranga District in which improved technologies are partially adopted by farmers. The technologies promoted include proper spacing, land preparation, timely weeding, use of fertilizers/manure, use of improved planting materials, use of manual and powered grater and chipper machines for cassava processing, and use of insecticides/herbicides (Mtunda *et al.,* 2002). The majority of farmers are still confined with traditional technologies such as use of local planting materials, improper spacing, improper fertilizer application, traditional cassava processing, improper land preparation and improper weeding (Mkamilo and Jeremiah, 2005).

1.2 Problem Statement

The government through Kibaha Research Center and Mkuranga District has made efforts on technology transfer sensitization. Despite these efforts and supply of cassava improved planting materials, proposing the use of herbicide/pesticides, planting time, use of proper spacing, use of fertilizers, weed control, harvesting time, improved storage, planting methods, and proper processing; there is still low adoption of recommended technologies. The District annual report on cassava production in a year 2012/13 indicated that, the distribution of improved cassava planting materials and promotion of improved cassava technologies was taught and demonstrated through District Agricultural Development Programmes (DADPs) and Kibaha Research Center by using groups of 20-25 farmers in farmers' field school (FFS). However, farmers are reluctant to change and still practicing with their traditional ways of growing cassava such as use of local planting materials which are susceptible to pest and diseases. Considering low adoption of improved cassava

technologies in Mkuranga District, this study aims at identifying factors influencing adoption of improved cassava production technologies by farmers.

1.3 Justification of the Study

The results of this study are potential to provide in-depth information to key stakeholders such as farmers, policy makers, practitioners, researchers and extensionists on cassava production and factors that influence adoption of improved production technologies so that they can address them.

1.4 Objectives of the Study

1.4.1 General objective

The aim of this study was to assess factors influencing adoption of improved cassava production technologies in Mkuranga District.

1.4.2 Specific objectives

The following were the specific objectives:

i. To examine technologies used by cassava smallholder farmers.
ii. To identify extension services provided to cassava smallholder farmers.
iii. To find out cassava production constraints.
iv. To identify factors leading to adoption of improved cassava production technologies.

1.4.3 Research questions

Research questions for the study include:

i. What are the current cassava production technologies?
ii. What services, information and technologies are being disseminated?

iii. What are the cassava production constraints?

iv. Which factors influence the adoption of improved cassava technologies?

1.5 Conceptual Framework

The main dependent variable in this study was factors influencing adoption of improved cassava production technologies, the independent variables included age, size of household, sex, labour availability, farming experience, farm size and education level. The institutional factors were market availability, extension service, training, and credit availability. Rogers (2003) reported social scientists investigating farmers' adoption behavior have accumulated considerable evidence showing that demographic variables, technology characteristics, information sources, knowledge, awareness, attitude, and group influence adoption behavior.

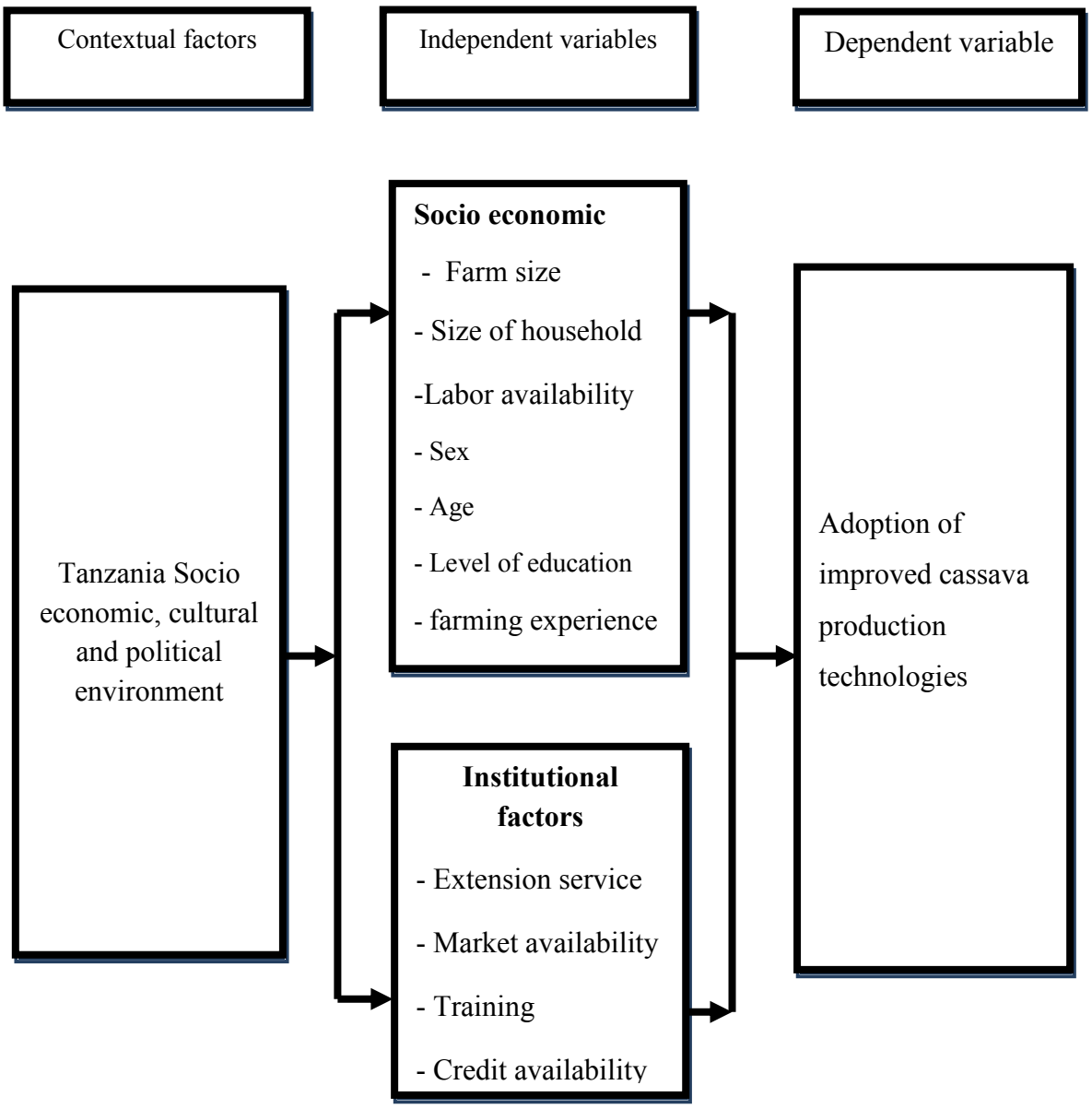

Figure 1: Conceptual framework of this study

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The Concept of Adoption

Adoption can be defined as the mental process through which an individual passes from first hearing about an innovation to final adoption (Rogers, 1995). According to Liberio (2012) the term adoption is the continued use of a recommended practice by individuals or groups over a reasonable long period. Adoption also refers to the decision use of new technology, methods and practices by a farmer. Adoption is not a permanent behavior (Liberio, 2012). Rogers and Shoemaker (1995) define adoption as a decision to make full use of new ideas as the best course of action available.

The decision of whether or not to adopt a new technology hinges upon a careful evaluation of a large number of technical, economical and social factors. Adoption of technology is a decision that should be made by an individual. However an individual may decide to continue or discontinue the adoption of technologies for a variety of personal, technical, economical, institutional and social factors focusing on the availability of an idea or practices that is better in satisfying his or her needs (Rogers, 1995).

2.2 The Concept of Technology

Technology is the process of applying the finding of science and other forms of enquiry to situations. Production technology therefore involves applying the work of researchers to develop new products and processes. Technology can be seen as the process by which humans modify nature to meet their needs and wants (Hornby, 2000). Adofu *et al.* (2010) defined technology as an organized capacity for some purposive activity. The definitions

above suggest that agricultural technology include both components and processes of agricultural production. These processes may include; production of plant and animal breeding, the introduction of new crops, livestock and fisheries, mechanization, infrastructural development and inputs.

Empirical studies on agricultural technology adoption generally divide a population into adopters and non-adopters, and analyze the reasons for adoption or non adoption at a point in time (Jabbar, 2003). Technology adoption is not a static decision; rather is a dynamic process in information gathering, learning and experience, which play pivotal roles, particularly in the early stage of adoption (Jabbar, 2003).

2.3 Adoption of Agricultural Technologies in Tanzania

Several studies have reported issues related to adoption of technologies and factors that influence adoption of technologies. Nkonya (2003) reported that the rate of adoption for farmers using chemical fertilizer in Northern zone of Tanzania was 64% and 44% on moderate rainfall zone and low rainfall zone, respectively. The reasons for different rate of adoption were associated with income differences in the zone (Nkonya, 2003).

According to Oladele (2005), the importance of farmers' adoption of new technology has long been of interest to agricultural extensionist and economist. Several parameters have been identified as influencing the adoption behavior of farmers from qualitative and quantitative models for the exploration of the subject (Fedder and Umali, 1993). Social scientist investigating farmers' adoption behavior has accumulated considerable evidence showing that demographic variables, technology characteristics, information sources,

knowledge, awareness, attitude, and group influence affect adoption behavior (Oladele, 2005).

2.4 Production and Constraints of Cassava

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). In east Africa, Tanzania was rated first in cassava production followed by Uganda for the period between 2006 and 2010 with figures ranging from 6.2-7.9 million tons respectively (Kulembeka, 2010). In Tanzania, eighty four percent (84%) of the total production is utilized as human food, the remaining percentages are for other uses like starch making, livestock feed and export (Mtunda *et al.,* 2002). Also Mtunda (2009) reported the main producing areas are the coastal belt on the Indian Ocean, the southern zone, the Lake Victoria basin and on the shores of lakes Nyasa and Tanganyika. The production of cassava in the southern zone accounts for 32% of the total cassava production in the country, the eastern coastal zone accounts for 18%, and the Lake Victoria zone accounts for 13% and the southern highlands for 9% (Mtunda, 2009).

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 (Mtunda and Muhanna, 2002). Its relatively high prominence in production because of ability to grow on 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 from famine (Odoemenem and Otanwa, 2011). It is a crop for most of subsistence farmers particularly those in areas prone to drought. It is thus a widely held belief that “there is no famine where cassava is grown” cassava is a “food security” crop (Odoemenem and Otanwa, 2011).

Although cassava has many benefits as a crop of the tropics, its production faces many constraints leading to low productivity. The constraints include biotic, abiotic and socio-

economic factors. Biotic and abiotic constraints include shortage of appropriate improved cultivars with high genetic potential, long growth cycle, inadequate availability of disease-free planting materials, post-harvest losses, nutritional deficiency for people who solely depend on cassava, cyanide content, diseases and pests (IITA, 1990).

Kimata (2012) documented that abiotic stresses for cassava production are drought and poor soil fertility, while biotic constraints include diseases and pests. Inadequacy of improved cassava varieties is another constrain to cassava production. Shortage of planting materials, due to the inherent low multiplication ratio of cassava, is critical in semi - arid areas where farmers harvest most of their cassava in dry months and leave stems to dry in the field. During planting season, farmers face critical shortage of planting materials, this causes farmers to use any cassava materials readily available in their localities without considering quality of those planting materials which leads to low cassava yields (Lukombo *et al*., 2002). Mtunda (2009) reported the major constraints limiting cassava production and productivity include pests and diseases, poor crop management practices, declining soil fertility, inadequate inputs, erratic weather conditions, limited access to quality planting material and low adoption of improved technologies.

According to Oluwasola (2010) the major constraints to smallholder farmers are scarcity of affordable and environmentally appropriate technologies. Scarcity of appropriate technologies makes smallholder farmers to depend mainly on natural systems for sustenance. Mkamilo and Jeremiah (2005) stated that there are constraints which decrease production of cassava in Tanzania including diseases and inadequacy of planting materials. Most of the varieties grown by farmers have been selected randomly and have low genetic potential for yields and resistance to major pests and diseases. Among the

major diseases are Cassava Brown Streak Disease (CBSD) and Cassava Mosaic Disease (CMD). COSCA Tanzania (1996) pointed out that, lack of improved seed systems, inadequate processing facilities, knowledge, marketing, inadequate capital investment and unavailability of credit facilities also contributed to low cassava productivity in farmers' fields and subsector at large. These problems are caused by lack of favorable policy which favors cassava commercialization (Mkamilo and Jeremiah, 2005).

2.5 Adoption of Cassava Production Technologies

Adoption of agricultural technologies, such as the high yielding varieties could lead to significant increases in agricultural productivity and stimulate the transition from low productivity subsistence agriculture to a high productivity agro-industrial economy (Ojo and Ogunyemi, 2014). Azilah (2007) reported that, the adoption of cassava technologies is important in increasing household food security in Ghana, Nigeria and Malawi. Mtunda *et al.* (2002) reported the improved technologies in cassava production include proper spacing, land preparation, timely weeding, use of fertilizers/manure, use of improved planting materials, use of manual and powered grater and chipper machines for cassava processing, use of insecticides and use of herbicides. Mkamilo and Jeremiah (2005) asserted that the majority of farmers in Tanzania were still confined with traditional technologies such as use of local planting materials, improper spacing, no fertilizer application, land preparation, weeding and traditional cassava processing. Ojo and Ogunyemi (2014) noted that If the demand for cassava and income generated from cassava production increase, farmers will be motivated to adopt productivity-enhancing technologies to increase yields and to expand cassava production.

2.6 Factors Affecting Adoption of Technology

The adoption of technologies by farmers is affected by socio-economic factors, institutional and intervening factors. Socio-economic factors include, age of the potential

adopters, sex, education level, farming experience, farm size and labour availability. Institutional factors include market availability, access to credit facilities, extension service delivery mechanism and training of cassava production technologies (Anderson and Fedder, 2004). Extension services tend to educate farmers and assist in solving their problems, thereby adopt improved cassava farming technologies hence increased production. However, the services are affected by inadequate number of extension officers and inadequacy of working facilities. Lack of transport for extension agents to reach farmers in remote areas affect delivery and adoption of technologies. Also, poor linkage between research, extension services and farmers is among the main cause for farmers not to adopt improved technologies. Another problem affecting farmer's adoption of technology is due to lack of involving farmers in the planning process (Feder *et al.,* 1985). Minten and Barret (2008) found that communities with higher rates of adoption of improved agricultural technologies had higher crop yields and lower level of food insecurity. On the other hand intervening factors include risk aversion, infrastructure, assets and government policy (Kassie *et al.*, 2009). For instance, farmer with high level of income may be less risk averse than low income farmers (Ogunlana, 2004). Moreover, the number of people in a household may influence the adoption of the technology, the bigger the size of the family in a household the higher the chance of adoption also as labour accessibility increases (Asmelash, 2014).

2.7 Extension Service Delivery for Cassava Farmers

Extension can be described as the process of assisting farmers to become aware of and adopt improved technology from any source to enhance production efficiency, income and welfare (World Bank, 2001). The extension service is the most effective source of information flow to farmers on farming practice, innovations and technology. According

to Liberio (2012), extension agent is the key person to train farmers on issues related to farming including dissemination of new technologies. Extension agent is a change agent who influences client's innovation in a direction deemed desirable by a change agency. In most cases change agents seek to secure the adoption of improved technology, they do receive the knowledge from research centers and pass it to farmers (Liberio, 2012).

An extension service can have an important function in increasing the rate of adoption by being directly involved in increasing awareness, facilitating skill acquisition and assisting in understanding of improved cassava technologies and its relevance to farmer circumstances (Neil *et al.,* 2001). It also has an important role in feedback information on farmer constraints, potentials and farmers' experiences with new technology to the research system, as well as in working with farmers and researchers in developing and spreading indigenous solutions to problems (Neil *et al.,* 2001). Agricultural extension agent helps to educate farmers and assist to solve their own problems and thereby adopt improved cassava farming technologies and increase production (Belay *et al.,* 2004).

Different methods are used to ensure that agricultural information and research results reach farmers. These methods include; personal contacts, group methods such as meetings, demonstrations, farmers' field days, farmers training and agricultural shows (Belay *et al.,* 2004). Agriculture extension is used to improve food security in rural development programmes in many developing countries (Rivera and Quamar, 2003). Extension can help to enhance the productivity of food as well as the quality of rural life by way of community development (Rivera and Quamar, 2003). Pattanayak *et al.* (2003) pointed that access to extension services, other stakeholders and Non-Governmental Organization have an influence in farmers' adoption of cassava improved technologies. The argument was

that farmers who usually meet extension officers and have done demonstration on the proposed technology have a high chance of adopting technology.

Mkamilo and Jeremiah (2005) pointed the effort of National Root and Tuber Research Programme under Ministry of Agriculture, Food Security and Cooperatives (MAFC) has been distributing small quantities of improved cassava varieties to farmers through on-farm trials and demonstration plots using farmer groups or individuals as a strategy to disseminate technologies. These efforts helped farmers acquire improved knowledge, skills and ultimately adopt technologies to increase cassava production and productivity as well as improve food security. Moreover extension aimed to fill in the knowledge gap on improved technologies and facilitate adoption of recommended packages for improved cassava production by farmers.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was carried out in Mkuranga District, Coast Region of Tanzania. Six villages of Bigwa, Kibululu, Kiparang'anda A and B, Mwarusembe, Kimanzichana Kaskazini and Matanzi were selected in three wards of Kiparang'anda, Mwarusembe and Kimanzichana as shown on the study area location map (Fig. 2). The six villages are the main cassava producers and majority of farmers depend on the crop as a source of food and income.

According to 2012 National Population Census, Mkuranga District has 222 921 people where males were 108 024 and females were 114 897. It is bordered with Dar-es-Salaam city to the north, Indian Ocean to east, to south by Rufiji District and to the west by Kisarawe District. The District has a total area of 2432 km² (243,200 ha) of which 447 km² (44 700 ha) is covered by Indian Ocean and 1985 km² (198 500 ha) is mainland. The area that is covered by natural reserves is 51 km² (5 100 ha). Area suitable for cultivation is 1934 km² (193 400 ha) while the area that is under cultivation is 1662.3 km² (166 230 ha), which is 86% of the arable land. The main economic activities carried out in Mkuranga District are agriculture and livestock keeping and the main crops grown include cassava, sweet potato, cashew nut, maize and rice.

Mkuranga District experiences a modified type of equatorial climate. It is generally hot and humid throughout the year with an average temperature of 28^0C. The hottest season is from October to March while it is relatively cool between May and August with temperature approximately 25^0C. There are two rain seasons: Short rain (*Vuli)* from October to December and long rain (*Masika*) season between March and June.

The average annual rainfall is 800-1000mm. Humidity is around 96% in the mornings and 67% in the afternoons. The climate is also influenced by the Southwest monsoon winds from April to October and Northeast monsoon winds between November and March.

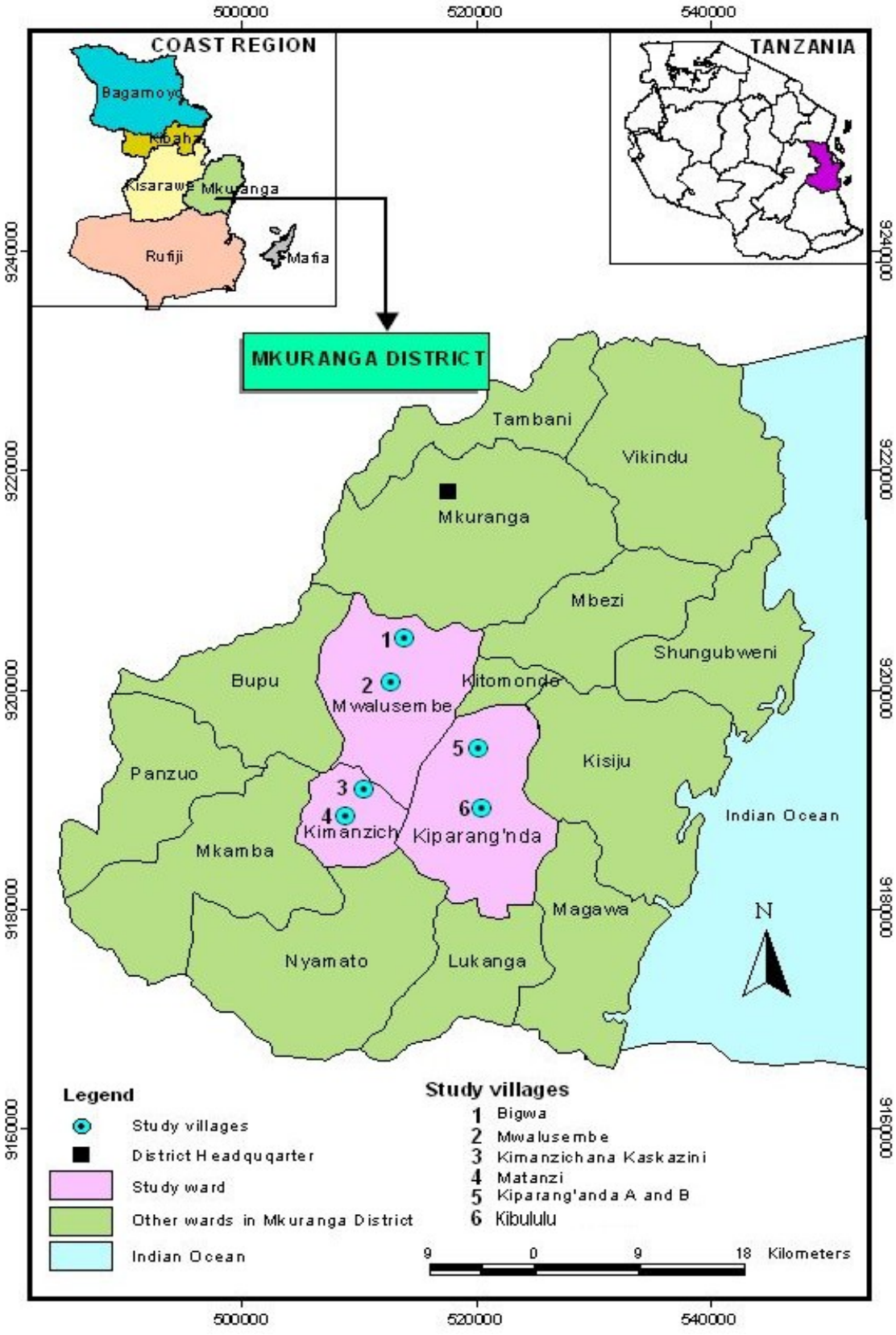

Figure 2: A Map of Coast Region with sampled wards and villages in Mkuranga District

3.2 Research Design

The study used a cross-sectional research design. Under this design, data from households' respondents was collected at a single point in time without repetition from the representative population. The design has the advantage of describing and determining the relationship between variables (Babbie and Mouton, 2005). It also gives the researcher time/opportunity to observe and describe the working situation, events and behaviour of the subjects.

3.3 Sample Size and Sampling Procedure

Purposive sampling techniques were used to select wards namely Kiparang'anda, Mwarusembe and Kimanzichana. From the three wards, purposive sampling technique was used in selecting a targeted village relevant to study in the specific areas namely Bigwa, Kibululu, Kiparang'anda A and B, Mwalusembe, Kimanzichana kaskazini and Matanzi. The villages were selected according to history of cassava production. Thereafter selection was done randomly to pick farmers. A total of 120 respondents were selected by using simple random sampling procedure. According to Matata *et al*. (2010), a sample of 80 up to 120 respondents is adequate for most socio-economic studies in sub Saharan Africa households.

3.4 Data Collection

3.4.1 Pre-testing of instruments

Before actual data collection, the questionnaires were pre-tested in one of the villages and administered to twenty respondents. Pre-testing helped to check the validity and reliability of the questionnaire items (Kajembe and Luoga, 1996). The respondents involved were not included in the actual total sample size of 120 farmers for interviewing. The results of

the pre-testing were used to revise the instrument before it was administered to the research sample. Questions that were not clear, specific and pertinent to the study objectives were adjusted accordingly, before embarking on data collection exercise.

3.4.2 Primary data collection

Combinations of methods (triangulation) were used to collect primary data. Primary data were collected using structured questionnaires that were administered to 120 respondents. A checklist was used for Focus Group Discussion (FGD) and key informants. The questionnaires and checklist were used to know the adoption of recommended cassava production technologies and determine the independent and intervening factors that influence the adoption of improved cassava production technologies in the selected villages in Mkuranga District.

3.4.3 Focus group discussion

Focus Group Discussion (FGD) checklist was prepared for sixty cassava farmers. A total of three FGDs were held. The FGDs were important in obtaining information that could not be easily obtained through a questionnaire. This method brought together participants in three groups, which comprised of cassava farmers, non cassava farmers and cassava vendors, to discuss the topic. A topic guide to aid discussion was prepared before hand and a range of aspects of the topic were explored. Brainstorming techniques were used to explore the topic. Data collected helped understanding of the values and beliefs held by the members of the population (Appendix 2).

3.4.4 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). In this study, ten key informants

who were village extension officers and progressive cassava farmers were asked on various aspects regarding cassava production including varieties grown, production constraint and priorities, available technologies to list a few. These people were interviewed to get their experiences on the issues to be researched by using a checklist (Appendix 3).

3.5 Data Processing and Analysis

3.5.1 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 was to summarize 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 discussion with respondents was broken down into smallest meaningful units of information, values and attitudes of respondent.

3.5.2 Quantitative data analysis

Quantitative data analysis was done by using descriptive analysis mainly frequencies and percentage to answer the objectives and to summarize the characteristics of households and factors affecting cassava production technologies.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic and Demographic Characteristics of Respondents

The socio-economic characteristics analysed in this study were age of respondents, sex, marital status, education level, household size, and occupation.

4.1.1 Sex of the respondents

The study results showed that majority (59.2%) of the respondents engaged in cassava cultivation were males and 40.8% were females (Table 1) and that males dominated cassava production in the study area. During the Focus Group Discussion (FGD) male participated more than female, probing on this it was observed that normally women are left home as they are being involved in reproductive and income generating activities such as food vending, hair dressing, tailoring and petty trading (culture and customs of the Coastal Region). During the interview also some of the respondents were noticed saying that the males' work is to produce while females' work is to use the produce and caring the family. According to Oladeji *et al*. (2001) it is generally believed that males are often more energetic and could readily be available for energy demanding jobs like cassava farming. The result from this study relates to findings observed by Nweke *et al. (*2001) who reported that women were found to contribute less than half of the total labour inputs in the cassava productive system in five of the six Collaborative Study of Cassava in Africa (COSCA) countries.

Table 1: Socio-economic and demographic characteristics of respondents (n=120)

Variable	Frequency	Percent
Age in years		
18-30	8	6.6
31-45	44	36.7
Above 46	68	56.7
Total	**120**	**100**
Sex		
Male	71	59.2
Female	49	40.8
Total	**120**	**100**
Marital status		
Single	9	7.5
Married	96	80.0
Widowed	10	8.3
Divorced	5	4.2
Total	**120**	**100**
Level of education		
Non formal education	30	25.0
Primary school	78	65.0
Secondary school	6	5.0
College/University	6	5.0
Total	**120**	**100**
Family size		
1-3	24	20.0
4-7	67	55.8
8 and above	29	24.2
Total	**120**	**100**
Occupation		
Crop production	94	78.3
Business	2	1.7
Employment	5	4.2
Crop production and livestock keeping	19	15.8
Total	**120**	**100**

4.1.2 Age of respondents

According to the results, 56.7% of the respondents were aged 46 years and above, 36.7% aged between 31- 45 and 6.6% aged between 18-30 years (Table 1). This implied that more than half of the respondents were above 46 years old. This is the group which owned farms and did cassava production activities.

4.1.3 Marital status

Results show that 80% of the respondents who cultivated cassava were married, 8.3% were widowed, 7.5% were single, and only 4.2% were divorced (Table 1). During FGD, most of farmers who are married relied on cassava for several household needs such as food, cash for education, and health services. This is due to the fact that these families have more responsibilities than unmarried. Also some of the married women revealed that cassava production is a source of food and that they sometimes exchange it with other crops such as maize and rice. Either all farmers said that when they are in financial problems they sell part of cassava produce and get money for other domestic uses. It was also observed that youth, both men and women were not interested in cassava farming and hence they engaged themselves in other activities like food vending, hair dressing, fashion design and petty trading. For widowed women and single family both male and female headed, were less productive due to the fact that they had insufficient labour supply from their own family that they can engage in agriculture production. According to World Bank (2009) marital status is said to influence farm practices. Moreover, marital status has implication on social organization and economic activities such as agriculture and resource management as well as adoption of cassava technologies. According to Mende *et al*., (2015) married couples are likely to be more productive than single persons due to labour supply in farm activities and access to productive resources in agriculture.

4.1.4 Level of education

According to the results, 65% of the respondents who cultivated cassava had primary school education, experience has indicated that they can easily learn and adopt new technologies, 25% of the respondents had no formal education implying that they tend to be conservative as they resist even to adopt new innovations, 5% had secondary education and 5% had college or university education meaning they are more knowledgeable and can easily adopt new technologies. The net effect of this low level of education is continuous adoption of traditional farming practices with the associated vicious cycle of low productivity. 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.

4.1.5 Family size

The results show that 55.8% of the respondents had family size ranging between 4-7, 24.2% had family size above 8 (Table 1). Also results show that 20% had family size between 1-3. This implies that families that have more members are engaged in agricultural production particularly cassava production because of the labor force available in the household. According to Asmelash (2014) the number of people in a household is the factor that influences the adoption of the technology, the bigger the size of the family in a household the higher the chance of adoption as labor accessibility increases, adoption is also expected to increase.

4.1.6 Occupation of the respondents

Occupation is very essential when it comes to economic matters; the element become important in knowing how the respondents in the study area were earning a living.

Study results revealed that 78.3% of the respondents engaged in crop production, 15.8% engaged in crop production and livestock keeping, 4.2% engaged in business activities and the rest (1.7%) were employed in government and private sectors (Table 1). This implies that the survival of most respondents' depended mainly on farming activities and business activities. These findings comply with results reported by Liberio (2012), who reported that agriculture is the main source of food and provides employment opportunities to about 80% of Tanzanian population. According to Obisesan (2013) as a cash crop, cassava was found to generate income for the largest number of households compared to other staples, contributing positively to poverty alleviation in Nigeria.

4.2 Land Acquisition and Cassava Production

Normally farming needs a fertile and enough land. According to the study results it show that most of the respondents in the study area got farm land through inheritance, meaning that land are being transferred from one generation to another without segregation of gender. Also during FGD farmers revealed that they have no money to purchase land for cassava farming. According to Okereke (2012) cassava farmers sourced their farmland through inheritance of family land.

4.2.1 Farm size for cassava production

Farm size is an important factor to consider when it comes to production; it therefore became one of the essential elements for the study. Findings as presented in Table 2 show that more than a half (56.7%) of the respondents have 1-3 acres of land for cassava cultivation, 7.5% have 3 acres and above and 35.8% had less than one acre of land. This implied that there is a possibility of decreasing cassava production and adoption of technologies because land is a limiting factor in the study area. Ruben *et al.* (2006)

indicated that the majority of African smallholders cultivate less than two hectares of farmlands. Farmers with larger farms are likely to be better informed, be able to take larger risks associated with early adoption, and have more opportunity to experiment.

4.2.2 Cassava planting methods

Cassava planting methods is very important to plant growth and health. The study revealed that 49.2% of the respondents use cassava upright planting method which is a traditional practice, 37.5% of respondents used slanting (45 degree) planting method which is recommended practice and 13.3% use horizontal planting method which is being used especially during dry weather (Table 2). This indicates that majority of cassava farmers in the study area continue using traditional technologies of planting due to low adoption of improved cassava planting technologies. During focus group discussion (FGD) respondents revealed that they don't know the importance of using slanting method. Mkamilo and Jeremiah (2005) also indicated that most of the farmers staying in villages, Coast Region are still confined with traditional technologies.

4.2.3 Fertilizer application in cassava production

Cassava is known for its ability to produce fair yields where other crops fail. Fertilizer use may be the easiest way to improve cassava productivity. Study results show that 97.5% of the respondents they do not use any fertilizer in their cassava farm, 1.7% of the respondents applied inorganic fertilizer and 0.8% applied organic fertilizers (Table 2). This implies that majority of farmers in the study area they did not apply fertilizers in cassava cultivation which may cause low yields. During FGD farmers said that Inorganic fertilizers are expensive and sometimes are not available.

A few number of farmers who applied organic fertilizer said that it is difficult to apply due to high labour requirements and limited availability. Ayoola and Makinde (2014) reported

that cassava removes substantial amount of nutrients with the harvested roots, the highest being potassium followed by nitrogen. Also, commented that application of fertilizer in cassava crop, improves soil nutrients as well as yields.

Table 2: Farm size and cassava production practices (n=120)

Variables	Frequency	Percent
Farm size (acres)		
Less than 1	43	35.8
1-3	68	56.7
3 and above	9	7.5
Total	**120**	**100**
Cassava planting methods		
Upright	59	49.2
Horizontal	16	13.3
Slanting (45 degree)	15	37.5
Total	**120**	**100**
Fertilizer application		
Organic fertilizer	1	0.8
Inorganic fertilizer	2	1.7
Not applied	117	97.5
Total	**120**	**100**

4.2.4 Reasons for farmers not using fertilizers

Study results show that 52.9% of the respondents said they lack knowledge about fertilizer, 27.4% said it is expensive, 10.3% said fertilizers are not available, and 9.4% said that their farms are naturally fertile that there is no need to apply or use fertilizers (Table 3). Key informant said that many farmers believe that soil fertility is not important in cassava production. However, some farmers use other options to improve cassava production such as ashes and cassava leaves (residuals) to increase nutrient availability in

the soil. IITA (2010) reported high prices and unavailability of fertilizer to farmers limit the adoption of fertilizer technology.

Table 3: Distribution of respondents by reasons for not using fertilizers (n=117)

Reasons	Frequency	Percent
Lack of knowledge	62	52.9
Expensive	32	27.4
Not available	12	10.3
Fertility of the land	11	9.4
Total	**117**	**100**

4.3 Production of Cassava Planting Materials

Like in any other crops, cassava production is increased by the use of improved planting materials. Most farmers in Tanzania use cassava planting materials that are low yielding and susceptible to insect pest and diseases, as improved varieties are not readily available**.** Study results indicated that 93.0% of the respondents were not able to produce cassava planting materials (both improved and none improved), while 7.0% were capable to produce cassava planting materials. During the interview the respondents confirmed that it was difficult for them to produce planting materials due to various reasons. It showed that 30.4% of the respondents said that they failed to produce cassava planting materials due to small farm size, 28.6% due to lack of education, 19.6% high costs, 12.5% due to lack of irrigation machine and 8.9% of the respondents admitted to have been failed to produce cassava planting materials because of the unpredictable weather condition (Table 4). The finding implies that producing and preserving cassava planting materials by smallholder farmers depends not only on economical ground but also on environmental situations. Mkamilo and Jeremiah (2005) reported that there were no organizations responsible for the multiplication and distribution of cassava planting materials in the country. The

National Root and Tuber Research Programme under Ministry of Agriculture, Food Security and Cooperatives (MAFC) has been distributing small quantities of improved cassava varieties to farmers through on-farm trials and demonstration plots using farmer groups or individuals as a strategy to disseminate technologies.

Table 4: Distribution of respondents by reasons for not producing cassava planting materials (n=112)

Reasons	Frequency	Percent
Small farm size	34	30.4
Lack of education	32	28.6
High costs	22	19.6
Lack of irrigation machine	14	12.5
Dry weather	10	8.9
Total	**112**	**100**

4.4 Benefits of Cassava Production

All farmers have expectations on the main benefits of the crop they cultivate. The findings showed that 92.5%, of the respondents benefited mainly from the cassava crop by providing food for their family, 5% for increasing household income through selling and exchanging for goods, and 2.5% for feeding their animals (Table 5). This implies that cassava can benefit for various purposes. Mtunda *et al.* (2002) found that 84% of the total cassava production in Tanzania is utilized as human food, the remaining percentages were for other uses like starch making, livestock feeds and export. Also Sanni *et al.* (2008) and Adebowale *et al.* (2008) reported that the crop and its derivatives have excellent potentials in livestock feed formulation, textile industry, plywood, mix cassava flour and wheat flour is used to make breads and cakes, paper, brewing, chemicals, pharmaceutical and bakery industries.

Table 5: Distribution of respondents by the main uses of cassava (n=120)

Uses	Frequency	Percent
For food	111	92.5
For household income	6	5.0
Animal feed	3	2.5
Total	**120**	**100**

4.5 Technologies Used by Cassava Smallholder Farmers in Mkuranga District

It was found that majority of farmers used traditional technologies and other farmers used improved technologies in the study area. Moreover the findings from direct observation and FGD showed that majority of the farmers used traditional technologies such as burning of bushes and planted cassava direct without neither distumping nor ploughing and spacing consideration.

4.5.1 Distribution of respondents according to the usage of current improved cassava production technologies

The usage of current improved cassava production technologies 120 (100%) were interviewed. The results show that out of the 120 respondents, 88.2% used improved cassava planting materials, 80.4% used proper spacing, 74.5.7% used weeding, 72.5% applied the planting method, 7.8% used fertilizer and 2.0% used either herbicides or insecticides (Table 6). Nweke *et al.* (2002) reported that the renaissance of cassava production systems in Ghana in 1990s was primarily due to the successful diffusion of both improved varieties and mechanized processing following a positive shift in government policies with respect to expanding cassava research, development, adaptation and extension.

Table 6: Distribution of respondents by adoption of cassava technologies

Technologies	Frequency	Percent
Improved cassava planting materials	45	88.2
Proper spacing	41	80.4
Weeding	38	74.5
Planting methods	37	72.5
Use of fertilizer	4	7.8
Use of insecticide/herbicides	1	2.0

Note: Data set was based on multiple responses

4.5.2 Reasons for farmers not adopting improved technologies

During the FGD, farmers gave several reasons for not adopting improved cassava production technologies. Majority of the respondents said that they did not adopt improved technologies due to ignorance, difficulties in using it, not available, expensiveness of technologies and inadequate of extension services. Hence, farmers continued to use traditional technologies in cassava production. Similar to this study, Mkamilo and Jeremiah (2005) asserted that the majority of farmers in Tanzania were still confined with traditional technologies such as use of local planting materials, improper spacing, no fertilizer application, land preparation, weeding and traditional cassava processing. Doss *et al*. (2003) mentioned several reasons for farmers not adopting improved technologies in maize and wheat; unaware or misconception of technologies, farmers did not understand the benefit of the improved technologies.

4.6 Extension Services Provided to Cassava Smallholder Farmers

Extension service was found to have a strong relation with adoption of cassava production technologies as it enhances ability to acquire and use information required for production and productivity. Therefore, emphasis has to be given towards strengthening farmers' knowledge on adoption of improved technologies by providing training to increase

awareness of the farmers in the study area. The study shows that out of the 120 respondents, 86.2% reported to have been facilitated service by extension worker in the planting techniques, 77.6% confirmed to get directions and skills on a proper spacing, 72.4% weeding knowledge, 60.3% reported to get knowledge on the use of improved planting materials, 60.3% got training on marketing and 39.7% reported to have been given education on market techniques and 36.2% reported on cassava processing (Table 7). This implies that shortage of extension service contributed to low adoption of improved technologies. According to Okuthe (2014) extension service is assumed to have positive influence on adoption of improved cassava production technologies by farmers.

Table 7: Extension Services provided to cassava farmers

Services	Frequency	Percent
Planting technique	50	86.2
Proper spacing	45	77.6
Weeding knowledge	42	72.4
Improved planting materials	35	60.3
Market techniques	23	39.7
Processing education	21	36.2

Note: Data set was based on multiple responses

4.6.1 Farmer's contacts with extension officer

The results show that 62.5% of the respondents reported not to have contact with the extension officers while 37.5% of the respondents had contact with the extension officers. The results from FGD also showed that majority of the respondents did not have contact with the extension officers because extension officers are not available, some of extension officers stay far from the village and they have no transport. This implies that farmers do not get enough agricultural advices from extensionists who could encourage them to adopt cassava agricultural technologies such as use of improved planting materials, spacing,

planting methods and weed control. Due to unavailability of extension officers there is low adoption of cassava improved technologies in the study area. To make farmers competent and adopt technologies it is expected from the extension agent to work closely with farmers (Liberio, 2012).

4.7 Constraints Facing Farmers in Cassava Production

No success without setbacks, during the interview the respondents lamented on various problems that have been facing them from land preparation to harvesting. According to Akinnagbe (2010) there are numerous challenges to cassava production that could be grouped under agronomic, institutional/technical and financial constraints. Mtunda (2009) reported the major constraints limiting cassava production and productivity include pests and diseases, poor crop management practices, declining soil fertility, inadequate inputs, erratic weather conditions, limited access to quality planting material and low adoption of improved technologies. Study findings as presented in (Table 8) show various constraints which faced the farmers in the study area. The major constraints faced cassava farmers and identified during the survey were pests and diseases, drought, inadequate planting materials, scarcity of land, poor soil fertility, inadequate education as well as inadequate finance.

Table 8: Constraints in cassava production

Constraints	Frequency	Percent
Pests and diseases	95	79.2
Drought	73	60.8
Inadequate planting materials	70	58.3
Scarcity of land	45	37.5
Education and knowledge	39	32.5
Inadequate finance	31	25.8
Poor soil fertility	22	18.3

Note: Data set was based on multiple responses

4.7.1 Pests and diseases

The findings show that out of the 120 respondents, 79.2% mentioned pests and diseases such as cassava mealybug, termites, elegant grasshopper, Cassava Mosaic Disease (CMV) and Cassava Brown Streak Disease (CBSD) were the main constraints to cassava production. During the FGD, participants noted that currently there are no pesticides for CMV and CBSD, hence they depended on advices from agricultural extension officers. These results highlight finder concerns as those noted by Rwegasira *et al*. (2011) who stated that Cassava Mosaic Virus (ACMV) and Cassava Brown Streak Disease (CBSD) are the most important cassava diseases in Tanzania.

4.7.2 Drought

The results show that 60.8% (Table 8) pointed at the natural calamities such as drought as among the major constraint in cassava production. Extension officers reported that: “It is not that we do not help our farmers, since we visit them almost in all the stages. The big problem is drought which has been destroying the cassava. Farmers lack the ability to irrigate and so end up harvesting low products”. Kapinga *et al.* (2005) indicated challenges facing cassava farmers to include drought, shortage of planting materials, poor soil fertility, use of varieties with low genetic potential, lack of improved seed systems and low adoption of research recommendations.

4.7.3 Inadequate planting materials

Inadequate planting materials also constrained cassava production in the study area. The result showed that 58.3% (Table 8) confirmed to have been facing the problem for a long time. During FGD the issue was also raised where the majority supported that it has been difficult to get planting materials where sometimes they travel a long distance searching

for the favourable variety. This implies that they do not preserve their own cassava planting materials for the next cultivation season due to drought. Mkamilo and Jeremiah (2005) reported that there was no organization responsible for the multiplication and distribution of cassava planting materials in the country causing inadequacy of planting materials.

4.7.4 Land scarcity

Land is an asset. The statement has been different by reflected in the study area in that 37.5% claimed lacking enough land for cassava production. During FGD some of the participants complained that during villagelization people were forced to move from their land which was adequate for both grazing and cultivation to new areas, where they found themselves landless. Also they said that they lacked money to buy land needed for cultivating all crops including cassava. The finding relates to what was reported by Achoja *et al.* (2012) who indicated many challenges facing the cassava farmers among them was land scarcity.

4.7.5 Inadequate education and knowledge

According to the results 32.5% (Table 8) claimed not to thrive in cassava cultivation due to lack of agricultural skills and knowledge on the selection of cassava planting materials, timely planting, proper spacing, and weeding among many requirements. Liberio (2012) stated that farmers' educational background is a potential factor in determining the readiness to accept and properly use advocated technologies.

4.7.6 Inadequate finance

The results show that 25.8% (Table 8) claimed that inadequate finance was a major constraint in cassava production, that most of them are living in villages and engaged in

cassava cultivation without using agricultural inputs such as fertilizers and quality planting materials. Further, farmers were incapable of purchasing the inputs as they were very expensive. The finding relates with what was indicated by Achoja *et al*. (2012) who said that inadequate finance for the cassava cultivation was a major problem to smallholder farmers in Nigeria.

4.7.7 Poor soil fertility

The issue of infertility of the soil could not be avoided, 18.3% commented that the soils were not fertile in that if one need to increase production it was necessary to apply fertilizers of which to some was impossible due to their poor economic status. This implies that although farmers are trying to cultivate cassava but still the land needs some kind of fertilizer, even if some farmers explained they do not need fertilizers due to several reasons such as soils were naturally fertile and others claimed that fertilizers either destroyed their soil or burned the crop. According to Asher *et al.* (2002) observed that increasing pressure on arable land near homesteads led to shorter fallow periods for soil fertility restoration which consequently led to low soil fertility which affected cassava growing. The amount of major nutrients removed from the soil at harvest is high; hence need to be replaced.

4.8 Factors Leading to Adoption of Improved Cassava Production Technologies

Adoption of technologies becomes essential when are well transmitted and reaches the targeted group. During the interview the respondents gave various responses on cassava technologies adoption. Results show that out of the 120 respondents, 58.8% (Table 9) said that farming knowledge/skills through training and seminars could increase the adoption of the technologies, 46.5% said market availability for cassava could encourage

participation of middleperson in cassava marketing which gives farmers more time to grow cassava as well as technology adoption. Further, 45.6% said that availability of high yielding cassava varieties for food and cash could be easily adopted by farmers, 43.0% said that appropriateness of the technologies to farmers may help to produce more and improve their livelihood through increased income, 42.1% said availability of credit facilities will help to purchase inputs for cassava farming and 38.6% said that the availability of cassava inputs may help to increase cassava production and hence adoption of the respective technology. Similar to this study, CIMMITY (1993) indicated that some of the factors that enabled adoption of technologies were the shift in the focus of advice, better education and training of farmers, quicker and cheaper means of disseminating and sharing information, availability of financial resources and pressure from consumers.

Table 9: Distribution of respondents by factors affecting adoption of improved cassava production technologies

Factors	Frequency	Percent
Knowledge/skills on cassava farming	67	58.8
Market availability for cassava	53	46.5
High yield for food and cash	52	45.6
Appropriate of the technologies	49	43.0
Access to credit facilities	48	42.1
Availability of agricultural inputs	44	38.6

Note: Data set was based on multiple responses.

4.9 Farmers' Opinion for Improving Cassava Production

Farmers were asked for their most pressing needs for improving cassava productivity and ultimately improved food security and households' incomes. The findings revealed that 41.7% of the respondents (Table 10) expressed their needs for high yielding cassava

varieties, 32.5% pointed out the need for improved and reliable markets for cassava products. In most cases, the farming household sells their cassava tubers in unprocessed forms to middle men thereby losing a substantial proportion of the profit margin accruable at the level of processing other cassava products. This is most often attributed to the poor condition of rural roads that cause transportation of fresh cassava and processed products to urban markets difficult. About 20.0% of the respondents expressed their needs for improved and efficient agricultural extension services delivery systems for improved cassava production. Since cassava saves as a food and cash crop, 5.8% of the respondents pointed out that, reliable prices for cassava products are vital for income generation at household level and the nation at large. Hagmann *et al*. (2003) argued that extension services facilitate farmers for collective and individual learning about innovations to enhance community's capacity to innovate.

Table 10: Respondents' major opinions on improving cassava production (n=120)

Opinions	**Frequency**	**Percent**
High yield	50	41.7
Reliable markets	39	32.5
Extension services	24	20.0
Reliable prices	7	5.8
Total	**120**	**100**

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Several studies have reported issues related to adoption of technologies and factors that influence adoption of technologies. This study focused in assessing factors influencing adoption of improved cassava production technologies in Mkuranga District. The finding indicates majority of the respondents in the study area did not adopt the improved cassava technologies and that they continued using the traditional technologies in cultivating cassava. There are many reasons that contributed to low adoption of cassava improved technologies by farmers, which included the difficult in using it, expensivity of technologies, unavailability of technologies and ignorance. On the other hand dissemination of technologies to farmers is not done properly. Factors that influenced farmers to accept and use those technologies included market availability, availability of inputs, high quality planting materials and access to credit facilities. Extension workers were inefficient due to several reasons such as lack of transport, large coverage areas, most of them are engaged in other non-agricultural related activities.

5.2 Recommendations

i. Government through extension worker should improve extension services delivery to farmers through different communication media such as radio, leaflets, brochures, television and newspapers on improved technologies for cassava production.

ii. Mkuranga District council through agricultural extension officers should organize adequate seminars and workshops for farmers in order to improve production and productivity of cassava as well as adoption of technology.

iii. Mkuranga District should improve markets and price of cassava produce so as farmers can sell their produce easily.

iv. Financial institutions, both governmental and private institutions such as FINCA, VICOBA, PRIDE and AMCOS should provide friendly conditions such that farmers can easily access them and get simple loans with minimum interest rates.

v. Ministry of agriculture through research centre should make effort on availability of improved technologies to farmers such as use of improved variety, proper weeding, and planting methods to sensitize cassava farmers hence adoption of cassava improved technologies.

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APPENDICES

Appendix 1: Questionnaire on factors influencing adoption of improved cassava production technologies in Mkuranga District

Instruction: Fill in the space provided

District _____ Division _____ Ward _____ Village _____

Respondent No. _____ Date _____

Farmers' characteristics (Tick the correct answer in the bracket)

1. Age of the respondent (years)
    1) 18-30 years ( )
    2) 31-45 years ( )
    3) Above 46 years ( )
2. Sex of respondent
    1) Male ( )
    2) Female ( )
3. What is the marital status?
    1) Single ( )
    2) Married ( )
    3) Widowed ( )
    4) Divorced ( )
4. What is your level of education?
    1) Informal Education ( )
    2) Primary school ( )
    3) Secondary school ( )

4) College/ University ( )

5) Other (specify) ……

5. How many members live in your household?

1) 1-3 ( )

2) 4-7 ( )

3) 8 and above ( )

6. How many members are involved in cassava production?

1) 1-3 ( )

2) 4-7 ( )

3) 8 and above ( )

7. What is your main occupation?

1) Crop production ( )

2) Livestock keeping ( )

3) Business ( )

4) Employee ( )

5) Crop production and livestock keeping ( )

8. Do you grow cassava?

1) Yes ( )

2) No ( )

9. If yes how many acres of cassava do you have?

1) Less than 1 acre ( )

2) 1-3 acres ( )

3) 3 and above ( )

10. How long have you been cultivating cassava?

1) Less than I year ( )

2) 1-2 years ( )

3) 3-4 years ( )

4) Over 6 years ( )

11. What types of cassava do you grow?

1) Sweet variety only ( )

2) Bitter variety only ( )

3) Both sweets and bitter varieties ( )

12. Why do you grow that type of cassava?

1) Easy to get market ( )

2) Easy to control vermin ( )

3) Others (specify) ( )

13. Do you have access to land for cassava farming?

1) Yes ( )

2) No ( )

14. Have you purchased, rented or inherited the land for cassava farming?

1) Purchased ( )

2) Rented ( )

3) Inherited ( )

15. How easy is to get land in the village?

1) Very easy (no conditions to get the land) ( )

2) Easy (few conditions to get land) ( )

3) Difficult (strong conditions) ( )

4) Very difficult (very strong conditions) ( )

16. What type of cultivation do you use in cassava production?

1) Ridge cultivation ( )

2) Flat ( )

17. Which month do you prefer to plant cassava in your farm?

1) August to November during short rains ( )

2) March to May during long rains ( )

18. Which variety of cassava do you cultivate in your farm?

1) Kalolo ( )

2) Rasta ( )

3) Kiroba ( )

4) Muzege ( )

5) Kikombe ( )

19. Do you use recommended spacing in cassava farming?

1) Yes ( )

2) No ( )

20. If yes which spacing do you use?

1) 1mx1m ( )

2) 1mx1.5m ( )

3) 1.5mx1.5m ( )

21. How do you plant cassava cuttings in your farm?

1) Up right ( )

2) Horizontal ( )

3) Slanting (at 45^0 degree) ( )

22. Do you apply fertilizers in your farm?

1) Yes ( )

2) No ( )

If yes what type of fertilizer?

1) Organic fertilizers ( )
2) Inorganic fertilizers ( )

24. If no why

1) Not available ( )
2) Too expensive ( )
3) No knowledge on fertilizer use ( )

25. Do you use the traditional agricultural technologies in cassava production?

1) Yes ( )
2) No ( )

26. If yes which technologies do you use?

……..

……..

…….

27. Do you use the new/ improved agricultural technologies in cassava production?

1) Yes ( )
2) No ( )

28. If yes which technologies do you use? (You can tick more than one)

1) Use of improved cassava planting materials ( )
2) Proper spacing ( )
3) Land preparation ( )
4) Proper weeding ( )
5) Use of fertilizers/manure ( )
6) Use of insecticides/herbicides ( )

29. Why do you prefer the above technologies?

1) Easy to use ( )
2) It increases production ( )
3) It helps to eradicate pests and diseases ( )
4) Others (Specify) ( )

30. If no why don't you use improved agricultural technologies in cassava production?

1) Difficult to use ( )
2) Not available ( )
3) Expensive ( )
4) Ignorant ( )
5) Others (Specify) ( )

31. What cassava production constraints do you face? (You can tick more than one)

1) Prevalence of pests and diseases ( )
2) Inadequate of planting materials ( )
3) Drought ( )
4) Lack of seed system ( )
5) Poor soil fertility ( )
6) Poor quality of planting material ( )
7) Lack of market for cassava ( )

32. Have you ever received training concerning cassava production technology?

1) Yes ( )
2) No ( )

33. If yes from where do you get the training

1) Extension worker ( )
2) Research centers ( )

3) Neighbors ( )

4) Key informant ( )

34. Did your training incorporate packages on cassava production technologies?

1) Yes ( )

2) No ( )

35. What is the status of your land? (Tick one)

1) Fertile ( )

2) Moderate ( )

3) Not fertile ( )

36. Do you buy any agricultural inputs?

1) Yes ( )

2) No ( )

37. If yes where do you buy them?

……

……....

38. Do you have any source of fund to buy those inputs?

1) Yes ( )

2) No ( )

39. If yes, what is your source of fund?

1) Loan from Bank ( )

2) Savings and Credit Association ( )

3) Any other specify…… ( )

40. What is the major source of labour in farming activities?

1) Family only ( )

2) Hired labor only ( )

3) Family labor and hired labor ( )

41. Do you use irrigation in cassava farming?

1) Yes ( )

2) No ( )

42. Do you have market for cassava in your area?

1) Yes ( )

2) No ( )

43. If yes, market for……

1) Raw cassava ( )

2) Processed cassava ( )

44. Do you produce cassava planting materials in your farm?

1) Yes ( )

2) No ( )

45. If yes, under what terms do you sell those cassava cuttings?

1) On credit ( )

2) On cash ( )

3) Through barter system ( )

46. If no, why? (Give a reason, tick more than one)

1) Dry weather condition ( )

2) Small farm size ( )

3) Lack of irrigating machine ( )

4) Lack of education ( )

5) High costs ( )

47. Where do you get improved cassava planting materials?

1) Research centre ( )

2) Relative/neighbors/other farmer ( )

3) Extensionist ( )

4) Project/organization ( )

48. What tools do you use in doing farm activities?

1) Hand hoes ( )

2) Animal power ( )

3) Motorized tools ( )

49. Do you weed your farm?

1) Yes ( )

2) No ( )

50. If yes, how many times do you weed your farm per season?

1) 2times ( )

2) 3times ( )

3) 4times ( )

51. Do you use fungicides/pesticides for preventing pests and diseases?

1) Yes ( )

2) No ( )

52. If yes, what type of fungicides/pesticides do you use? (Tick one)

1) Locally made ( )

2) From industries ( )

53. Do you have contacts with a village extension officer?

1) Yes ( )

2) No ( )

54. If yes which services do you get from your extension officer? (Tick more than one)

1) Planting techniques ( )

2) Proper spacing ( )

3) Weeding ( )
4) Use of improved planting materials ( )
5) Marketing ( )
6) Processing ( )
7) Others specify ( )

55. What benefits have you gained by producing cassava?

1) Animal feed ( )
2) Food ( )
3) Increasing household income ( )

56. What are the factors leading to the adoption of cassava production technologies? (Tick more than one)

1) Knowledge/skills on cassava farming ( )
2) Access credit facilities ( )
3) High yield for food and cash ( )
4) Availability of agricultural inputs ( )
5) Appropriateness of the technologies ( )
6) Market availability ( )

57. What is your opinion about cassava production? (Tick one)

1) Farmers to produce more ( )
2) Increasing market for cassava ( )
3) It is good for income generation ( )
4) Provision of agricultural training ( )

58. What is your opinion about cassava farming innovations? (Give one opinion)

……

THANK YOU FOR YOUR COOPERATION

Appendix 2: Checklist for Focus Group Discussion

1. The benefits of cassava cultivation
2. The situation on adopting new technologies
3. Cassava production constrains farmers face
4. The solutions for the constraints faced in cassava production
5. Farmer's contacts with a village extension officer
6. Availability of cassava market in the study area
7. Factors leading to the adoption of cassava production technologies
8. Farmers suggestions about cassava farming

THANK YOU FOR YOUR COOPERATION

Appendix 3: Checklist for Key Informants/Extension officer

Name of key informant/ extension officer……

Sex……..

Occupation….....

Village.....

Ward.....

District……...

Date……..

1. What fertilizers do farmers apply (if any) in their farms?
2. For how long (years) have you been serving farmers?
3. How have you been helping farmers in cassava farming?
4. What variety of cassava do farmers use in their farms?
5. Do farmers use recommended spacing in cassava farming?
6. How many times do farmers weed their farms per season?
7. Do farmers use fungicides/pesticides for preventing pests and diseases?
8. What type of fungicides/pesticides do farmers use?
9. What benefits do farmers gain by producing cassava?
10. Is there any market for cassava in your area?
11. Do you have contacts with cassava farmers?
12. What do you think are constrains facing farmers for not adopting new technology?
13. What are the factors leading to the adoption of cassava production technologies?
14. What do you think can be done to improve cassava production in the area?

THANK YOU FOR YOUR COOPERATION