ACCESS TO FORMAL CREDIT AND ITS LINKAGE WITH AGRICULTURAL TECHNOLOGIES ADOPTION: A CASE OF SMALLHOLDER FARMERS IN ZANZIBAR

BY

KHALID SALIM MOHAMED

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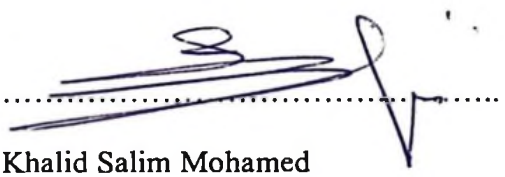
ABSTRACT

This study was conducted in order to determine the extent of access to formal credit in rural Zanzibar and identify factors that influence smallholder farmers' access to formal credit. It also aimed to assess the linkage between access to credit and the adoption of agricultural technologies. In conducting the study, both primary and secondary data were collected. In the collection of primary data, questionnaires were administered to 750 randomly selected smallholder farmers. The data collected were analyzed descriptively and quantitatively. The results from the study reveal that outreach and access of formal credit in the study areas is low. About 78% of sampled households were found to be credit constrained. It was also revealed that 41% of the credit constrained households were relatively members of the more poor group in the study areas, while only 10% of the non-credit constrained belonged to this group. Furthermore, the study results suggest that the number of times one has received formal credit, keeping livestock, having a bank account, value of productive assets owned and household total income are important factors in influencing smallholder farmers' access to formal credit. The findings also show that the intensity of extension contacts, household size, and the value of productive assets are important factors in influencing agricultural technology adoption among non-credit households, while the number of times one has ever received formal credit was found to have more influences in inducing technology adoption among credit constrained households. Based on these findings, it is recommended that smallholder farmers should be availed the opportunities of getting repeat loans in order to improve their chances of accessing credit in the formal credit markets and enhance adoption of agricultural technologies. Farming households can as well be encouraged to diversify their income sources within and away from agricultural activities through promotion of mixed farming and off-farm activities. The need to develop a saving culture in the farming communities

is also crucial for ensuring the creation of sustainable and efficient financial system. Furthermore, it is recommended that in order to enhance adoption of agricultural technologies, extension services should be targeted to non-credit constrained households.

DECLARATION

I, Khalid Salim Mohamed, do hereby declare to the Senate of Sokoine University of Agriculture, that this thesis is my own original work and that it has never been nor concurrently being submitted for a higher degree award in any other university.



15/9/2009

Khalid Salim Mohamed — Date

(PhD Candidate)

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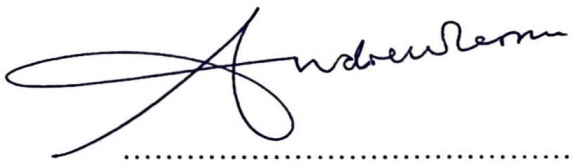

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Prof. Andrew E. Temu — Date

(Supervisor)

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While many people and institutions have participated in this work in one way or another, I wish to confirm that the views expressed in this thesis do not represent the views of these people and their institutions. The views are entirely mine and so are the weaknesses that will be depicted herein.

DEDICATION

This work is dedicated to my grand parents: Mrs Fatma Juma Khamis and Mr. Khalid Ameir Kiasi for their loving care to me during my childhood and for all the troubles and hardship they faced during my upbringing and education.

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ACRE	-	Size of landholding
AGE	-	Age of household head
AIDS	-	Acquired Immuno Deficiency Syndrome
BAFIA	-	Banking and Financial Institutions Act
BANS	-	Bank Saving
BIZANJE	-	"Biashara za Nje"
BOT	-	Bank of Tanzania
CBOs	-	Community Based Organizations
CDF	-	Cummulative Distribution Function
CGA	-	Cloves Growers Association
EACB	-	East African Currency Board
EACU	-	East African Currency Union
EDUC	-	Level of Education
EXTI	-	Intensity of Extension Contacts
FBME	-	Federal Bank of the Middle East
FCUI	-	Intensity of Use of Formal Credit
FICOs	-	Financial Cooperatives
FREC	-	Keeping Financial Records
GDP	-	Gross Domestic Product
GEND	-	Sex of Respondent
GOZ	-	Government of Zanzibar
GSB	-	Government Savings Bank
HH(s)	-	Household(s)
HHS	-	Household Size

HIV	-	Human Immuno Deficiency Virus
ICOM	-	Income
ICTs	-	Information, Communication, Technologies
IFAD	-	International Fund for Agricultural Development
IFIs	-	Informal Financial Institutions
IFPRI	-	International Food Policy Research Institute
IMR	-	Inverse Mills Ratio
KM	-	Kilometer
LC	-	Life Cycle
LEAD	-	Household Head Leadership Status
LICs	-	Low Income Countries
LIF	-	Life Insurance Fund
LPM	-	Linear Probability Model
LSTOCK	-	Keeping Livestock
MFCs	-	Microfinance companies
MFIs	-	Microfinance Institutions
MKUZA	-	"Mkakati wa Kukuza Uchumi na Kupunguza Umasikini"
MLE	-	Maximum Likelihood Estimation
NBC	-	National Bank of Commerce
NCPI	-	National Consumer Price Index
NCRE	-	Number of Credit Received
NGOs	-	Non-Governmental Organizations
OLS	-	Ordinary Least Square
PBZ	-	People's Bank of Zanzibar

PC	-	Principal Component
PCA	-	Principal Component Analysis
PIH	-	Permanent Income Hypotheses
POSB	-	Post Office Savings Bank
PRIDE	-	Promotion of Rural Initiatives Development Enterprises
REPOA	-	Research on Poverty Alleviation
ROSCAS	-	Rotating Savings and Credit Associations
SACAs	-	Savings and Credit Associations
SACCOS	-	Savings and Credit Cooperatives
SELF	-	Small Entrepreneurs Loan Facility
SGL	-	Solidarity Group Lending
SMEs	-	Small and Medium Enterprises
SPSS	-	Special Package for Social Sciences
TBC	-	Tanzania Bank of Commerce
TECH	-	Intensity of Adoption of Agricultural Technologies
Tsh	-	Tanzania Shillings
UNDP	-	United Nations Development Programme
VASS	-	Value of Productive Assets
WEDTF	-	Women Entrepreneurs Development Trust Fund
ZCCFSP	-	Zanzibar Cash Crops Farming Systems Project
ZFSR	-	Zanzibar Fund for Self Reliance
ZGS	-	Zanzibar Growth Strategy
ZIC	-	Zanzibar Insurance Corporation
ZSGRP	-	Zanzibar Strategy for Growth and Reduction of

		Poverty
ZSTC	-	Zanzibar State Trading Corporation

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Most developing countries continue to rely on their agricultural sectors for economic growth, poverty reduction, and food security. In Zanzibar, agriculture contributed 30 percent to Gross Domestic Product (GDP) in 2006 (GOZ, 2006a) and still remains an important economic activity to the majority of the Zanzibar population, particularly those who live in rural areas. About 42% of the households in Zanzibar are directly engaged in agricultural activities for their income earning (GOZ, 2006b). However, a majority of these farming households are categorized as smallholders with landholdings of less than 1.2 ha (GOZ, 2004).

In cognizance to the importance of the agricultural sector to the Zanzibar economy and welfare of the majority of Zanzibar people, the Government of Zanzibar (GOZ) has placed a lot of emphasis on the role of credit and agricultural technology for increasing agricultural productivity and household income. The provision of credit to smallholder farmers is perceived to be an effective strategy for promoting the adoption of improved technologies. It is believed that access to credit promotes the adoption of risky technologies through the relaxation of the liquidity constraint as well as through the boosting of household's risk bearing ability. With option of borrowing, farmers are able to do away with risk reducing but inefficient income diversification strategies and concentrate on more risky but efficient investments (Eswaran and Kotwal, 1990). In order to facilitate the availability of affordable loans to smallholder farmers, the GOZ in collaboration with various donor agencies and non-governmental organizations have

initiated and implemented credit schemes/programmes since early 1980s. Credit to farmers has been given both in cash and in the form of in-kind loans such as fertilizers, seeds and tractor hire services.

Despite these joint efforts by the government, donor agencies and non-governmental organizations in the provision of credit for enhancing improved agriculture technology, adoption of these technologies still remain low. It is often argued that credit access constraints facing smallholder farmers are widely responsible for the low adoption of improved agricultural technological packages due to their requirements for costly inputs.

A substantial amount of the literature has reported on the impact of access to credit on technology adoption, and many studies found that credit has a positive impact on the adoption of farming technologies (Simtowe *et al.*, 2006). Similarly, a lot of research has been conducted on identifying factors that influence credit constraints conditions of smallholder farmers.

Nevertheless, most studies that have looked at the impact of credit have generalized their analysis by assuming that credit access should always lead to positive impact outcomes. It is strongly argued that these studies have ignored household behaviour with regard to whether or not the household is credit constrained. The underlying assumption is that access to credit becomes effective in impacting technology adoption only for farmers facing binding liquidity and borrowing constraints. Furthermore, the inter-likages between access to credit and the adoption of technologies have not been adequately explored by past studies. This situation create a knowledge gap on what household socio-economic factors influence access to formal credit and knowing if there is linkages between access to credit and the adoption of agricultural technologies.

This study therefore seeks among other things to empirically test these potential inter-linkages between access to credit and adoption of agricultural technologies under smallholder farming conditions in Zanzibar.

1.2 Policy and Regulatory Framework for Financial Sector in Zanzibar

1.2.1 Policy framework

Zanzibar Development Vision 2020 provides the long term development policy framework for Zanzibar. The Vision was formulated in 2000 and has the overall objective of eradicating absolute poverty in the islands. Among other things, the Vision emphasizes the need for the existing commercial banks and MFIs to provide tangible credit to small scale producers and micro-enterprise sector in order to attain the national economic development and poverty reduction targets. The Zanzibar Strategy for Growth and Poverty Reduction (ZSGRP), 2007 (popularly known as MKUZA in Kiswahili) is a medium term plan for the implementation of the Vision. The ZSGRP is therefore the overarching document for guiding the development of sectors in Zanzibar. It also places the private sector as the main growth driver and in all its three goals have elements that call for the need to promote access to credit to the private sector and in particular to the poor segment of the Zanzibar population.

The Strategy for Growth (ZSG) formulated in 2006 has identified trade and tourism as leading sectors for economic development in Zanzibar and agriculture and manufacturing as supporting sectors. Consistent with Zanzibar Development Vision 2020 and ZSGRP, the objective of the ZSG is to realize high growth that is pro-poor. Under the Strategy, the Government is responsible to facilitate the availability and access to financial services to the enterprise sector, including micro, small and medium enterprises, both in urban and rural areas. The ZSGRP also seeks to facilitate the

establishment of SACCOS as a strategy of cutting down administrative costs, enhancing loan recovery and improving reach to communities.

Other related policies include, the Agricultural Sector Policy (2002) and the Zanzibar Small and Medium Enterprises (SMEs) Policy. The Agricultural Sector Policy is in line with both medium and long term development frameworks. It requires the government to gradually withdraw from production and direct supply of inputs, and instead remain with the role of creating a favourable policy environment for private sector to assume the role of production, processing and marketing of agricultural produce and supply of inputs.

The Zanzibar SMEs Policy (2006) has the objective of fostering job creation and income generation through promotion of SMEs and improving competitiveness of existing ones in order to increase their participation and contribution in the economy (GOZ, 2004). The policy appreciates SMEs' limited access to financial services due to: (a) the perception that it is a high risk sector to lend to, (b) inability of SMEs operators to fulfill collateral requirements, (c) most banks are not operating micro-credit facilities (d) some banks have limited geographical operating areas. (e) lack of guarantee facilities to support banks financing SMEs, and (f) high cost of loan administration.

So far, Zanzibar has no micro-finance policy. The Tanzania national micro-finance policy, 2000 does not adequately address the peculiarities of the Zanzibar socio-economic situation. Lack of micro-finance policy has to a large extent constrained the reforms of the micro-finance sector in Zanzibar and that the micro-finance activities have remained without effective coordination mechanism. Currently, the micro-finance activities in Zanzibar are not well mainstreamed in many sectoral policies which are led under different government ministries. There is a serious need for concerted efforts to

mainstream micro-finance in several sectoral polices and to establish a well and effective coordination of micro-finance activities with all actors both in the public and private sector in order to ensure availability and access of financial services to the majority of people in the islands.

1.2.2 The regulatory framework

The BOT is the regulator of the financial sector in Tanzania, and is therefore mandated to operate both in Zanzibar and Mainland Tanzania. Since early 1990s a number of regulatory reforms have been introduced in Tanzania in support of the emerging economy. In 1991 the Banking and Financial Institutions Act (BAFIA) was introduced and this has liberalized the financial sector and paved the way for the participation of private sector in the industry. The BOT Act enacted in 1995 gave the power to the BOT to play its role as the main regulator and supervisor of banks and financial institutions in both Zanzibar and Mainland Tanzania.

In response to the growing MFIs, the Financial Laws (Miscelleneous Amendments) Act 2003 was enacted, bringing the micro-finance under the ambit of formal regulatory framework for the first time. These amendments changed the BOT Act, 1995 and the BAFIA, 1991. In Mainland Tanzania the Cooperative Societies Act, 1991 was also changed in order to conform to the changing financial sector regulatory landscape in Tanzania. Subsequently, all these legislations were repealed giving way to the Banking and Financial Institutions Act, 2006 and the BOT Act, 2006 which mainstreamed the regulatory and supervisory framework for micro-finance.

Following the formulation of the National Microfinance Policy in Tanzania, regulatory and supervisory mechanisms for microfinance and rural finance sector, including

performance, quality standards and prudential norms for the MFIs have been put in place. These are included in several pieces of legislations, namely: Microfinance Companies (MFCs) and Microcredit Activities Regulations, 2005: Financial Cooperative Societies Regulations, 2005; Savings and Credit Cooperative Societies (SACCOS) Regulations, 2005; Amendments to existing regulations to address Non-governmental organizations (NGOs); Regulations Relating to Independent Audit and Internal Control and Internal Audit Regulations, 2005.

These regulations provide for the licensing of deposit-taking MFCs. This provision gives ways for the NGO-MFIs with a track record to establish MFC in association with strategic partners and can have up to 66% shareholding in the MFCs compared to the 20% limit for bank and other financial institutions. Such companies are subject to supervision by the BOT, as are banks and other financial institutions. Minimum capital requirements for MFC is Tshs 800 million for those with multiple branches and Tshs 200 million for those with a single branch (unit MFCs).

Furthermore, the existing legislative framework provides for the supervision of financial cooperatives (FICOs), including SACCOS. It is provided that FICOs reaching a core capital of Tshs 800 million (the minimum for MFC) will be regulated by the BOT. The legislations also provide for the mandate of BOT to issue an accounting manual to be used by all regulated banks and financial institutions in order to have consistency and maintain accounts standards. Based on these regulations, BOT also has to put in place client identification and a framework for reference system for banks and financial institutions (including regulated MFIs). Provision is also made for private credit reference bureaus regulated by the BOT and bank to administer the database. Fair lending and collection practices are also included in the regulations for the MFIs.

In addition, the legislations also provide for the classification and provisioning of microloans. This has been made stricter than for normal banking because of the need for taking prompt action in case of delinquency on unsecured loans. Also the legislations now provide for banks and other financial institutions to engage in correspondent contracts with non-regulated MFIs, including Savings and Credit Associations (SACAs), Community based organizations (CBOs), SACCOS, and NGOs in order to reach out to distant rural areas. This also provides an opportunity for rural/grassroots MFIs to link up with formal financial institutions, which are regulated.

Under the existing legislations, the banks and MFCs are supposed to publish their income statements, cash flow statements and balance sheets in the public media. In ensuring effective internal control, regulations require explicit internal control policies and procedures and internal auditors with proven experience in order to minimise the possibility of fraudulent actions.

Furthermore, the existing legislations recognize a four-tier system of financial institutions: Commercial banks, regional unit banks (single branch), non-bank financial institutions (including MFCs, FICOS) and regional non-bank financial institutions. Under the existing law, BOT delegates the work of supervising grassroots level MFIs (including SACCOS) to the Registrar of Cooperatives, who is supposed to apply the same prudential regulations on SACCOS as those applied to MFCs in addition to conforming to cooperative principles.

The existence of a comprehensive regulatory framework provides both opportunities and challenges for the operations of microfinance institutions in Zanzibar. The provision for regional unit banks opens up possibilities for setting up Community Banks in Zanzibar. Nevertheless, there is none so far, while many have been

established in Mainland Tanzania. On the side of challenges emanating from the establishment of the new financial regulatory framework include that of NGO-MFIs of Zanzibar being unable to meet the set criteria for the establishment of MFCs. The Zanzibar NGO-MFIs are all small with limited size of capital therefore can not be able to benefit from opportunities offered by these new legislations.

The capacity of regulatory authorities and MFIs to undertake their role as provided for in the existing regulatory framework also poses serious challenges for the micro-finance industry in Zanzibar. Besides, the regulatory and supervisory framework is not adequately disseminated in Zanzibar and many key players are not yet aware on their provisions. Also the exclusion of SACAS and other CBOs in the regulatory and supervisory framework is contrary to the national objectives of deepening access to financial services and the support needed in integrating the semi-formal MFIs to the formal financial system.

Other issues that need attention in the policy and regulatory arena, particularly for Zanzibar is the lack of effective coordination mechanisms. The coordination for the implementation of the policy and regulatory framework was found to be weak and this calls for the need to put in place a mechanism that will ensure effective coordination of the various interventions aimed at boosting the agriculture and the small scale industry sectors for poverty reduction. Radical changes are also required in the area of pro-poor private sector development for an approach that can assure the building up of the synergies in the interventions. Because of the risks inherent in microcredit operations, regulated MFIs are supposed to comply with a more sophisticated technology/requirements compared to banks and other financial institutions. This means the existing regulations may actually stifle the development of regulated MFCs.

There is a possibility that the regulations are unnecessarily restrictive and this needs to be critically examined. These challenges seem to impede the expansion and deepening of financial services in Zanzibar and therefore strategies to address them are likely to overcome the credit access problems facing smallholder farmers in Zanzibar.

1.3 Agricultural Innovations in Zanzibar

The generation of agricultural innovations in Zanzibar is guided by the Agricultural Research Master plan. The master plan places high priority on adaptive research to help smallholder farmers to enhance their productivity. The adaptive research has been used by many projects to generate and disseminate farming technologies to the farming communities. Technological recommendations that have been generated from these research activities include good performing varieties in terms of yield and resistance to pests and diseases, agronomy including use of recommended rates of organic and inorganic fertilizers, mulches, pests and diseases control, post-harvest technologies and use of irrigation facilities (Fowler, 1997). With livestock sub-sector, development activities were focused on areas of cross-bred heifer multiplication, cattle upgrading, and integration of crops and livestock (Krain, 1998). Farmers were encouraged to use artificial insemination services, and were trained to use urea treated rice straws, urea-molasses blocks and the use of forage legumes such as leucaena and gliricidia to improve milk production. In addition, the emphasis was placed on proper livestock husbandry practices, including appropriate methods of rearing crossbred animals and proper housing of livestock. The promoted technologies entails the use of improved breeds of animal (crosses), feeds and concentrates, housing facilities, use of veterinary drugs and services, and processing. These technologies constitute the soft technological packages which are the subject of this study.

1.4 The Research Problem

The reforms and liberalization of the financial sector were aimed at increasing the deepening of the formal financial services and address the need of the emerging private sector and household economy. This being the case, the outcomes of the reforms were expected to be the increased outreach of the formal financial institutions and enhanced access to formal financial services by the majority of the people, both in urban and rural areas. For the case of Zanzibar, the result of the liberalization of the financial sector is rather mixed. While the number of formal financial services providers and the volume of loans disbursed have been increasing, the majority of people undertaking micro and small businesses have remained marginalized with respect to access to financial services (Mohamed, 2003). In particular, smallholder farmers' access to financial services has been diminishing. For instance, available statistics indicate that less than 5% of Zanzibar population has access to formal financial services (GOZ, 2006a). Due to inaccessibility of formal credit, the majority of rural households use informal credit. Study by Krain (1998) revealed that about 98% of rural population in Zanzibar relies on informal sources for their credit needs which are mainly for consumption.

In realizing the increasing marginalization of the poor farming households with respect to access to formal credit and the constraints that smallholder farmers are facing in accessing the required capital for farming technologies adoption, various policy options are adopted and implemented with the aim of filling the financial gap that is created by the liberalization of the financial sector. The government has been taking deliberate efforts to encourage the existing commercial banks to open up micro-finance windows for serving the poor. This has been in the form of establishing the credit guarantee schemes and the relaxation of bank lending conditions.

Despite these efforts, commercial banks still confine their financial services to the low risk urban based customers and therefore leaving majority of rural households outside the formal financial system. In respect to this, the MFIs which have missions of bridging the gaps between small clients and banking institutions are found to be weak, fragmented and with limited scope and outreach (Mohamed, 2006a; Mohamed, 2003; Krain, 1998). This continued overall inefficiency of the formal financial market, which seem to have remained and increasing despite the financial sector reforms makes the fight against poverty reduction even more challenging. The existing inadequacy of the formal financial market therefore continues to constrain the rural development as potential households' savings remain untapped and profitable rural investments remain largely unfunded. According to GOZ (2006d), only 2% of farm households operate bank accounts in Zanzibar. Moreover, nearly 97% of farm households in Zanzibar indicated to have used their own capital to start their farm enterprises (Mohamed, 2006b).

Although there is sufficient evidence of inadequate access to formal credit among small holder farmers, there is no study that has established the extent of credit inaccessibility and that has identified socio-economic factors that influence smallholder farmers' credit access constraint in the formal credit market in Zanzibar. In addition, the inter-linkages that exist between access to formal credit and the adoption of agricultural technologies by smallholder farmers have not been empirically established. Thus, a comprehensive study is needed to fill the lacuna in knowledge and aid informed policy decisions for improving access to credit in farming communities and improve the adoption of available agricultural technologies.

1.5 Objectives

1.5.1 General objective

The general objective of this study is to establish the extent to which smallholder farmers in Zanzibar have accessed credit from formal credit institutions and further assess the linkages between access to credit and the adoption of agricultural technologies. The study is guided by the following key questions: (a) How many smallholder farmers in the study area have access to formal credit market?, (b) How many smallholder farmers are credit constrained?, (c) What factors contribute to smallholder farmers becoming credit constrained in the formal credit market? and (d) Is there a linkage between access to credit and the adoption of agricultural technologies?.

1.5.2 Specific objectives

The specific objectives of the study are to:

(a) Review the development of the financial sector in Zanzibar and assess outreach of existing formal financial institutions.

(b) Examine the influence of household socio-economic characteristics on access to formal credit.

(c) Assess the linkages between access to formal credit and the adoption of agricultural technologies under smallholder farming conditions.

(d) Recommend on policy aspects regarding the approaches and strategies to improve access and the effectiveness of formal credit in smallholder agriculture in Zanzibar.

1.6 Study Hypotheses

The study was guided by the following hypotheses:

(a) There is limited access to formal credit in rural Zanzibar and the financial system is biased against smallholder farmers who are relatively poor in the society.

(b) Household socio-economic characteristics influence smallholder farmers' access to credit in the formal credit market.

(c) For the smallholder farmer to be able to adopt agricultural technologies he/she needs to be non-credit constrained in the formal credit market.

1.7 Conceptual Framework

The overall objective of this research work is, on the one hand. to create knowledge about the factors that determine smallholder farmers' access to formal credit in Zanzibar. and on the other to establish the linkage between access to credit and the adoption of agricultural technologies. Thus, the conceptual framework of this research is centered on the access of smallholder farmers to the formal credit and the inter-linkages with adoption of agricultural technologies. According to Mohamed and Temu (2008b) and Stiglitz and Weiss (1981), households' decisions with respect to accessing credit are largely influenced by socio-demographic characteristics and institutional factors.

The conditions, lending policies and operational procedures of the financial institutions represent the first category of factors that determine farm household access to formal credit. Short term loans with many formal requirements are considered less attractive than long-term loans or more flexible short term loans like those provided in the

informal sector. High interest rates can crowd out poor, risk-averse households in favour of less poor more risk-loving households (Hoff and Stiglitz, 1990). The decision to apply for a loan is constrained by the household's willingness to take a loan. Perceptions about the desirability of working with credit or having a debt also influence the decision on whether to borrow or not. The desire to work with credit is shaped by autonomous factors like aversion to debt, or can be specifically related to perceptions on the financial institution. Households evaluate the usefulness and desirability of credit with respect to the specific products offered and the selection procedures applied by the financial institution. High interest rates or high collateral requirements can make especially poor risk-averse households to refrain from applying for a loan (Sarap, 1990).

A second group of factors that influence access to formal credit is human capital. These factors reflect the capacity of the household to meet formal credit institutions' selection criteria, and constitute such factors as personal characteristics of the household head such as sex, age, level of education and income. The third category is the household characteristics that determine the household's capacity to meet the collateral requirements. Basically, these are households' endowments such as owning registered land, houses, livestock and durable consumer goods. Also, social networks and engagement in non-farm activities are additional household characteristics that can support one to meet the expectations of the financial institutions with regard to repayment capacity. The role of networks in relation to preferential access to credit has been extensively documented under the guises of the role of patronage or political favour (Sarap, 1990; Krain, 1998).

In addition, access to information on available financial services, degree of access to extension services, market access intensity and the level of farming technology adoption are all key factors that enhance households' capacity to meet credit conditions and also be able to utilize it effectively. In this study the focus is more on the demand side, focusing on the household side reflecting access to credit by smallholder farmers rather than the supply side i.e outreach of formal credit institutions. It is therefore conceptualized that some socio-economic factors influence smallholder farmers' credit constraint condition in the formal credit market (see Fig. 1). The study further postulates that some socio-economic factors and household credit access do influence the intensity of adoption of agricultural technologies differently between credit constrained and non-credit constrained smallholder farmers.

1.8 Organization of the thesis

The thesis is organized into five chapters with chapter one being the introduction. Chapter two reviews the empirical literature for the determinants of access to formal credit and technology adoption. Chapter three describes the methodology of the study. The description covers the characteristics of the study area, data needs and sources, sampling, technique of data collection, preliminary survey, recruitment and training of enumerators, operationalization of the field work and data processing and analysis. This is followed by empirical findings and discussion in chapter four. The last chapter gives conclusions and recommendations based on the major findings of the study.

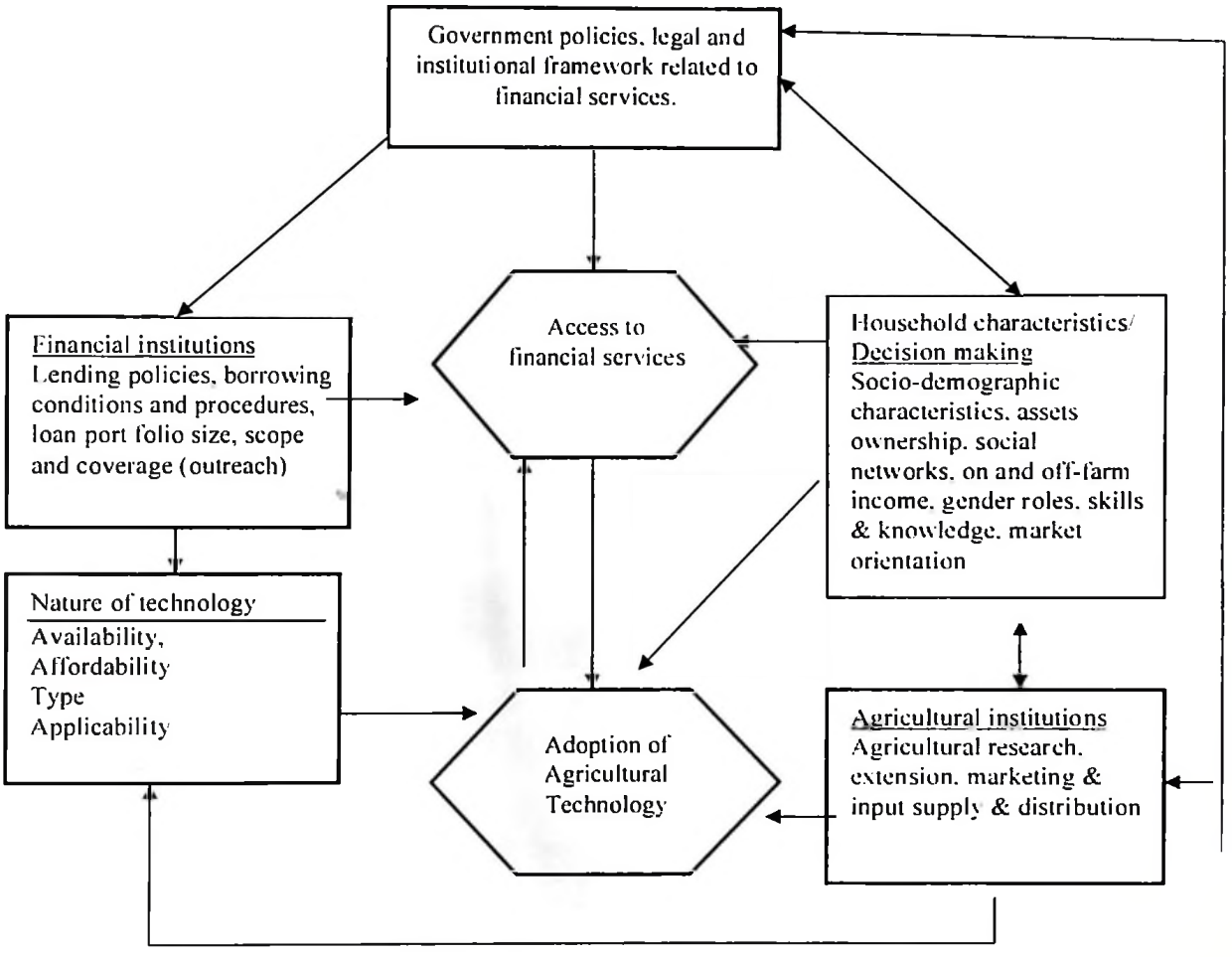

Figure 1: The conceptual framework of access to credit and the inter-linkages with farming technologies adoption

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter attempts to review the relevant literature on rural finance and access to formal credit in particular. The chapter has a total of nine sections. Section two describes the role of credit in economic development, while section three gives the general characteristics of financial markets in Low Income Countries (LICs). Access to formal financial services by small and micro-enterprise sector is discussed in section four and section five reviews the development and the performance of the financial sector in Zanzibar. The concept and approaches of measuring access to credit and credit constraints are discussed in section six, while section seven discusses the determinants of access to credit. Section eight highlights on access to credit and farming technologies adoption interlinkages. The chapter concludes by reviewing the theoretical framework and empirical methods relevant to the study topic. Generally, the study postulates inadequate impact of the financial sector reforms and the liberalization of financial markets in Zanzibar with respect to the access to credit by the smallholder farmers, a situation which negatively effect on the farmers ability to adopt improved agricultural technologies. Furthermore, the study hypothesizes that the problem of credit inaccessibility by smallholder farmers is not only a supply side issue, but it is also due to lack of an effective credit demand. Therefore, it is assumed that socio-economic characteristics of farm households largely determine their ability to access credit in the formal credit market.

2.2 The Role of Credit in Economic Development

Many researchers and development practitioners assert that availability of credit is important for accelerating economic development (Kirkpatrick and Green, 2002). Gilla and Lassalle (1994), note that the rapid development reached in Europe and Asia was highly facilitated by the availability of credit to the majority of people. Countries like India, Indonesia, Burma and China were reported to have recorded a good pace of development after they had managed to solve the problems of credit availability.

According to Mohamed (2003), credit in agriculturally-based rural economy can alleviate constraints on the purchase of needed inputs in the production process and facilitate the achievement of more efficient resources allocation through balancing the differences in investment and consumption alternatives among household and firms. Advocates for credit, as a poverty-alleviation measure, see the poor as trapped in a "vicious circle" that is their low income cause low savings, constraining investment, and reinforcing low incomes. Credit would thus give poor people a means of investing and breaking out of this circle (Mohamed, 2003). Kashuliza *et al.* (1998) argued that credit significantly influences the rate of output transformation through the adoption of new technologies and tapping on the advantages of economies of scale. This being the case, credit enables entrepreneurs to specialize on the better performing enterprises thus enabling them to graduate to higher or more sophisticated levels of operations with increased income and expansion of employment opportunities.

Many studies have found that poor rural households in developing countries lack adequate access to credit (Diagne and Zeller, 2001). Lack of access to credit is believed to have significant negative consequences for various aggregate and household level outcomes, including technology adoption, agricultural productivity, food security,

nutrition, health and overall household welfare (Diagne and Zeller, 2001). In order to be able to adopt improved farming technology, smallholder farmers must alleviate their capital constraints to finance the purchase of seasonal agricultural inputs (Mohamed and Temu, 2008a). In most cases, smallholder farmers' experience a negative cash flow during peak periods of critical farm activities such as the time of land preparation, planting, weeding and fertilizer application. In the absence of enough own savings and remittances from relatives, farmers must obtain credit in order to finance critical farm operations and required inputs. In this case access to credit can significantly increase the ability of poor farmers with little or no savings and with no financial support from relatives to acquire agricultural inputs necessary for increasing production and productivity. In this respect, financial ability becomes a prerequisite for smallholder farmers to adopt farming technologies, regardless of their degrees of access to extension services (Mohamed and Temu, 2008a).

According to Eswaran and Kotwal (1990), easing potential capital constraints through accessing credit reduces the opportunity cost of capital intensive assets relative to family labour. Thus, encouraging the adoption of labour saving, high yielding technologies and increasing land and labour productivity, that is a crucial factor in encouraging development. Access to credit can as well increase a household's risk-bearing ability and modify their risks coping strategies and therefore enabling them to adopt new and highly profitable but riskier technologies (Schrieder and Heidhues, 1997).

Credit has also been used to assist farm households to smoothen their consumption (Morduch, 1990). This enables them to regain their ability after being hit by a period of income shocks. As such this may directly influence their ability to adopt improved

technology. Households may also benefit from mere access to credit, even if it is not borrowing, because with the option of borrowing it can adopt high risk enterprises with high profit. Agricultural credit is also envisaged to lead to an increased production and raise income, allowing for improved consumption and savings, hence facilitating more investment. However, it is important to note that access to financial services cannot on its own be a panacea to all poor peoples' problems. It is because of this fact that the debate on rural poverty has now shifted towards markets paradigm, where the cause of poverty is attributed to failure of market.

2.3 Characteristics of Financial Markets in LICs

Broadly, financial markets of most LICs including Tanzania are regarded to be divided into two: *urban and rural markets* (Ghate, 1992). The financial transactions and participants in rural areas are therefore termed as rural financial markets. There is another dimension of financial system fragmentation: *the formal and informal financial markets*. The two co-exist side by side (Ghate, 1992). The formal financial markets encompass all activities under the purview of government and those not under the government control are regarded as informal financial markets. The informal financial sector is highly heterogenous with respect to the type of the relationship between borrower and lender, such as social cohesion or the existence of interlinked transactions. Formal financial markets are overwhelmingly urban-oriented from the point of view of both distribution of bank branches over national territory and the concentration of their deposits and lending activities.

Ghate (1992) defines the informal financial markets as activities of various financial intermediaries ranging from friends, fellow farmers, money-lenders, relatives, shopkeepers, merchants, traders and Rotating Savings and Credit Associations

(ROSCAS). There is a third fragment of the financial system in LICs which is referred to as "semi-formal financial intermediaries". This segment falls between the prior two, formal and informal, and may include credit unions, village banks, SACCOS, various government credit schemes and micro-finance NGOs.

Zeller (1994), notes that the existing segmentation of the rural financial markets provides credit services that differ from each other with respect to loan duration, amount of loan, its use, interest rates and transaction costs. According to Kochar (1997) the formal financial market is the cheapest source of credit. In many developing countries, the rural financial markets are said to be underdeveloped. The debates on the under-development of the rural financial market in developing countries are well documented (Hoff and Stiglitz, 1990; Besley, 1994a; Yaron, 1997; Thillairajah, 1994; Seibel, 1986). In developing countries, the rural financial markets are characterized by certain unique features that reflect their under-development. These characteristics, according to some literature, can be summed up into three groups: limited collateral security; insufficient complementary institutions; and covariant risks (Hoff and Stiglitz, 1990).

Most smallholder farmers have none or few assets that can be collateralized to secure loans. In a way, this is also a reflection of the underdevelopment of property ownership rights as understood in modern world. However, property ownership rights and inheritance in most African cultures is based on an elaborate family-hood systems and norms, which are unfortunately not acceptable to the standard banking practices as understood in the business sense (Bee, 2007).

On the other hand, there is inadequate loan repayment enforcement capacity as well as insufficient insurance services. Mitigation of credit default is a major issue of concern to the credit institutions, as there are no well-established insurance facilities to secure incomes from whatever shocks. Moreover, there are inadequate records of individual credit histories, as is the case in many of the developed countries (Besley, 1994b). Furthermore, there are no means for enforcing loan repayments due to inadequately developed local leadership capacities with reliable systems of communication, on which financial system may rely on.

Most of the developing countries are also faced by a problem of covariant risk and segmented markets. Majority of rural households depend on agriculture, which is risk prone. Risks involved include weather and price fluctuations, floods and pests. These shocks affect the agricultural credit repayment if not properly planned. One way to minimize this effect is for lenders to diversify their loan portfolios. However, according to Besley (1994b) this might be impossible as credit market in rural areas tends to be segmented, that is lenders' loans portfolios are concentrated on a group of people facing similar income shocks, as they either produce under the same geographical and/or climatic conditions, cultivate same crops, or borrowers are from the same kinship. In Zanzibar, like in other developing countries, the financial market is segmented into three sub-sectors: the formal, semi-formal and informal markets. Each of these segments has its own set of conditions and application procedures and therefore have different clients based on their socio-economic characteristics (Mohamed, 2006a; Mohamed, 2003).

In this study, it is argued that adoption of improved agricultural technologies can contribute greatly towards contending with production risks in smallholder farming. It

is therefore suggested that credit has the potential role in enhancing technology adoption and enabling smallholder farmers to manage agriculture related risks. This calls for the development of appropriate policies and strategies that can ensure adequate and sustainable access to financial services in the farming communities.

2.4 Access to Formal Financial Services by Small and Micro-Enterprise Sector

Access to financial services by smallholders is seen as one of the constraints limiting their benefits from credit facilities. Many smallholder farmers are perceived to be rationed in the credit market because the formal financial institutions prefer to work with larger less risky customers (Yaron, 1997). According to Levitsky (1993), most development and commercial banks view small borrowers as risky and lending to them is to incur high administrative costs and to cut down the profitability of such transactions for the lending institutions. Yaron (1997) also notes that due to reasons of high administrative costs, commercial banks prefer not to deal in small amounts of "personal loans" given to smallholders who are scattered widely in the country side.

The subsidized and targeted credit approach has been widely adopted in a number of LICs for the purpose of enhancing access to financial services to the micro-enterprise sector, both in urban and rural areas (Yaron, 1997; Thillairajah, 1994; Aryeetey, 1996). The traditional rural finance approach is aptly characterized by government interventions in rural credit markets. Interventions were justified on the grounds of market failure to deliver the needed financial services to the rural people to support their development initiatives. In order to realize the desired impact, governments in most developing countries started to own commercial banks through the nationalization of existing private banks or establishing own banks. According to Besley (1994b), India

and Mexico, nationalized their banks in 1969 and 1982 respectively in order to force the banks to open up rural branches that would serve the rural people.

According to Bee (2007), Tanzania also underwent similar practice, whereby it nationalized private commercial banks in 1967 and established public financial institutions in their place, partly to address the credit need of farmers. In other countries such as Nigeria, regulations were put in place for the banks to serve rural areas. In almost all cases, credit were issued at subsidized interest rates, a situation that called for credit rationing/targeting as demands exceeded supply.

The main reason for government interventions in rural financial markets is based on the perceived market failure especially by commercial banks' inability to serve rural people. Most commercial banks operate in urban areas where customers are easily accessible and infrastructure more developed. These banks with branches in semi-rural areas are mostly targeting similar group of clients in the peripheries of cities/urban centers as those addressed by their regional branches or head offices. Services offered are mostly short-term credit, deposits and money transfers, and in most cases the category of small farmers was out of their scope of business. Interest rates charged for targeted loans were also controlled by the state so as to allow borrowers to repay. Thus, central banks were charged with setting low interest rates on both credit and deposits. Whereas credit was encouraged, savings were demotivated through lower interest rates.

Group lending approach was also adopted for the purpose of deepening the outreach and using the peer pressure mechanism to enforce loan repayment among small borrowers. Bee (2007) notes that this approach was first practiced by few NGOs in the 1970s but accelerated during the 1980s through the 1990s. In almost all the

programmes the emphasis was on "credit-first". Over the past few years, however, the group lending approach has gained popularity especially among the donors and financial NGOs. This has partly been prompted by the stories of success of the Grameen Bank model of micro-credit implemented in Bangladesh.

There is enormous literature on the successes of this model, and some scholars and policy makers have even recommended for its replications elsewhere (Yaron, 1992). The justification for group lending is based on: (a) transactions costs are low, (b) poor people prefer group approach for all sorts of actions, and (c) repayment rates are more favorable when they borrow and repay as group. The main premise behind the group model is the presumption that homogeneous groups exhibit higher degree of group solidarity and pressure. Under this system, groups apply and receive small amounts of loans that in turn are distributed to each individual member in the group, but the larger group remains liable for the repayment of the total sum. In modern banking sense, there is no physical collateral, but rather group liability and hence the lender relies on social pressure for loan recovery. Despite the success of group lending approach, some doubts still linger around. The difficulties involved in measuring the degree of group cohesiveness, homogeneity, and group pressure on loan repayment still need to be worked.

Co-operatives have played very crucial roles in the provision of agricultural finance. There are also reports that, they have been misused by the rural elites to amass both political and economic power (van Cranenburgh, 1990). Many governments in the developing countries, Tanzania inclusive, have used co-operatives to achieve a broad array of objectives (Krain, 1998; Bee, 1996; Moll, 1989). Moll (1989), for instance, pointed out that both governments and international donor agencies took co-operatives

as appropriate instruments for rural transformation in general and agricultural development in particular. As a result, co-operatives were given a broad range of development objectives to fulfill. These ranged from mobilization of resources for the state, organization of rural credit, provision of marketing facilities, and polarization of the rural communities. In this regard, co-operatives were considered as business entities on one hand, but also as instruments for implementation of public policies.

A typical co-operative society is a self-financing organization. A financial co-operative means, therefore, members contributing to a common fund to be loaned to its members. However, in many instances governments and donors financed co-operative activities with the intention of attaining rural development. In other instances, the rural credit component was made part of a marketing society, or at times input supply on credit to farmers was facilitated through co-operatives.

There are growing empirical evidences that SACCOS or Credit Union have made substantial contributions to rural finance. SACCOS/Credit Unions as specialized form of co-operatives are depending largely on own financial arrangements. In this respect, co-operatives can be autonomous and self-regulating financial institutions. However, the role of SACCOS in rural areas is limited reflecting partly the existence of covariant risks and market segmentation. This outcome may be explained by three elements: ability to save, incentive to save, and secure and dependable opportunities to save. In many cases, these elements are lacking in rural areas of most developing countries.

2.5 Review on the Development and Performance of Financial Sector in Zanzibar

2.5.1 The financial sector development in Zanzibar - a historical perspective

The development of banking sector in Zanzibar dates back in early 1900s. when the Postal Office Savings Bank (POSB) was established in 1909 by a Decree No. 24. The POSB was statutorily charged with the duty of providing facilities for the deposit of savings, essentially from small savers. This bank operated until 1926 when the Government Savings Bank (GSB) was established to take over its responsibilities. The locations of these banks were restricted in town areas and therefore rural population made small use of their services partly due to high costs associated with travelings and formalities which necessarily attend deposits and withdrawals, and partly due to the absence of the habit of saving (Mohamed, 2006b).

In financing agricultural activities, particularly the clove sub-sector, loans were provided by the Clove Growers Association (CGA). The CGA was formed in 1928 and was incorporated by Decree No. 118 of 1934. The aim of CGA was to unite the clove plantation owners to control the costs of production, market the produce and finance harvesting loans (Krain, 1998). An important part of the work of the Association was its loan facility for the grant of financial assistance to agricultural producers. Long-term loans were granted by way of mortgage on the immoveable property for such purposes as the purchase of land required for the improvement of agricultural property, its maintenance and the discharge of existing mortgage or charges. Short-term loans were granted on security of agricultural produce pledged with the Association by chattel mortgage for such purpose as picking cloves, leasing clove crops, and weeding the clove plantations prior to picking. The fact that credit from CGA was extended to clove growers, smallholder farmers who were mostly squatters in the cloves plantation were

denied these credit services. Although the name of CGA gave the impression that it was a voluntary group of clove farmers, the association was in fact a state controlled institution (Krain, 1998). In an assessment of cooperatives movement carried out in Zanzibar in 1932, there were suggestions of converting the state-controlled CGA into a full-fledged cooperative organized by farmers (Krain, 1998). However, in 1934 the government decided to leave the CGA under the state control (Kerr, 1950).

In 1946, there were efforts by Colonial Office to develop the cooperative movement in colonies. This was made through issuance of a circular to all *Colonial Dependencies* encouraging the idea of institutionalizing the cooperative movement (Krain, 1998). A model ordinance was attached to the circular. The initial costs for the establishment of cooperative organizations were to be borne from the *Colonial Welfare Fund*. The co-operative movement was re-established in Zanzibar because of this initiative. Subsequently, the Principal legislation (*Cooperative Societies Decree No. 7*) was enacted in Zanzibar in 1948. This was followed by subsidiary legislations in 1952 and 1953 (Krain, 1998).

In 1950, A. J. Kerr, an external consultant was commissioned to provide advises on the implementation of the legislation. Based on his recommendations a Co-operative Department was created and a Registrar of Co-operatives was appointed. In 1953 the first cooperatives were registered and by 1958 there were 58 co-operative societies in Zanzibar (with total co-operative membership of 4073), of which 19 were rural credit societies (Kharusi, 1958). However, the development of co-operative movement in Zanzibar suffered a major setback in the late 1950s, at the time when there was a force from a colonial protectorate to an independent Zanzibar. Political parties started at this

time and unfortunately the cooperatives were used for political interests contrary to the basic principles and laws of cooperative movement (Kharusi, 1958).

In 1956, the three commercial banks were established in Zanzibar. These were the Standard Bank, the Barclays Bank and National and Grindlays Bank. These banks operated as branches of multinational banks, controlled from their head offices overseas. Their interests were more commercial and thus could not serve the traditional sectors, including agriculture (Kimei, 1987).

Following the 1964 revolution, the GOZ took the decision of nationalizing the monetary sector and established the state bank. With this move, the People's Bank of Zanzibar (PBZ) was established in 1966 under the Zanzibar Companies Decree (Cap. 153), with fully paid-up capital of Tshs 16 million wholly subscribed by the Revolutionary Government of Zanzibar (Krain, 1998). The PBZ, initially confined its activities to the taking over the operations of the National and Grindlays Bank as the government banker and the financiers of the Zanzibar State Trading Corporation (ZSTC) established in 1967. As a result, the branches of the National and Grindlays Bank, the Barclays Bank and the Standard Bank in Zanzibar were rendered dormant.

The decision between Zanzibar and Mainland Tanzania to establish the Central Bank for Tanzania was reached after the three East African countries agreed to the decisions for each member state to establish separate national Central Banks in 1965 (Kimei, 1987). In Tanzania the Union Parliament passed the BOT Act, 1965. This act provided for the "Establishment, Constitution and Functions of the Bank of Tanzania (BOT) as Central Bank, to provide for the currency of Tanzania, to provide that the Bank shall be the Banker to the government and shall have certain powers in relation to other banks

and financial institutions, to extend the banking ordinance to Zanzibar and to make certain amendments to the law relating to Banking and Exchange Control, and for the connected purposes". The BOT was established on the 14 June, 1966. With the establishment of separate Central Banks in all East African countries, the East African Currency Board (EACB) and the East African Currency Union (EACU) collapsed (Kimei, 1987).

Major structural changes in the banking sector in Tanzania occurred following the 1967 Arusha Declaration, whereby all major commercial banks that existed in Tanzania were nationalized to form the National Bank of Commerce (NBC). In Zanzibar, the assets and liabilities of the private banks that were nationalized were transferred to newly established Zanzibar NBC branch and to the Zanzibar Insurance Corporation (ZIC). As a result of nationalization of banks, Zanzibar was left with only two commercial bank establishments, namely the PBZ and the NBC. These banks were wholly government-owned and therefore much of the decisions were made by the government. Despite the structural changes made in the banking sector, access to financial services from the bank to the private sector and rural population became even more difficult.

During the 1980s Tanzania experienced serious macro-economic imbalances that called for reforms (Bee, 2007). According to available literature (Bee, 2007) the financial sector in Tanzania experienced multiple weaknesses that include loan in arrears, misallocation of credit and inability of the financial system to mobilize domestic resources more efficiently. Also the poor governance within the financial system and the ineffective monetary policies were factors that contributed to the weaknesses of financial sector in Tanzania. These problems were partly as a result of government interventions in financial markets that favoured lending to non-performing parastatals

and cooperatives. The government interventions had mostly been in the form of providing subsidies to the loss making parastatals and provision of guaranteed loans at concessional interest rates to finance agricultural production and marketing. This, to a large extent was responsible for increasing money supply and subsequently fuelling inflation. In order to solve these problems, the government formulated the BAFIA, 1991 on which basis the legislation reforms in the financial sector were initiated.

The financial sector reforms in Zanzibar were initiated in 1991. These reforms were aimed to liberalize the financial sector in order to create a more competitive and efficient financial system. The reform process has encouraged the entry of private banks into the financial sector and has led to the liberalization of interest and exchange rates. At the time of adoption of financial sector reforms, NBC had only three branches, one in Zanzibar town and the other two at Chake Chake and Wete in Pemba. The PBZ had only one branch office and three agencies in Zanzibar and three branches in Pemba, one in each main town. At that time the role and performance of these branches was relatively limited, particularly for saving mobilization (Mohamed, 2006a).

The PBZ loan portfolio prior to the reforms was dominated by loans to the public sector. The lending was also in accordance with the priorities established by the Revolutionary Government of Zanzibar and more guided by revenue needs of government and not of commercial considerations (BOT, 1990). During this period, PBZ loans were dominated by two main public companies: ZSTC, which was responsible for cloves export and copra marketing and "Biashara za Nje" (BIZANJE), which was the main importer of food and consumer items. According to BOT (1990), these two companies accounted for 75% of the PBZ loan portfolio. Generally, the public sector accounted for 95% of the PBZ credit during 1967 – 90, implying that only

5% of the credit from PBZ went to the private sector (BOT, 1990). Despite the increase in bank establishments, the flow of credit to the private sector has remained low. The scale of operations of the existing commercial banks are yet to expand under the reforms period and the private banks and other financial intermediaries licensed under the reforms period continue to target specific low risk market niches, mainly in the Zanzibar town thus leaving the majority of the population, particularly in the rural areas still marginalized by the formal financial institutions.

2.5.2 The structure and performance of existing financial sector in Zanzibar

2.5.2.1 The structure of existing financial sector

Currently, there are a number of institutions offering financial services in Zanzibar. These include commercial banks, government and Non-governmental MFIs, Bureau de change and informal financial institutions (IFIs).

2.5.2.2 Existing commercial banks

The commercial banks active in Zanzibar offers the traditional banking services, such as money transfer, opening of letters of credit, deposits and current accounts. Some of these banks provide short, medium and long term loans to productive sectors mainly businesses and trade sectors. In addition, most of these banks have started salaried loan schemes for government employees. The key operational features and scope of services of existing bank institutions are summarized in Table 1.

Although commercial banks have more than adequate liquidity and though not officially denounced in their lending policies, they do not prefer to lend to farmers and to the rural sector of the economy (Millinga, 2006). Lack of acceptable collateral, high

transaction costs, and high risks of default are some of the reasons that are attributed to the commercial banks reluctance to lend to farmers and small clients in rural areas.

Majority of farmers in Zanzibar lack collateral acceptable to banks, and therefore their access to bank loans is generally difficult, if not impossible. In principle, banks take three types of collateral: mortagage, cash cover and guarantees. Under these circumstances, the bulk of the commercial banks loans accessed by Zanzibaris is secured by guarantee of the employer through salary loan products (Mohamed, 2006b).

Available statistics show that bank lending in Zanzibar has increased from Tshs 10 715 million in 2000 up to Tshs 30 465 million in 2006, marking 184% increase in lending (GOZ, 2006a). Despite the increased lending, banks in Zanzibar are still extremely conservative in their lending policies, resulting to lending to deposit ratio of less than 45%. As shown in Table 2, the commercial bank deposits exhibited an increasing trend between 2000 and 2006, rising from Tshs 38.7 million in 2000 to Tshs 133.9 million in 2006. However, during this period, the total bank lendings showed a fluctuating trend with the lowest amount lent was Tshs 10.7 million in 2000 and the highest amount of Tshs 30.5 million lent in 2006. These figures show a serious imbalance between deposits and lending which requires concerted efforts in reforms and restructuring so that the deposits are fed into the economic system through lending.

Table 1: Key features and scope of existing bank institutions in Zanzibar

Name of bank, year of establishment and ownership	Number of branches and locations	Targeted sector(s)	Types of services offered, lending interest rates and duration
People's Bank of Zanzibar Ltd, established in 1966. It is fully owned by the government of Zanzibar.	Has three branches (two in Unguja and One in Pemba). All located in main towns	Productive sectors, mainly businesses and trade sectors	Provide short, medium and long-term credit, interest rate charged for lending 12% on average. Have started salaried loan scheme with government employees and administers the government empowerment fund
National Bank of Commerce. Established in 1977. It is largely privatized	Has one branch in the stone town, Unguja	Productive sectors, mainly businesses and trade sectors	Provide short, medium and long term credit. Lending interest rate charged 15% p.a
Tanzania Postal Bank. Established its branch in Zanzibar in 2000.	Has one branch in Zanzibar town	Productive sectors, building construction and related sectors	Provide short, medium and long term credit, lending interest rate charged 16.5%. Operate salaried loan scheme.
National Microfinance Bank, established its branch in 1997	Has one branch in Chake Chake, Pemba	Productive sectors, including SMEs	Provide short, medium and long term credit. Lending interest rate charged 14%.
Barclays Bank, established its branch in Zanzibar in 2004.	Has three branches in Zanzibar town	Trade and businesses sectors	Provides medium and long term credit. Interest rate charged was 15%.
FBME Bank, established in Zanzibar in 2000	Has one branch, located in stone town, Unguja	Trade and businesses sectors and the SMEs.	Short, medium and long term credit. Lending interest rate was 16%.

Table 2: Commercial bank deposits and lending statistics in Zanzibar (In Billion Tshs)

Year	Total deposits	Total lendings	Lending/Deposit ratio
2000	38.7	10.7	27.6
2001	47.6	11.2	23.1
2002	51.8	22.5	43.4
2003	61.5	23.9	38.9
2004	61.5	11.7	19.0
2005	104.9	27.9	26.6
2006	133.9	30.5	22.7

Source: BOT (2006)

Despite the low lending rates of commercial banks, bank lending to the private sector has shown an increasing trend (BOT, 2006). As can be seen in Table 3, bank lending to the private sector increased from Tshs 3.5 billion in 2000 to 30.5 billion in 2006. This trend shows a positive decreasing tendency of lending to government and government parastatals. Lending (private sector)/deposit ratio is extremely low despite showing a positive increase during the period. Similarly, the deposits/GDP ratio is showing a tendency of increasing implying improvement in public savings and the potential for increase in investments. However, the lending/GDP ratio is extremely low that confirms existing low investments in the economy.

Table 3: Commercial banks deposits and lending to private sector (In Billion Tshs)

Year	Deposits	Lending to private sector	Lending/ Deposits (%)	GDP Current prices	Deposits/GDP (%)	Lending/GDP (%)
2000	38.7	3.5	9.0	190.5	20.3	1.8
2001	47.6	3.9	8.3	222.4	21.4	1.8
2002	51.8	15.3	29.5	256.0	20.2	6.0
2003	61.5	16.7	27.1	286.6	21.5	5.8
2004	61.5	11.7	19.1	344.3	17.9	3.4
2005	104.9	27.9	26.6	395.7	26.5	7.0
2006	133.9	30.5	22.7	419.5	31.9	7.3

Source: BOT (2006)

Trade sector was the major beneficiary of cumulative bank lending, with recorded loan amount of Tshs 40 627 million during the period of 2000 – 06, followed by agricultural sector with loan amount of Tshs 24 779 million. Tourism and transport sectors received relatively smaller proportions of cumulative bank lending amounting to Tshs 2585 million and Tshs 1107 million, respectively (BOT, 2006). Fig. 2 shows the relative proportions of cumulative bank lending in the four sectors of the Zanzibar economy from 2000 to 2006.

Lending to the agricultural sector by commercial banks during the period had been fluctuating, with highest lending of Tshs 7115 million recorded in 2002 and the lowest lending of Tshs 15 million was recorded in 2001. The total amount lent to the sector in 2006 was Tshs 4528 million, which is only 15% of the lending by commercial banks in that year.

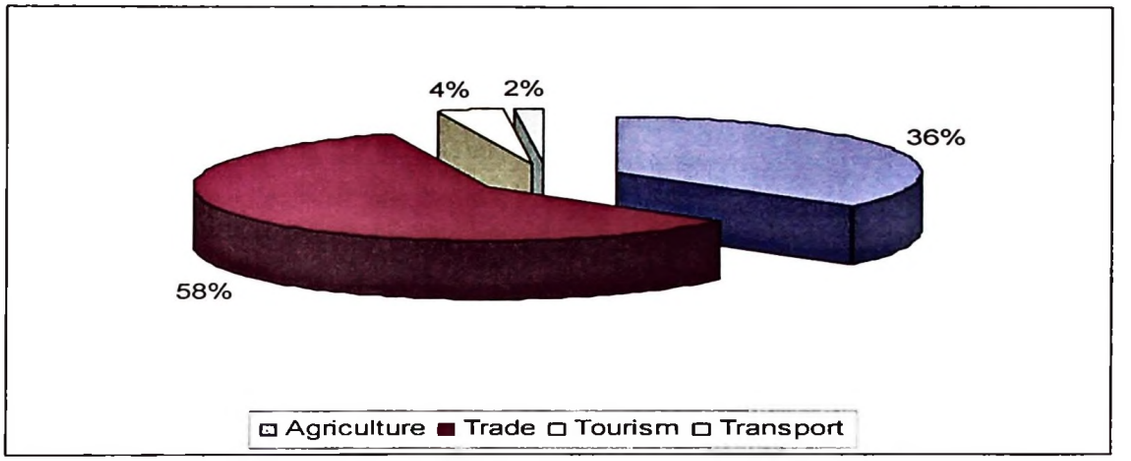

Figure 2: Proportion of cumulative bank lending to the four sectors of Zanzibar economy from 2000 to 2006.

Source: BOT (2006)

Parastatal organizations, particularly, the ZSTC, which deals with clove sub-sector and other private companies are the major beneficiaries of the amount lent to the agricultural sector. Table 4 shows the percent share of bank lending to the agricultural sector between 2000 and 2006.

Table 4: Percentage share of bank lending to the agricultural sector, 2000 - 2006

Year	Total bank lending (Tshs' million)	Amount lent to the agricultural sector (Tshs' million)	Percentage of the amount lent to the agricultural sector
2000	10 715	30	0.3
2001	11 234	15	0.1
2002	22 498	7 115	32.0
2003	23 889	7 018	29.0
2004	11 736	1 060	9.0
2005	27 861	5 013	18.0
2006	30 465	4 528	15.0

Source: BOT (2006)

Commercial lending rates have generally been relatively high, ranging from between 14 to 17%. However, negotiated lending rates have been lower ranging between 10 to 11%. On the other hand, saving deposits rates have been extremely low ranging from 2.5 to 2.6%. The challenge that Zanzibar is facing as far as the interest rate is concerned is to narrow the spread rate between lending and savings rates so as to increase savings and encourage investments.

Table 5 presents the structure of Tanzania commercial interest rates as from 2001 to 2006. In nominal terms the interest rates for deposits have been decreasing. The rate decreased from 4.1% in 2001 to 2.6% in 2006. In real terms, the interest rates have remained negative between 2002 and 2006, implying loss to savers and thus discouraging mobilization of savings from the general public. Similarly, nominal lending rates have been slightly decreasing. In 2001, nominal lending rate averaged 19.3% compared to 15.7% experienced in 2006. However, on real terms average lending rates declined drastically from a record of 16.1% in 2001 to 4.3% in 2006. The existence of competition in banking sector, as a result of implementing financial sector reforms could possibly have impacted on stabilizing the lending interest rates. Furthermore, pursuance of prudent financial and monetary policies also to some extent managed to restrict the inflation rate to a single digit during 2001 and 2006.

Zanzibar has very little natural resource and a weak industrial base and therefore largely depends on importation of consumer and producer goods. Price developments in Zanzibar, therefore, are highly influenced by movements in world prices. Movements in prices in the Mainland and the Tanzania shilling exchange rate also influence prices in Zanzibar.

Table 5: Tanzanian financial system: interest rate structure (%)

Year	NCPI	% change	Deposits rates		Lending rates	
		NCPI	Nominal	Real	Nominal	Real
2001	356	3.2	4.1	0.9	19.3	16.1
2002	375	5.3	3.4	-1.9	16.2	10.9
2003	409	9.0	2.6	-6.4	14.4	5.4
2004	442	8.1	2.5	-5.6	14.4	6.3
2005	485	9.7	2.6	-7.1	15.3	5.6
2006	6014	11.4	2.6	-8.8	15.7	4.3

Source: BOT (2006)

Despite the pursuance of prudent fiscal and monetary policies. Zanzibar has experienced an increasing trend of inflation rate growing from single digit of 3.2% in 2001 to double digits in 2006. The higher the rate of inflation implies an increase in cost of living and the cost of capital which has an effect on the supply of and access to credit, particularly for the rural poor. Fig. 3 shows the trend in inflation rate between 2001 and 2006.

Specific issues for the banking institutions that need to be critically looked into are their lack of interest in microfinance and to lend to small and medium enterprise sector. Nevertheless, some banks have started wholesale lending to SACCOS, which is a good sign of bank picking interest in microfinance activities. However, given the overall high lending rates, wholesale lending interest rates are still high (10 – 14%), leaving small margin for SACCOS lending operations. Another critical issue is lack of capacity of banks to deal with microfinance clients. Lack of skilled staffs in micro-lending imposes enormous challenge to commercial banks to engage in microfinance activities.

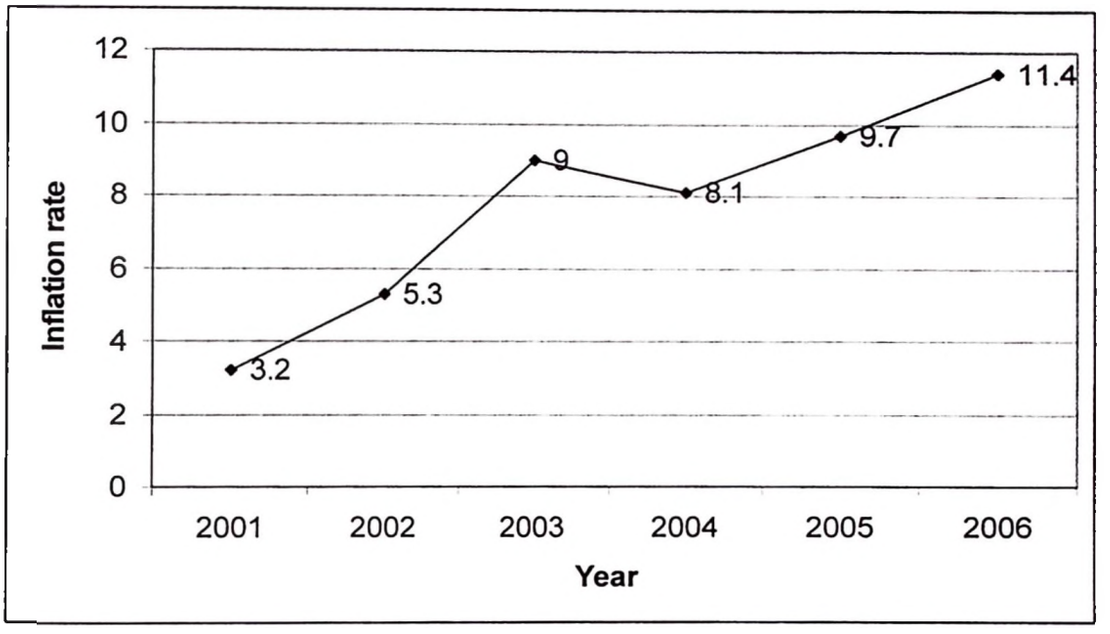

Figure 3: Trend in inflation rates, 2001 to 2006

Source: GOZ (2006a)

2.5.2.3 Microfinancial institutions (MFIs)

There are several government and non-governmental (International and local) MFIs in Zanzibar. The outreach, types of services and scope of each of these organizations are given below and summarized in Table 6.

Promotion of Rural Initiatives and Development Enterprises, Tanzania

PRIDE, Tanzania, which has a long history in Mainland Tanzania set up a branch in Zanzibar in 1997. PRIDE (T) has split its business into a MFC, which operates in commercial terms and PRIDE Rural Finance which focuses on developing rural financial markets. However, this split is still incomplete in legal terms although internally, the operations are already separated. PRIDE offers solidarity group lending (SGL). PRIDE offers a pre-loan training for 4 weeks, during which clients deposit their Loan Insurance Fund (LIF) weekly. Individual Loans are also called premium and they

range from Tshs 2 million to Tshs 50 million. Interest rate charged for the loan is 21% per year.

Collateral accepted is flexible, and depends on the judgment of the loan officer. Clients must have at least 15% of the loan in savings with PRIDE. In addition to a fixed asset. PRIDE requires individual borrowers to guarantee each other in groups of three. As the loan amounts increase, clients become increasingly hesitant to guarantee each others, making asset collateral increasingly important. PRIDE has entered into agreement with Heritage Insurance whereby the later provides death, permanent disability, fire and accident insurance to all PRIDE clients at 1% of the loan amount.

The main challenge facing PRIDE is competition from new MFIs, which offers more flexible and less strict lending conditions. Despite the success PRIDE has achieved in terms of increasing the number of clients, it has not yet been able to establish an outreach links into the rural areas thus leaving the majority of rural population remaining unable to benefit from its operations.

Changamoto Life Preservation Fund

Changamoto Life Preservation Fund was established in 1992. It has a total of 55 groups each with at least 3 persons, and a total membership of 400. Its main products are short term step-up individual and group loans. Changamoto Life Preservation Fund has a loan fund of Tshs 81 million [(Tshs 41 million of its own money and Tshs 40 million borrowed from Small Enterpreneurs Loan Facility (SELF)]. Non-group members borrow from the SELF fund and can take between Tshs 50 000 and Tshs 500 000 while groups can borrow up to Tshs 1.0 million and pay 20% annual interest. Members can

get twice their savings as a loan with a maximum of Tshs 5 million and pay only 8% in interest per year. Repayment rate remain high ranging between 98% and 101%.

The main challenge facing Changamoto Life Preservation Fund is limited capacity to mobilize loanable funds, which restrict its capacity to expand and increase outreach. Its human resources are also limited and lack skills in microfinance.

Women Entrepreneurship Development Trust Fund (WEDTF)

This NGO started as government scheme with the aim of developing entrepreneurial and technical skills of women with seed money as a revolving fund. The project ended in 1995 and since then WEDTF was operating as an NGO aiming at sustaining the interventions. WEDTF has a total of 3500 members in six districts and 95% of them are women. It uses the group lending model and has decentralized some 70 loan collection and disbursement centers, both in urban and rural areas. These centers are also used as forum for discussion of issues like Human Immuno Deficiency Virus/Acquired Immuno Deficiency Syndrome (HIV/AIDS), reproductive health, family planning, nutrition, environmental awareness and leadership. WEDTF's main product is a short term solidarity group loan step up loan, ranging from Tshs 50 000 to 600 000. WEDTF Centers act as SACAs, and hence do mobilize savings and on lends. Repayment rate is around 99%.

Zanzibar Fund for Self Reliance (ZFSR)

This is the oldest MFI which started operations in 1991 as a government scheme. The core activity is credit to youth and women. It also provides training on business management, facilitates study tours and trade fairs. It has one product – step up short – term loan (maximum 18 months) through solidarity groups loans. Its loan fund of Tshs

160 million is about half of what it needs given the loan applications that it has. Loan sizes range from Tshs 60 000 to 600 000. Repayments are weekly or monthly and interest rate stands at 20%, with no grace period. ZFSR offers a certificate of acknowledgement to good clients (who pay on time) and also reference for those graduating and want to start a relationship with another financial institution. ZFSR also issues certificate of acknowledgement to those who pay smoothly as an encouragement to others. The outreach and services offered by the NGO-MFIs are summarized as shown in Table 10 below.

Table 6: Outreach, services and sizes of NGO-MFIs

Name of NGO MFI and Total Loan Fund in Tshs millions	**Main outreach and clients**	**Services offered and lowest interest rate/duration**	**Number of clients 2006**
WEDTF (158), Unguja	Women (95%) and men, urban and rural	Short term loan, use Solidarity Group Loans. Lending interest rate 20% annually.	2 617
ZFSR (160), Unguja and Pemba	Women (57%), youth, disabled, retired, urban	Short term loan, business and technical training: Solidarity Group Loans, Lending interest rate 15% annually.	797
PRIDE (T) Unguja (flexible)	Women (70%) and men, urban	Short-term loan, also use Solidarity Group Loan, charge monthly interest rate of 2.5%.	2 713
CHANGAMOTO (80) Unguja	Women (93%) and men, urban	Short-term loan also use Solidarity Group Loans	157
Total			6.284

Savings and Credit Cooperative Societies (SACCOS)

As in other African countries. SACCOS has increasingly been emphasized in Zanzibar. The purpose of establishing SACCOS is to encourage saving and provide opportunities to the majority of people of accessing credit both for consumption and productive investment. Statistics indicate that, as of December, 2005, there were a total of 85 registered SACCOS in Zanzibar and Pemba (Mohamed, 2006a). Mjini Magharibi region had the highest number of registered SACCOS, 29 in total and 1886 members. This is followed by Kusini region (Unguja) which had 24 SACCOS with 828 members. Kusini (Pemba) having 21 SACCOS with 1382 members and Kaskazini Region in (Unguja) having 6 SACCOS with 237 members. Kaskazini Region (Pemba) had the lowest number of SACCOS, only five with 404 members. As of 2005 the aggregate capital of all SACCOS in Zanzibar stood at Tshs 696.4 million, making an average share per member to be Tshs 167 253. About 70% (Tshs 483.7 million) of the total amount accumulated had been disbursed to members (Millinga, 2006).

Generally, the size of micro-finance industry in Zanzibar was found to be marginal with relatively low contribution to the GDP (BOT, 2006). As it is indicated in Table 7, the outstanding loan to GDP ratio remained virtually static; rose marginally from 0.03% in 2003 to 0.06% in 2006 with an average of 0.05% (BOT, 2006). Similarly, the MFIs' lending proportion to total commercial bank loans and advances remained substantially low from 0.4% in 2003 to 0.9% in 2006. This is an average rate of 0.8% per annum (BOT, 2006). Mobilized client savings by MFIs average only 1.1% of total savings mobilized by commercial banks. The low savings and lending ratio of MFIs to GDP and to total commercial banking portfolio implies that MFIs in Zanzibar are still inadequate instruments for economic development. Their depth and efficiency fall short

of expectation that they could be an important vehicle for poverty reduction and economic growth in Zanzibar.

Despite the limited performance of MFIs, a study conducted by BOT in 2006 reveals that MFIs savings have been increasing in absolute terms. The MFIs grew by 27% in 2006. Also in absolute terms, lending by MFIs almost doubled in 2006 from a low level of Tshs 88.1 million to an average of Tshs 176.0 million (BOT, 2006).

Table 7: MFIs size in terms of deposits and loan portfolio

Period ending	Dec. 03	Dec. 04	Dec. 05	Dec. 06
MFIs Savings (Mill. Tshs)	533.3	1 253.6	736.5	935.5
MFIs Outstanding Loans (Mill. Tshs)	88.1	165.3	186.7	264.6
Deposits (Mill. Tshs)	61 497.1	61 538.4	104 853.6	133 947.6
Lending (Mill. Tshs)	23 889.1	11 736.1	27 860.8	30 464.7
GDP (current prices) Mill. Tshs	286 632.1	344 326.5	395 720	419 463.2
MFIs savings/total deposits (%)	0.87	2.04	0.7	0.7
MFIs lending/total deposits (%)	0.37	1.41	0.67	0.87
MFIs saving/GDP ratio (%)	0.2	0.4	0.2	0.2
MFIs lending/GDP ratio (%)	0.03	0.05	0.05	0.06

Source: BOT (2006).

About 66% of the clients of MFIs in Zanzibar are female [Mohamed and Temu (In press) and BOT, (2006)]. With respect to the outreach of MFIs, the number of active clients rose by 51% from 5768 in 2003 to 8622 in 2006 (see Table 8). The increase of clients is attributed to the establishment of more MFIs from 28 in 2003 to 43 in 2006 (BOT, 2006). When disaggregated, the outreach for SACCOS and NGOs grew by 98% and 29% from 2003 to 2006, respectively. However, the outreach for government managed credit schemes declined from 102 active clients in 2003 to 64 clients in 2006 as the schemes did not extend credit in 2006 due to lack of funds (BOT, 2006).

However, despite the highest outreach growth for SACCOS, the size of membership between 2003 and 2006 averaged 52, reflecting a very small number to reap the benefits of economies of size. The members of SACCOS are relatively few, compared with average size of 272 members in Mainland Tanzania (Millinga, 2006).

Table 8: Number of active clients by MFIs category, 2003 – 2006

	2003	**2004**	**2005**	**2006**
Local NGO	3 847	4 300	4 095	4 966
SACCOS	1 819	2 329	3 006	3 592
Government	102	79	135	64
Total	**5 768**	**6 708**	**7 236**	**8 622**

Source: BOT (2006)

The outreach depth of MFIs in Zanzibar is remarkably low. The ratio of outreach increased from 5% in 2003 to 19% in 2006, with an average outreach of only 9.5% (BOT, 2006). The loans offered by MFIs are small in size averaged Tshs 88 842 in

2006 and that the loans were meant to finance micro-enterprises (BOT, 2006). Table 9 shows the depth outreach of MFIs in Zanzibar between 2003 and 2006.

Table 9: Depth outreach of MFIs in Zanzibar, 2003 – 2006

Outstanding loan (Tshs)'000	**2003**	**2004**	**2005**	**2006**
No. of active clients	88 100	165 300	186 700	766 000
Average outstanding loan	5 768	6 708	7 236	8 622
GDP per capita (Tshs)'000	15 274	24 642	25 802	88 842
Outstanding loan as % of GDP	284	331	368	464
per capita (Outreach depth)	5	7	7	19

Source: BOT (2006).

The MFIs outreach is also related to growth in loan portfolio which has significant impact on sustainability of respective MFIs. The study by BOT (2006) indicates that disbursements by MFIs in Zanzibar grew by 64% in 2003, 21% in 2004 and by 51% in 2006 (see Table 10). This increase was mainly attributed by the rise in a number of MFIs involved in credit extension from 28 in 2003 to 43 in 2006. Despite the increase in overall loan portfolio, there was no significant increase in loan disbursed by SACCOS due to limited capital. Millinga (2006) notes that most of the SACCOS in Zanzibar, depends for their operational and loan funds on members' shares and savings.

As indicated in Table 10, loan disbursements by SACCOS increased slightly from 37% in 2004 to 39% in 2005 before increasing to 49% in 2006. As a result of limited capital facing MFIs, the average loan size from these sources ranged from Tshs 238 000 to Tshs 305 000 between 2003 and 2006. The low capital base for SACCOS had hampered their wider outreach and threatened their sustainability (Millinga, 2006). From Table 10, it can also be observed that of all MFIs, financial NGOs on average lent

out 74% of total loans, while SACCOS lent 23.3% between the period of 2003 and 2006. In terms of credit growth, on average NGOs grew by 53% compared to 42% of SACCOS (BOT, 2006).

Savings through MFIs institutions is still very limited despite the increase in total compulsory deposits by 75% from Tshs 533.3 million in 2003 to Tshs 935.5 million in 2006 (BOT, 2006). Like with lending, this increase in compulsory deposits was mainly due to the increase in the number of MFIs from 28 in 2003 to 43 in 2006. Deposits increased by 135% between 2003 and 2004 and later decreased by 41% in 2005 before increasing by 27% in 2006 (BOT, 2006).

Table 10: Loan disbursed by MFIs from 2003 to 2006 (Million Tshs)

Indicator	2003	2004	2005	2006	Average amount
SACCOs	176	241	335	499	313
Financial NGOs	481	887	1 027	1 625	1 005
Govt. Parastatal	50	29	42	0	30
Total	706	1 157	1 404	2 124	1 348
SACCOs loans (% of total)	25	21	24	23	23.3
NGOs loans (% of total)	68	77	73	77	74.0
NGOs Credit growth (%)		**85**	**16**	**58**	**53.0**
SACCOs Credit growth (%)		**37**	**39**	**49**	**42.0**

Source: BOT (2006)

The voluntary savings with MFIs in Zanzibar is virtually absent. The reasons that were attributed to this situation include low commercial banks savings rates and high costs of living. The poor saving culture in the communities, low sensitization of people towards savings were also considered as crucial factors that contributed to poor voluntary savings with MFIs (BOT, 2006; Mohamed, 2003).

The critical issues that emanate from this review is that the existing MFIs are not comprehensive in their operations in the sense that they have specific target groups and mostly serve the urban and peri-urban clients for easy management of loans and reducing risks. However, the interesting good practices of WEDTF and ZFSR merit special recognition. These two schemes have developed special mechanism of recognizing the best performers among their clients in terms of recording good loan repayment. Also provision of reference for those graduating and who want to start a relationship with another financial institution is a good innovation that ensures graduated clients leave the schemes smoothly with an assurance of getting new opportunities in financing their enterprises for further growth and expansion. Also the decentralization of loan collection and disbursement to rural centres closer to rural clients facilitate easy access of services and increasing outreach.

All MFIs covered in the study were found to offering small, short-term capital loans for a period of up to 12 months. The loans offered by these institutions were ranging between Tshs 50 000 and Tshs 5 million. This means that opportunities for relatively bigger investments such as buying agricultural machinery have to come from outside the microfinance systems. It has also been observed that none of the NGOs interviewed have consciously developed financial products that were based on the demands of their respective clients (in most cases the financial product given is limited to offering

credit). Likewise terms and conditions of these MFIs rarely reflect the clients' socio-economic environment. For example, saving facilities were virtually absent in most existing MFIs that operate in Zanzibar.

Most existing MFIs were also found to concentrate on financing enterprises that have high turnover and that generate regular income flows. In this case individuals who request loans for agricultural activities were highly disadvantaged. Political and government interferences in the operations were also found to be high for the ZFSR, which is a government owned credit scheme. Moreover, MFIs were found facing serious capacity constraints in terms of enough trained and experienced personnel, facilities and loan capital, and therefore it is difficult for them to conceive, develop and offer products that are responsive to their clients.

Other issues which were found to limit the effectiveness of existing MFIs include failure to link graduating members to the commercial banks for loans above what can be offered by MFIs. Also there was virtual no established links between MFIs and commercial banks save for MFIs (including SACCOS) using banks for funds deposit.

For SACCOS, issues that have been identified as limiting factors for availing financial services to the small and micro-enterprise sector are that most existing SACCOS were workplace based for employees. The largest non-work place SACCOS found were MSHIKAMANO SACCOS, MAISHA BORA SACCOS, and PEMBA SACCOS (350 members) and WARIDI SACCOS (490 members). This implies that most progressing SACCOS are found in urban areas, thus still limiting the chances of rural clients to benefit from these grassroots initiatives. SACCOS that were non-workplaces were found to concentrate more in areas with cash crops and were rarely found in areas

where farmers were food crops producers. During the survey, it was also noted that many new SACCOS are being formed both in urban and rural areas as a result of high mobilization by politicians to enable their people access funds from President Fund for Empowerment. These SACCOS are hastily formed, in many cases with inadequate preparations, hence their longer term sustainability becomes questionable. Membership of Zanzibar SACCOS is very small, averaging only 52, which is almost five times lower than the average membership size of 272 for the Mainland Tanzania.

Existing SACCOS also face flexibility difficulties just like MFIs and have serious capacity limitations, including limited capital, lack of full-time staff/management with the ability to mobilize resources and membership and to develop appropriate market products. Shortage of expertise in micro finance is also a limiting factor for the operations of SACCOS. In order for SACCOS to remain financially viable, they have to attract sufficient deposits from members. Existing SACCOS has been unable to attract deposits through the use of flexible interest rates. This implies sustainability problems. Furthermore, the support framework for SACCOS in Zanzibar is weak. The Cooperative department faces serious shortage of competent staff, equipment and budget to be able to visit, audit, advice and regulate SACCOS.

2.6 The Concept and Approaches of Measuring Access to Credit and Credit Constraints

Existing literature indicates the existence of three main approaches that can be used to determine household access to credit and credit constraints. These approaches are: (a) the indirect method which infers the presence of credit constraints from violations of the assumptions of the Life Cycle (LC) or Permanent Income Hypothesis (PIH), (b)

detection of credit constraint by directly asking households and (c) the use of the credit limit variable.

Empirical models testing for the presence of credit constraints based on life-cycle/permanent income or "consumption–smoothing" hypotheses use household consumption and income data to look for a significant dependence of consumption on transitory income. Empirical evidence of a significant dependence of consumption on transitory income is taken as an indication of a borrowing or liquidity constraint. The LC/PIH literature is extensive and is reviewed by Browning and Lusardi (1996). Besley (1995) and Deaton (1992), among others. In general, the empirical evidence based on the LC/PIH approach has been inconclusive. At first, one may think that this is due to the fact that empirical testing of the implications of the LC/PIH requires repeated observations on the same households, whereas most of the studies are based on relatively short panels. However, there are more fundamental reasons why the evidence from the LC/PIH approach for detecting credit constraint has been inconclusive.

First, and perhaps most important, under conditions of uncertainty, violation of the implications of the LC/PIH can result from prudent or precautionary behaviour even if the household is not credit constrained (Kimball, 1990; Carroll, 1991). Several authors have extended the standard life-cycle model to explicitly incorporate both liquidity constraints and precautionary behaviour, and assess either through simulation or empirical testing of each effect (Morduch, 1990; Deaton, 1991).

However, due to identification problems, it is nearly impossible to disentangle the effects of credit constraint and precautionary behaviour from the type of income, consumption, and asset data typically available for these studies (Browing and Lusardi,

1996). Second, if conditions of uncertainty are negatively correlated with wealth, then current income will be negatively correlated with consumption growth, even in the absence of borrowing constraints (Caroll, 1991). Moreover, as Deaton (1990) points out, the effect of negative income shocks on consumption also depends on the initial asset position of households. Browning and Lusardi (1996) list several other reasons why the implications of the LC/PIH may be violated even without a credit constraint. Furthermore, an important insight from the simulation results of Deaton (1991) is that a credit-constrained household may still be able to smooth consumption with precautionary saving and thus not violate any implication of the LC/PIH. Hence, it can be concluded that the violation of an implication of the LC/PIH is neither a sufficient nor necessary condition for being credit constrained.

The second method of detecting the presence of credit constraints uses the information gained directly from household members on their participation and experiences in the credit market to determine if they are credit constrained. In practice, households are classified as credit constrained, based on their responses to several qualitative questions regarding their loan applications and rejections during a given recall period. This classification is then used in reduced-form regression equations to analyze the determinants of the likelihood of a household being credit constrained and the effect of this likelihood on various household outcomes. The method was first applied by Jappelli (1990) using data from a household survey in China. The method was subsequently used by Zeller (1994), Schrieder and Heidhues (1995) and Zeller *et al.* (1996) with household survey data from Madagascar, Cameroon and Pakistan, respectively.

The theoretical justification for the direct method itself can be found in the extended version of the life-cycle/permanent income model that explicitly allows for the possibility of a credit constraint. For example, Jappelli (1990), used the credit constraint inequality in the extended model to derive reduced-form equations for the determinants of the likelihood of a household being constrained. The information on household credit-market experiences collected in the direct method is also an important contribution towards empirically identifying the respective effects of liquidity constraint and precautionary behaviour in life-cycle models (Browning and Lusardi, 1996).

The third method of detecting the presence of credit constraint is the use of credit limit variable. According to Diagne and Zeller (2001), the credit limit variable is the extension of the direct method of measuring credit constraints condition of a household. It refers to the extent of access to credit from a given source and is measured by the *maximum* amount a household can borrow from that source. However, Diagne and Zeller (2001), notes that the credit limit that a borrower faces depends on both the lender's and the borrower's characteristics and actions. It also depends on random events that affect the fortune of lenders and other potential borrowers who may compete for the same possible credit. Stiglitz and Weiss (1981) also note that the concept of "credit limit" is based on the assumption that credit from any possible source is of limited supply i.e., lenders are constrained by factors beyond their control on the maximum amount they can possibly lend to any potential borrower. This maximum loanable fund is a function of available resources and is independent of the interest rate that can be charged and of the likelihood of default. This is especially true in developing countries, where even established commercial banks are very limited in their ability to raise capital for on-lending. Consequently, any borrower, however

credit-worthy, faces a limit on the overall amount he can borrow from any given source of credit; regardless of the interest rate he is willing and able to pay, or collateral he is willing to put up. Furthermore, due to the possibility of default and lack of effective contract enforcement mechanisms, lenders have additional incentives to restrict the supply of credit, even if they have more than enough capital to meet a given demand and the borrower is willing to pay a high enough interest rate.

As shown by stiglitz and Weiss (1981), the possibility of adverse selection arising from the asymmetry of information between the lender and the borrower will usually prevent the lender from using the interest rate as a way to ration credit. From the borrower's view, the relevant limit on supply is not the maximum the lender is able to lend, but rather the maximum the lender is willing to lend. The wedge between the *willing* and *able* represents the extent of the credit rationing that arises mainly because of information asymmetries. However, whether there is credit rationing or not, there is perceived maximum limit that cannot be exceeded when borrowing regardless of the interest rate one is willing to pay. This credit limit is the one which is used to quantify the extent of a household's access to credit. However, Godquin and Sharma (2005), argue that the credit limit approach still lacks information on excess demand and relies on the hypothesis that the household members that have reached their credit limit with a certain type of lender would have liked to borrow more from that lender and thus can be classified as credit constrained. They also note that it is unclear why credit constraints of individual household members can easily translate to a household level binding credit limit.

Of these three approaches, the widely accepted and used measure of access to credit is the direct questioning of the households (Gilligan *et al.*, 2005; Godquin and Sharma,

2005). Jappelli (1990) and Zeller (1994) classify households as credit constrained if they report any rejected application of credit or report being granted less than the amount they initially asked for and were not able to get the corresponding amount through another credit application. They also classified households that did not apply because they thought they would have been turned down as being credit constrained. Gilligan *et al.* (2005) and Feder *et al.* (1990), resorted to the approach of directly asking borrowing households whether they would have liked more institutional credit at the going rates of interest. They also asked the non-borrowing households the reason for not borrowing. According to Feder *et al.* (1990), borrowing households, which would have liked more institutional credit and non-borrowing households, which reported that they did not borrow because they could not obtain credit, were all credit constrained. Schrieder and Heidhues (1997) also used the approach of asking households whether during the recall period they had applied for a formal loan and if not why they did not apply. For those households that applied for formal loan were also asked if they had received loan entirely as requested or not. From the responses to these questions, households were classified into restricted credit access households and non-restricted credit access households.

2.7 Determinants of Access to Credit

Recent theoretical and empirical studies have established that rural financial markets in most developing countries are imperfect (Stiglitz and Weiss, 1981; Carter, 1988). As a result of this, most theoretical analyses have dealt with barriers to accessing credit arising from asymmetric information between borrowers and lenders (Ray, 1998).

Biggs *et al.* (2002) note that under imperfect market conditions, lenders being unable to screen and monitor individual projects, tend to rely on borrowers' characteristics to

assess the viability of the projects. On the other hand, Stiglitz and Weiss (1981) note that households act rationally and advance their objectives given the information and opportunities they perceive to have. This implies that farm household decisions with respect to accessing credit could be influenced by the characteristics of the households' attributes, their resource endowment and some institutional factors. They further note that theories of farm household behaviour generally provide a theoretical and conceptual framework for analysing the determinants of farm household access to formal credit.

The growing empirical literature on rural financial markets provides insights into institutional and socio-economic variables which can explain rural access to credit (Maumbe, 1993; Kochar, 1997; Kashuliza *et al.*, 1998; Mushinski, 1999; Temu *et al.*, 2001). From the institutional perspective, the location of the financial service providers and their lending policies and conditions greatly influence the probability of access to credit. Dallimore and Mgimeti (2003) contend that the long distances and high transport costs constrain the rural poor's to have access to formal financial services. The operational features such as interest rates and collateral requirements were also found to influence access to credit. Kochar (1997) observes that collateral requirement is a major factor that influences credit access in the formal sector. This view was supported by Daniels (2001), who also observes that the low levels of collateral among the poor, to a great extent, explain their limited access to financial services such as credit in the formal banking sector.

Vaessen (2001), in a study of accessibility of rural credit in Northern Nicaragua, showed that access to credit is influenced by both the lender and household characteristics. At the institutional level, the lender makes decisions based on the target

group, the selection criteria of clients, the geographic area of operation, and the features of financial products to be provided to address sustainability concerns, all of which influence credit supply. At the household level, being part of the specific target group or living in the targeted geographical area influences credit access. The logit regression results by Vaessen (2001), suggested that the probability of credit access is positively and significantly influenced by socio-economic factors such as level of formal education, family size, off-farm activities, and access to a network of information.

Zeller *et al.* (1994) suggested that access to credit from the Gambian Co-operative was positively and significantly influenced by age and household income, while being female had a negative and significant effect. What these results suggest is that older persons who control household resources may be rated to be more creditworthy, while women are discriminated against in the formal credit market. Kashuliza *et al.* (1998) used a logistic regression procedure to determine factors that influence credit accessibility in southern highlands areas of Tanzania. From the results of their study, factors such as level of education of borrowers, gender of clients and preferred form of credit (cash or kind) were important characteristics for an individual to access credit from semi-formal financial sector. Mohamed (2003) also used the logistic regression model to identify some key socio-economic factors that influence credit accessibility among the rural population in Zanzibar. His results indicate that the level of income, gender, age, number of years of formal education, credit awareness do significantly influence individual chances to access credit from formal and quasi-formal credit sources.

Temu *et al.* (2001) used farm level data to determine the demand for credit and identify socio-economic variables that influence credit disbursement and access. They used

regression and discriminant analysis models to test the hypotheses that socio-economic attributes of an individual determine his/her access to credit. Their results indicate that cash from off-farm activities, average costs of hired labour, input expenditure and information on credit availability were significant variables. In a related study, Maumbe (1993) indicates that access to farm credit is influenced by individual socio-economic attributes such as education level, farm size, income levels, experience in farming and pre-disposal to cash expenditure on farm inputs. In addition, awareness of available credit facilities, lack of experience and gender barriers are also attributes that explain farmers' failure to access institutional and formal credit (Kashuliza and Kydd, 1996).

In examining factors that determine household credit constraints, Zeller (1994) using the probit estimation method identified sex of household head, level of formal education and the ratio of informal outstanding debts to income to be important determinants in the formal credit markets. A similar study conducted by Ibrahim *et al.* (2006) in Ethiopia revealed that household expenditure and value of assets are important determinants of household credit constraints condition. Relatively, similar factors were also identified by Nuryartono *et al.* (2005) who reported that family size, education and total income as important factors that determine credit constraints of households in Indonesia.

With regard to gender differences on credit access, Otero and Downing (1989) note that womens' lack of control over economic resources and the nature of their economic activities restrict their access to formal credit more than mens'. Other factors pointed out as constraints for women in accessing credit are related to institutional requirements, cultural and social norms and to the type of productive activities that

women are engaged. McKee (1989) observes that gender-based credit constraints. such as limited education. inferior legal status and unpaid productive responsibilities aggravate the problems for women when operating small businesses.

Furthermore. Otero and Downing (1989) observes that lack of information about financial institutions prevent rural women to access formal credit. Also the institutional constraints such as administrative procedures and the necessity for guarantees were also cited as major obstacles limiting women to access credit. Again. with the problems of illiteracy and the lack of management knowledge. rural women are considered to be disadvantaged when it comes to accessing financial services. Tibaijuka *et al.* (1989). note that obstacles related to socio- cultural practices. also prevent women from accessing formal credit.

2.8 Access to Credit and Farming Technology Adoption Inter-Linkages

Credit is widely perceived as an effective tool for promoting the adoption of farming technologies and poverty reduction in the smallholder farming community. It is firmly believed that access to credit has the potential to promote the adoption of risky but high returns technologies through the relaxation of the liquidity constraint and through improving the household's risk bearing ability (Eswaran and Kotwal. 1990).

Existing literature shows that access to credit has a positive impact on farming technologies adoption (Simtowe *et al.*, 2006; Bahadur and Siegfried. 2004; Diagne Zeller, 2001; Panayotou. 1993). Many of the studies conducted have reviewed factors that affect technology adoption and have highlighted access to credit as a key determinant of adoption of most agricultural innovations. However. many of the existing studies have assumed that enhancing access to credit to farmers would

automatically lead them to adopt technologies. This generalization seems to have ignored the household behaviour with regards to whether or not the household is credit constrained. Simtowe *et al.* (2006) observe that credit access will only be effective for credit constrained household and they have found out that factors that affect technology adoption among credit constrained households are different from those that affect adoption among non-constrained households. Similarly, the marginal contribution of credit is likely to be high in households that have a larger binding credit constraint than those that are less constrained.

Vakis *et al.*(2004) argue that adoption studies on technology that do not take into consideration the differences that exist in households' credit constraints condition may lead to inconsistent parameter estimates. Knowledge of factors that exert separate effects on technology adoption between credit constrained and non-credit constrained households is therefore crucial. Simtowe *et al.* (2006) taking into account the two different regimes, found that credit access, landholding size, and gender impact on technology adoption differently between credit constrained and non-credit constrained households in Malawi. Teklewold *et al.* (2006) also reported that non-credit constrained farmers in Ethiopia who decide to take credit are about 41 times more likely to adopt improved poultry keeping technologies than credit constrained households. By the same token. Just and Zilberman (1983) observe that credit is one of the important determinants of credit constrained smallholder farmers to adopt improved farming technologies. In addition, Bahadur and Siegried (2004) note that smallholder farmers' access to extension services has higher potential to influence adoption of farming technologies to non-credit constrained than for credit constrained households.

2.9 The Theoretical Framework and Empirical Methods

2.9.1 The theoretical framework

Economic theories address farm households as decision makers who are concerned with questions such as what levels of different resources to devote to each farm enterprise and what technologies to use in the production processes. In the process of making such decisions farm households are influenced by their production objectives, which determine their willingness to invest in various production activities, including the desired production technologies.

According to the profit maximization theory of household behaviour in decision making, households, apart from having other production costs, they attempt to maximize profit. With profit maximization, it is assumed that households, in the short run will increase the amount of variable inputs as long as the additional revenue exceeds the additional costs. It is further assumed that farmers would not produce at all if the price of inputs exceeds the maximum average value of product. The profit maximization theories describe households as economic agents in the sense that they are efficient in the allocation of resources with an objective of maximizing profit. This implies that when farm households make investment decisions they tend to address important questions such as how much of output to produce, and what level of each input to apply in order to maximize net returns. In other words, farm households during the production process, tend to find the levels of output and input that will give them the highest net returns at given input and output prices. This theory is supported by many neoclassical economists, including Shultz (1968), Haswell (1970), and Ellis (1988), who defined the farm households as being both efficient and profit maximizing. Therefore, the prospects of higher income induce smallholder farmers to adopt the recommended agricultural technologies.

However, the risk aversion behaviour of farm households determine the willingness of the individual household to make firm decisions of whether to borrow and to invest in technologies. In the decision making process, the farm household considers the risk involved. In turn, household risk aversion tendency increases its credit constraint condition and also inhibits the adoption of agricultural technologies. Ellis (1988) notes that risk aversion declines as wealth or income rises. Higher income or wealthier farm households are able to withstand the losses which might result from risky investments. This implies that wealthier farm households are expected to be more efficient and more willing to borrow and adopt improved agricultural technologies. They are also likely to be better informed and have more access to credit and other available institutional support services.

2.9.2 Empirical methods

In analyzing farm household decision with respect to borrowing in the formal financial market, qualitative models are commonly used. These models are Linear Probability Model (LPM), probit and logit (Gujarati, 1988; Liao, 1994; Tambi *et al.*, 1999; Senkondo *et al.*, 2005; Hawassi, 2006). The qualitative choice models were developed to overcome problems associated with the use of Ordinary Least Square (OLS) regression model. According to Frone (1997), four common problems encountered with OLS regression model are (a) nonsensical predicted values, these are predicted values falling outside the possible range of the outcome; (b) biased regression coefficients; (c) non-normally distributed error terms and (d) presence of heteroscedasticity. The first two problems undermine one's ability to trust predicted values and the direction and size of estimated relations whereas the last two problems undermine one's ability to produce unbiased standard errors and to conduct tests of statistical significance.

The LPM has been used extensively because of its simplicity. However, the model has a number of drawbacks: (a) the error term may inherit heteroscedastic properties, which lead to the OLS estimator of parameters being inefficient and the standard errors being biased resulting in incorrect test statistics (Gujarati, 1988; Long, 1997; Tambi *et al.*, 1999; Wooldridge, 2003), (b) it may also possess elements of non-normality (Gujarati, 1988; Long, 1997; Tambi *et al.*, 1999; Wooldridge, 2003) and (c) the predicted value of the dependent variable may not fall within the unit value (Wooldridge, 2003; Powers and Xie, 2000; Tambi *et al.*, 1999; Gujarati, 1988; Falusi, 1995) and unrealistic application of functional forms (Long, 1997). For this reason, LPM is not useful for modelling binary responses compared to other alternative models.

The limitations of the LPM can be overcome by using more sophisticated binary response models. The use of monotonic transformation (probit and logit specifications) guarantees that predictions lie within the unit interval (Capps and Kramer, 1985). The probit and logit provide greater reliability and statistical sophistication in analyzing binary choice models (Amemiya, 1981). It is important to note that the probit model is more appealing than the LPM, partly because it accounts for heteroscedasticity of the error terms restricting predictions to lie between 0 and 1 range (Mazuze, 2004). The probit model is associated with the standard cumulative distribution (Hanushek and Jackson, 1977). However, the probit and logit models usually give similar results for most problems and it is difficult to distinguish between them statistically (Amemiya, 1981). The probit and logit curves are so similar as to yield essentially identical results. The only essential difference is the thickness of the tails of the curves that show how rapidly the curves approach 0 and 1 (Aldrich and Nelson, 1990). In practice, logit and probit models yield estimated choice probabilities that differ by less than 0.02 and which can be distinguished in the sense of statistical significance, only with very large

samples (Aldrich and Nelson, 1990). Consequently, there is little to guide the choice between the two.

Therefore, the choice of specification remains fairly arbitrary, revolving around practical concerns such as availability and flexibility of computer programs and personal preference and experience (Aldrich and Nelson, 1990). Hanushek and Jackson (1977) and Maddala (1989) stress that the choice between probit and logit models comes down to convenience. As a result, both models have been widely used to analyse the dichotomous dependent variable. For instance, Kashuliza *et al.* (1998), Vaessen (2001), Mohamed (2003) and Dufhues (2007) used logit model to determine factors that influence access to credit. Likewise, Pitt (1983), Feder *et al.* (1990), Zeller (1994), Fuglie and Bosch (1995) and Freeman *et al.* (2003) used probit models in analyzing determinants of household credit access constraint condition.

Capps and Kramer (1985) and Polson and Spencer (1991) compared results from logit and probit models and both deduced that the correlation coefficients and the prediction probabilities were slightly higher for the logit than for probit model. However, the values for the McFadden's, log likelihood function, likelihood ratio test, percentage of farmers' correctly classified and total number of iterations differed between the two models and the differences did not show the same trend. This suggests that criteria for the choice of any one between the two decisions must be based on statistical grounds (Amemiya, 1981). Consequently, Polson and Spencer (1991) suggested use of correct predictions, McFadden's R^2 and the likelihood ratio test as the criteria for evaluating the alternative specifications between logit and probit models. In addition, the linkage between access to credit and the intensity of adoption of agricultural technologies was assessed using switching regression model by Freeman *et al.* (2003). A switching

regression model is used to correct for possible sample selection bias which may arise from other interventions that provide multiple services to farmers in addition to credit (Lee, 1978); Maddala, 1983). Empirical application of this model to agriculture includes studies by Pitt (1983), Feder *et al.* (1990), Goetz (1992) and Fuglie and Bosch (1995).

In measuring poverty outreach of credit institutes, the commonly used approach is the Principal Component Analysis (PCA). This entails the development of Composite Indicator of Multidimensional Poverty by combining several important dimensions such as nutrition, primary education, primary health care, sanitation, safe water, housing facilities and income/expenditure which indicates capabilities of individuals and households to meet their basic needs (Asselin, 2002). It is generally argued that income and expenditures based measures alone do not provide a comprehensive profile of poverty status of individuals or households. The multidimensional poverty, per se, is considered to be a richer concept than the traditional income approach (Asselin, 2002; Meulman, 1992; Anderson, 1984).

The Principal Component Analysis (PCA) is a multivariate technique developed by International Food Policy Research Institute (IFPRI) as a poverty assessment tool in the late 1990s (Dufhues, 2007). The main objective of PCA is to reduce the dimension of observations such that different correlated variables are aggregated into fewer uncorrelated principal components, which can be seen as indices (Fraser and Kazi, 2004). With this technique, most of the information contained in the data is represented in the new indices.

Basically, PCA is viewed as a "data reduction technique", since the set of original "*m*" variables is reduced to "*n*" principal components (PC), with "*n«m*". This smaller number of components can then be used for interpretation purposes or further data analysis. The procedure carried out by the analysis is to calculate new uncorrelated principal components by linear combinations of the original, correlated variables. This is done by deriving (standardized) weights for each indicator. In algebraic terms this means that:

$$PC_1 = W_{11} \quad v_1 + w_{12} \quad v_2 + \ldots\ldots\ldots + w_{1m} \quad v_m \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$PC_2 = W_{21} \quad v_1 + w_{22} \quad v_2 + \ldots\ldots\ldots + w_{2m} \quad v_m \ldots\ldots\ldots\ldots\ldots\ldots .(2)$$

$$PC_m = W_{m1} \quad v_1 + w_{m2} \quad v_2 + \ldots\ldots\ldots + w_{mm} \quad v_m \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

With "w" is the calculated weight and "*v*" is the variable. Applied to poverty assessment, the PCA determines a subset of indicators that measure the relative poverty level of a household. In the end, a single indicator for each household is created that reflects the household poverty status in relation to all other households of the sample (Fraser and Kazi, 2004). With the weights of the PC_i and the respective indicators, the poverty index is calculated for each household. Relative comparisons can be drawn by ordering the households according to their poverty index. By creating terciles, quantiles or quintiles using the developed index, different wealth groups can be derived. The most advantage of PCA is that on one hand it creates a single indicator that is easy to use for analysis, while at the same time this single indicator is not limited to the monetary aspect addressed by household expenditures as the conventional method of (income) poverty. The PCA technique allows to take the multiple dimensions of poverty into account and to integrate qualitative with quantitative variables. The indicators can be categorized into three categories: (a) means to achieve welfare, which include indicators that reflect the earning capacities of a household. They are

subdivided into human capital, social capital and ownership of assets. (b) basic needs. which include indicators such as food consumption and shelter and (c) other aspects of welfare which include indicators such as having leadership role. access to extension networks and market access.

Siddhisema and Jayathilaka (2006) used weighted Principal Component (PC) based Factor Analysis to develop the Composite Indicator of Multidimensional Poverty in Sri-Lanka and obtained a better profile of poverty status compared to earlier results of traditional approach. Frazer and Kazi (2004) also used the PCA to critically assess the relative poverty level of clients and non-client of non-bank MFIs in Tanzania.

CHAPTER THREE

METHODOLOGY

3.1 Overview

Chapter three consists of three main sections. Section one introduces the chapter. In section two the characteristics of the study area is highlighted, while section three covers the methodological framework of the study, which is the major part of this chapter. In section three the information on the data needs and sources, data collection instruments used and the sample size and sampling procedures is also provided. The section further highlights on how the field work was conducted and it details on data processing and analytical approaches used to analyze the data.

3.2 The Study Area

3.2.1 Geographical location

Zanzibar consists of two main islands, Unguja and Pemba. The islands lie in a north-to south direction from 4°50'S to 6°30'S and in east-west direction from 39°10'E to 39°50'E and between 30 to 50 km off the shore of the Mainland Tanzania in East Africa (see Fig. 4, 5 and 6). The islands cover a total land area of 2332 km^2 whereas Unguja covers 1462 km^2 and Pemba covers 868 km^2.

3.2.2 Demographic patterns

According to the 2002 Census, Zanzibar currently has a population of 1.1 million habitats of whom 51% are female and 49% males. Fifty seven percent of the population lives in rural areas. The population density of 398 persons per sq. km turns out to be one of the most densely populated areas in Africa. However, this population is not evenly distributed. Unguja, with 63 % of the total land area, accommodates 60 % of the

population and Pemba has 40 % of the population. The Pemba population, which is relatively more rural based, is much more evenly distributed compared to Unguja. Population growth rate is high at 3.1 % per annum and the average household size is 5.3. Due to the fact that majority of the population is rural; one could expect that for poverty reduction the focus of formal financial services could have been placed more in rural areas than in urban areas.

3.2.3 Agro-ecological conditions

The climate of Zanzibar is dominated by a bimodal rainfall pattern and influenced by trade winds: the northeast monsoon from December to February, the southeast monsoon from March to November (Fowler, 1997; Krain, 1998).

The long rainy season (Masika) starts from end of March with heavy rainfalls and lasts in early June. On average 900 – 1000 mm precipitation accumulates during this season (Fowler, 1997; Krain, 1998). This season is more reliable than the more variable short rains (Vuli), which starts from October through to December, with average of 400 – 500 mm of rainfall. In general, the pattern of rainfall of Unguja island is similar to that of Pemba. However, Pemba receives more precipitation than Unguja (1900 mm compared with 1600 mm, respectively) (Fowler, 1997; Krain, 1998).

The highest temperature occurs during the short dry season with a monthly maximum mean of 33°C in Unguja and 31.9°C in Pemba. The cool season is between May and September. The relative humidity is high with a monthly average ranging from 87% in April (Masika) to 76% in November (Vuli) and a minimum at 60% during the dry season.

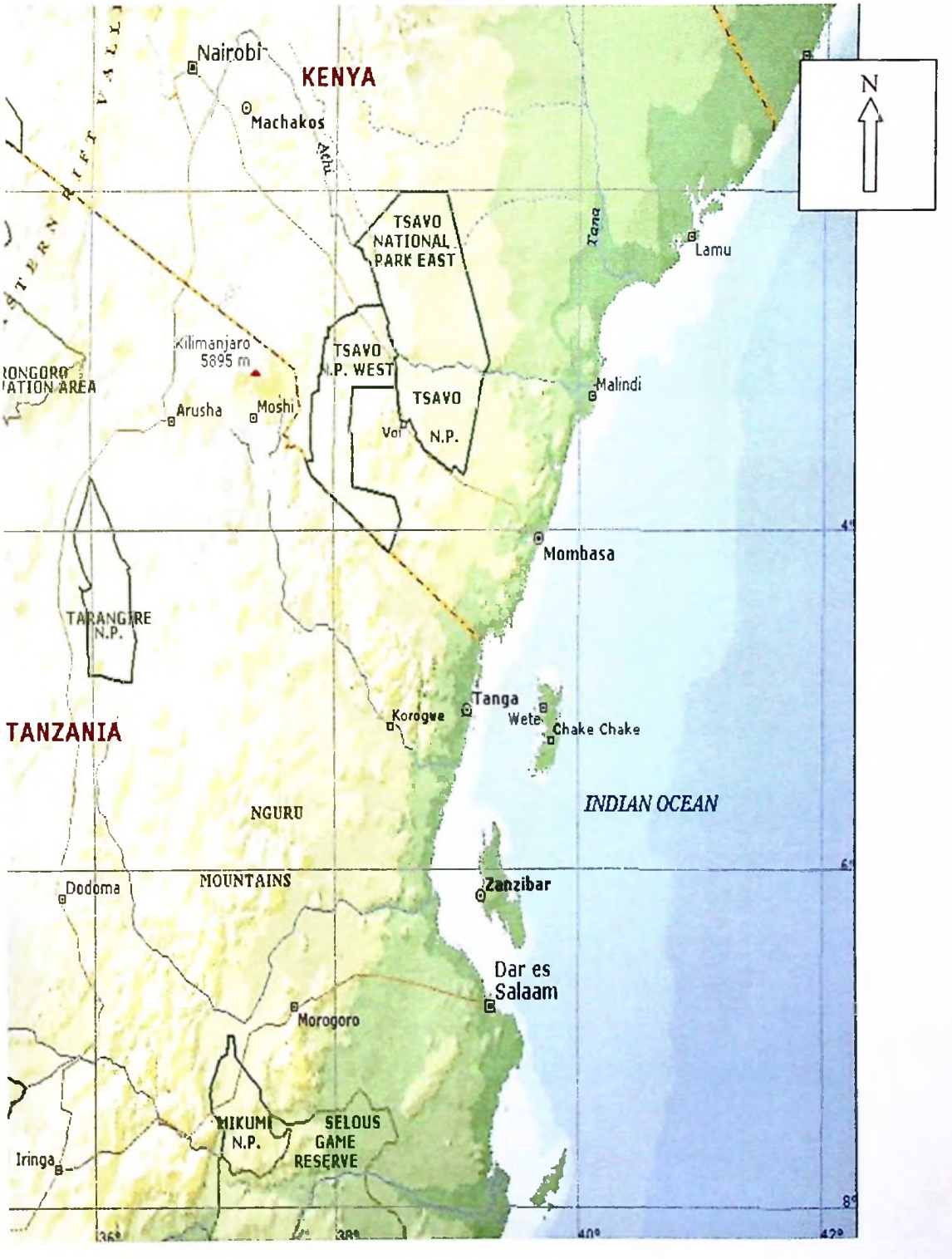

Figure 4: Location of Zanzibar

Source: Krain 1998

Figure 5: Map of Unguja island showing names of locations

Source: Krain 1998

Figure 6: Map of Pemba island showing names of locations

Source: Krain 1998

Both islands (Unguja and Pemba) are dominated by low ridges running in a north-south direction. They are situated closer to the west coast of the islands while eastern halves are mainly flat. In the middle of Unguja the highest point reaches over 90 m above sea level, while the hills in Pemba reach only a height over 60 m above sea level. Pemba Island is dissected more by hills and ridges than Unguja Island and has a marked indented western coastline. The east coast of Unguja and Pemba is called the coral rag area. It has developed from ancient coral reefs which stretches along the eastern coastline and build up low cliffs. On the west coast steep sandy cliffs occur. In general the soils of both islands are deeper and richer on the western side and become shallow towards the eastern side (Wirth *et al.*, 1988).

More than 50% of the total land is used for crop production. The main cultivated crops in Zanzibar are coconuts, cloves, cassava, banana, rice, sweet potato, pulses, maize sorghum, citrus and mango. These crops are mainly grown in an intercropping system. Some limited portions on the coral rag areas in the eastern part of Unguja Island are still practicing shifting cultivation, though with short fallow periods. In Unguja, the rice growing areas are concentrated on five extensive, flat and seasonally wet hydromorphic corridors. In Pemba, this crop is grown in over a hundred narrow valleys which tend to be wet all the year round. Coconuts and cloves occupy more than one-third of the cultivated land, rice about 5% and livestock production less than 1%. Coconuts and cloves are cultivated in both plantations and smallholder farms. Overall, the agro-ecological conditions favour the production of both food and cash crops as well as the keeping of the livestock. However, in order to boost agricultural productivity and production, the adoption of improved agricultural technologies becomes essential. Hence, availability of adequate financial facilities to enable smallholder farmers to purchase the required farm inputs is important.

3.2.4 Farming systems zones and sampled areas

Broadly, Zanzibar is classified into three major agro-ecological zones: the plantation zone, coral rag zone and hydromorphic valleys. These zones formed the basis for the classification of the farming systems zones made by the Zanzibar Cash Crops Farming Systems Project (ZCCFSP) in 1995. According to this classification, Zanzibar has 10 distinct farming systems zones, five in Unguja and five in Pemba. These farming systems zones are indicated in Fig. 7 and 8 and the major characteristics of each farming systems zones are summarized in Table 11 and 12. In Unguja, the sampled areas fall in farming systems zones 1, 2, 3, and 5. The Zone 4 has not been covered because there are relatively less agricultural activities in these areas. While in Pemba the sampled areas predominantly fall in Zones 3 and 5. As can be seen from Table 12, these areas are the most potential for agricultural activities.

3.2.5 Production of major food and cash crops

Cassava, sweet potatoes, banana and paddy are major food crops in Zanzibar, while clove is the major cash and export crop (GOZ, 2002). Besides, farmers grow many other food and cash crops such as citrus, paddy, legumes and vegetables. Much of the agricultural research and extension efforts have been focused on the development of major food crops that are cassava, sweet potatoes, banana and paddy with the objective of enhancing agriculture production and productivity for increasing farm incomes and improving household food security and nutrition in the farming communities. Some of these efforts are introduction of improved cultivars, use of organic and inorganic fertilizers, and integrated pests management systems.

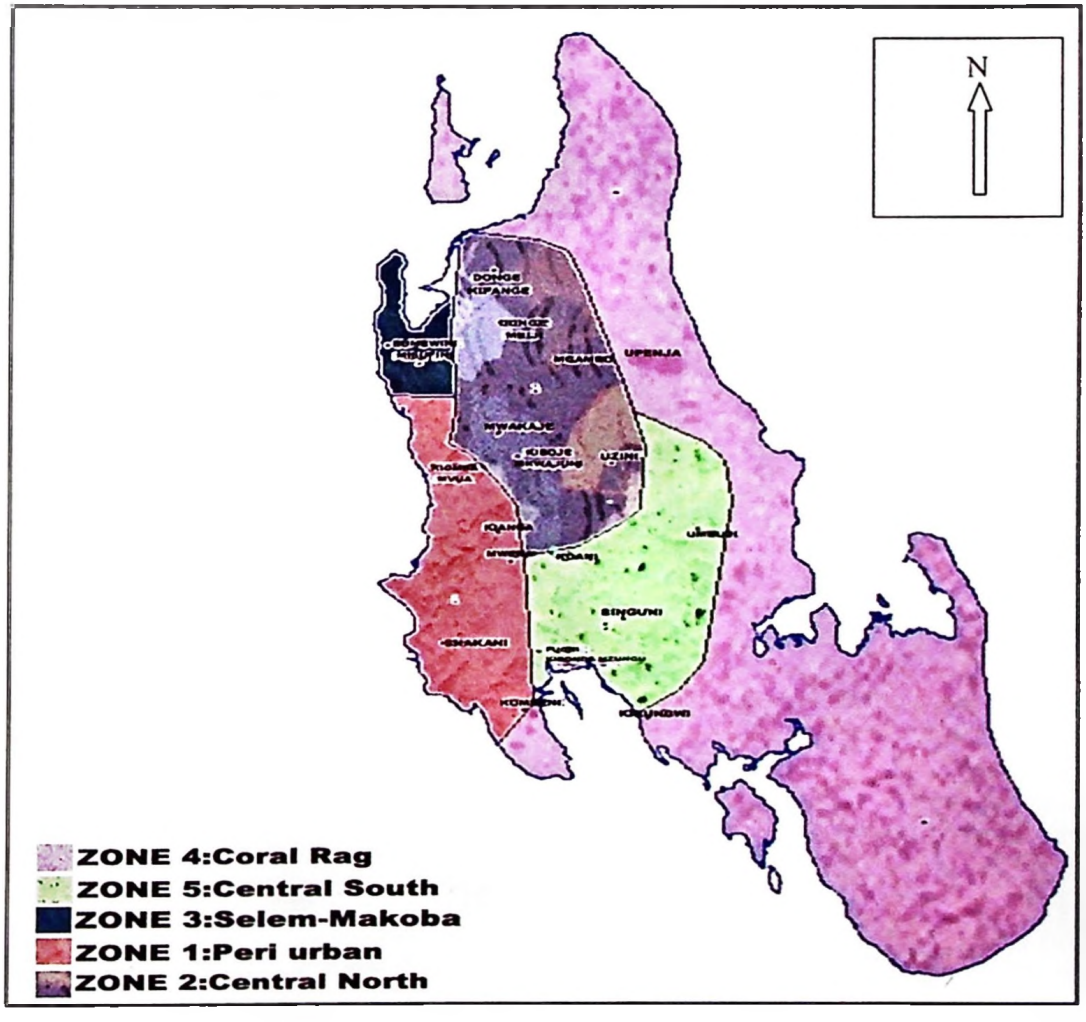

Figure 7: Map of farming systems zones of Unguja Island

Source: GOZ (1994)

Despite these efforts, productivity of these crops is generally low, far below the potential levels (Mohamed and Temu, 2008a). Table 13 shows the existing potential of increasing productivity of major food crops through improved technologies.

Table 11: The characteristics of Unguja farming systems zones and crops suitability

Zone	Type of Soils	Rainfall (mm/year)	Suitable crops
Peri—urban	Mostly sandy soils	1 500 – 1 800	Cassava. banana. sweet potatoes. yams. coco yams. vegetables
Central-North	Deep Clay soils	1 200 – 1 800	Fruit trees. cloves. coconuts. cassava. banana. sweet potatoes
Selem- Makoba	Sandy soils	1 200 – 1 800	Cassava. rice. sweet potatoes. banana. maize. cowpeas. mango. citrus. groundnuts. cloves. coconuts. millet.
Coral rag	Coral. rocky shallow soils	800 – 1 200	Tomatoes. pumpkins. chillies. limes. papaya. pigeon peas. cucumber. cassava. sorghum. banana. maize. yams. pigeon peas. green gram. hyacinth. cowpeas.
Central-South	Heavy clay soils	800 – 1 200	Cassava. rice. sweet potatoes. banana. millet. mango. vegetables and citrus

Source: GOZ (1994)

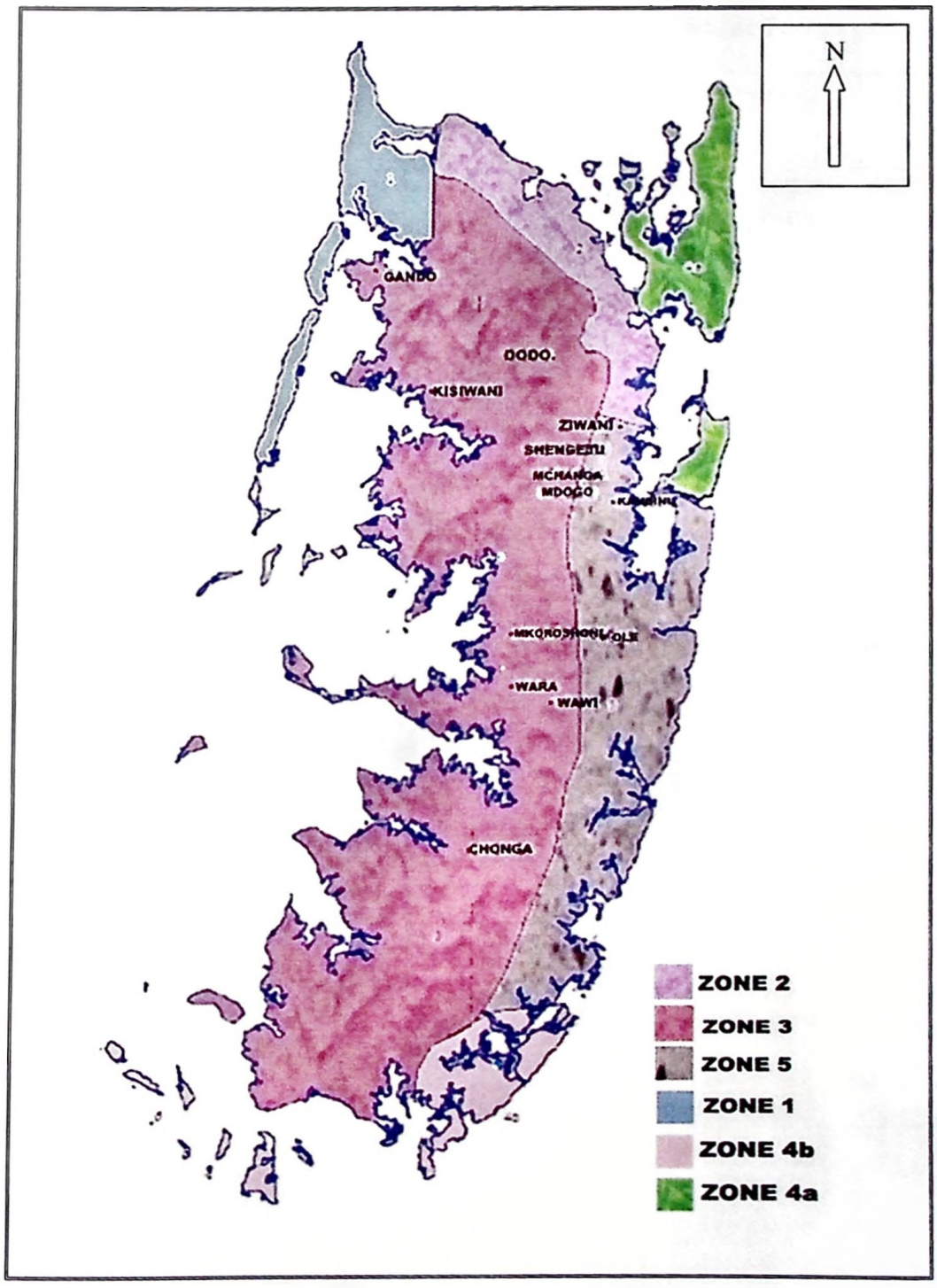

Figure 8: Map of farming systems zones of Pemba island

Source: GOZ (1994)

Table 12: The characteristics of Pemba farming systems zones and crops suitability

Zone	Type of Soils	Rainfall (mm/year)	Suitable crops
Zone 1	Coral rag type soils. with high sand content	900 – 1 100	Cassava. sweet potatoes. ground nuts. banana
Zone 2	Mostly sand soils	900 – 1 100	Cassava. rice. sweet potatoes. banana. coconuts. mangoes. pine apples. ground nuts. citrus. bread fruit
Zone 3	Sandy soils and heavy clay soils	1 600 – 1 900	Cassava. banana. rice. coco yams. sweet potatoes. cowpeas. fruits. cloves
Zone 4a	Coral rag with deeper clay soils	900 – 1 100	Cassava. millet. sorghum. banana. cowpeas. maize. bread fruit. pigeon peas. tomatoes. coconuts. mangoes
Zone 4b	Coral rag soils with deep clay soils	900 – 1 100	Cassava. banana. cowpeas. millet. maize. rice. tumeric. citrus. tomatoes. green gram. chillies.
Zone 5	Sandy loam soils. heavy clay soils	1 400 – 1 700	Cassava. banana. rice. cowpeas. tomatoes. groundnuts. mangoes. vegetables. citrus

Source: GOZ (1994)

Table 13: Current and potential productivity levels of major food crops in Zanzibar

Crops	Current productivity levels (kg/ha)	Potential Productivity levels (kg/ha)	Potential percent increase in productivity level
Banana	7 201	11 820	64
Paddy-upland	1 667	2 700	62
Paddy-irrigated	3 717	5 200	40
Vegetable (tomato)	1 918	2 970	55
Cassava	4 607	8 790	91
Sweet potatoes	4 560	7 360	61

Source: GOZ (2004)

Overall production of all major food crops have been fluctuating, showing no clear growth pattern, implying that macroeconomic reforms and the liberalization of agricultural and financial markets have had limited impact on the agricultural sector. There is also no evidence of positive impact of the policy of distribution of subsidized credit and production inputs in terms of increasing production and productivity. Fig. 9 shows the production trend of major food crops from 1995 to 2005.

3.2.6 Livestock keeping and production

Livestock production remains an important economic activity in Zanzibar. A majority of people in Zanzibar, particularly those who live in rural areas keep livestock. According to the International Fund for Agricultural Development (IFAD) Appraisal Report (2004), nearly half of the households in Zanzibar own livestock. About 88% of farm households keep chickens and about 11% keep goats.

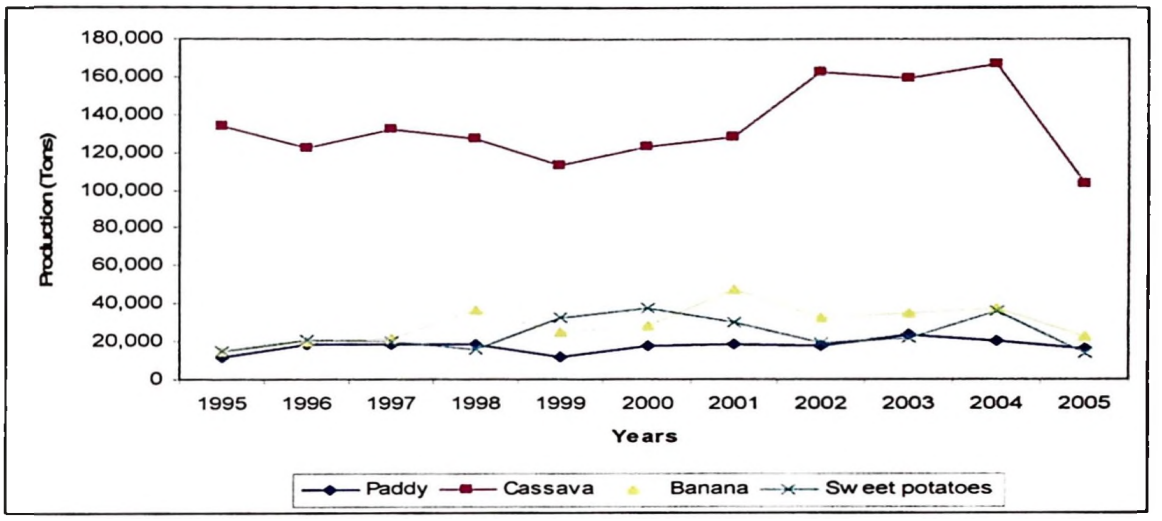

Figure 9: Production trend of major food crops from 1995 - 2005

According to Livestock Census of 2003, Zanzibar has an estimated number of cattle of 162 643 (of which 12 300 are hybrids for dairy production), 52 624 small ruminants (goats and sheep) and 1.1 million poultry. An estimated 33 239 households keep cattle (34% of agricultural households) while 70% keep chicken, and 10% keep small ruminants. Animal production is generally characterized by low levels of inputs use and hence low productivity (Mohamed and Temu, 2008a). According to the IFAD Appraisal Report (2004), Zanzibar is not self-sufficient in either milk or meat. However, production of milk has increased from 36 million litres in 1999 to 41.5 million litres in 2005. Average annual heads of cattle and goats slaughtered for urban markets averages 5000 and 4000, respectively. Average annual consumption rates of red meat and milk per capita is currently estimated at 3 – 4 kg and 11 litres, respectively. Fodder shortages and disease outbreaks are the major constraints to the development of livestock industry in Zanzibar. Table 14 shows the number of livestock in Zanzibar by type as obtained from the 2003 Livestock Census.

Apart from livestock keeping, smallholder farmers in the survey areas were also found to be engaged in fishing, petty trade, carpentry, masonry, lime making, charcoal making, firewood collection and offering casual labour. Relatively, few of the rural households are found engaged in permanent employment in government departments and in tourist hotels and restaurants.

Table 14: Total number of livestock in Zanzibar by type

Livestock type	Number	Households	Number per household
Cattle	162 643	33 239	5
Goats	52 324	9 315	6
Sheep	300	72	4
Pigs	535	54	10
Chickens	1 063 791	67 496	16
Ducks	53 571	2 917	18
Turkeys	841	117	7
Rabbits	1 231	130	9

Source: GOZ (2006c)

3.3 Data Needs and Sources

Data for the study were obtained from both primary as well as secondary sources. Secondary data were collected from various reports maintained by existing formal financial institutions including commercial banks, MFIs and SACCOS, while the primary data were collected from a survey of 750 smallholder farmers, carried out from May to June, 2006.

The main data sets collected from the sample survey include:

- Demographic data: age, sex, education, marital status, main farm occupation, main off-farm activity and years of experience in farming of the head of the household and household size.
- Household resource ownership: land, livestock, farm equipment
- Household heads financial practices: savings and credit access aspects, keeping financial records etc.
- Levels of agricultural technologies adoption for various households: An index of intensity of adoption.
- Access to extension services: An index on the intensity of extension contacts.

3.4 Data Collection Instruments

A structured questionnaire was used to collect primary data from smallholder farmers. The questionnaire was designed to capture both qualitative and quantitative data from the respondents. The questionnaire (Appendix 1) was made up of nine main sections. The first section was designed to collect household characteristics. The second section covered household composition, while the third section dealt with the type of farming activities and use of agricultural technologies. The information on record keeping was captured in section four of the questionnaire. Section five covered aspects of farm mechanization, while section six captured land issues. Section seven dealt with aspects related to the respondents' ownership of agricultural equipment. Information on institutional support covering aspects of access to basic agricultural services such as credit and extension is covered in section eight. The final section was designed to capture information about household head's income.

The collection of information from the key stakeholders, mainly the credit institutions was carried out through the use of a checklist of questions (Appendix 2). The data collected from these institutions include loan portfolio size, sector-wise allocation of loans and geographical coverage. Furthermore, information on lending conditions, loan application procedures and organization's own opinion regarding lending to smallholder farmers were also collected.

3.5 Sample Size and Sampling Procedure

Five out of 10 districts of Zanzibar were purposefully selected based on their agricultural potentials and presence of active credit operations. From each district, six shehias[1] were randomly picked. In selecting respondents, a stratified random sampling technique was employed. With the assistance of shehia leaders, lists of all units in the target population were first developed and later the population was stratified based on individual credit access status, gender and the level of farm technologies in use. In order to be able to establish the existence of inter-linkages between farming technologies adoption and access to credit it was found necessary to have a sample that contains a sufficient share of smallholder farmers who were credit constrained and those who were non-credit constrained and at the same time have smallholder farmers who were at different levels of adopting improved agricultural technologies. Therefore in drawing the sample for this study, special considerations were made to ensure a fair representation of the mentioned strata.

Credit schemes registers as well as knowledge and experience of extension agents and shehia leaders were used in the stratification process. Selection of respondents from these strata was done randomly by picking every fourth name in the lists. The target

[1] Shehia is the smallest administrative structure of the government in Zanzibar, normally it consists between two and three villages

was to interview at least ***20 respondents*** from each selected shehia. The aim of creating unique sub-sets of the population was to ensure each stratum was well represented in the study sample. Table 15 shows the proportion of sampled smallholder farmers in each district and shehia.

Table 15: Proportion of sampled smallholder farmers by district and shehia

District	Total shehia available	Sampled shehia	Total smallholder farmers in the sampled shehias	Total smallholder farmers sampled	Percentage of smallholder farmers sampled
Kati	38	6	1 625	60	3.7
Magharibi	29	6	5 168	180	3.5
Kaskazini "B"	23	6	2 817	100	3.5
Chake chake	19	6	5 769	200	3.5
Wete	18	6	6 120	210	3.4
Total	**127**	**30**	**21 499**	**750**	**3.5**

3.6 Survey Preparations

In preparing for the formal survey, a structured questionnaire was designed and a team of 15 enumerators was formed. As a requirement, the enumerators had to have at least a diploma in agriculture related disciplines and be familiar with the local environment. For the purpose of ensuring that the enumerators understand clearly the objectives of the study and be able to administer the questionnaire appropriately and efficiently, a two-day training of enumerators was organized, one day in each island (Unguja and Pemba). During the training, the team also had the opportunity to thoroughly discuss the questionnaire and in the process clarifications and some changes were made as

necessary. After the training the questionnaire pre-testing was conducted in five shehias of Unguja island, namely: Mnyimbi, Mwakaje, Kipange, Kikungwi and Umbuji. The pre-testing provided the enumerators with the opportunity to orient themselves with the art of interviewing and familiarize with the questionnaire before the actual survey. The observations during the pre-testing were also used to improve on the questionnaire.

3.7 Operationalization of the Fieldwork

The operationalization of the field work involved interviews and discussions with key informants and government officials in the study areas. The interviews and discussions were carried out by the researcher with the assistance of the trained enumerators. Prior to the day of starting interviews, the researcher and enumerators visited the shehias, and district offices to inform the relevant authorities about the purpose of the study. With the assistance of Village leaders/Sheha, appointments for meetings with the smallholder farmers were also made a day prior to the interviews.

During the day of interviews sheha with his/her assistants were asked to be around the village to assist enumerators to locate the respondents' residences and farm plots. All interviews with smallholder farmers were carried out on the farm sites to enable the enumerators to verify the reply given by the respondents. Before the start of interviews and discussions, the objectives of the study were explained to each respondent in order to create good understanding between the interviewer and interviewee. The respondents were interviewed once and their responses were recorded immediately. All interviews were conducted in Kiswahili, which is well understood by both enumerators and respondents. In the discussions with key informants, the researcher with the assistance of few enumerators used the checklists to obtain both qualitative and quantitative information. These discussions were held in the interviewees' offices.

3.8 Data Processing and Analysis

3.8.1 Data processing

Data from the study were first coded and later entered into the SPSS for windows version 11.5, cleaned by running frequencies of individual variables and later analyzed. Clean data were also exported to other software packages such as Micro Soft Excel, LIMDEP for windows (version 8) and Stata/SE for windows (version 10) for further analysis.

3.8.2 Data analysis

The descriptive statistics such as frequencies, cross-tabulations, means and correlation coefficients were used to profile respondents' characteristics, determine their financial practices with formal lenders as well as levels of adoption of improved agricultural technologies. Apart from the descriptive statistics, quantitative statistical analysis such as probit model, Heckman selection equation and reduced form switching regression model were used in order to reinforce the descriptive statistics and test the three hypotheses not validated by using the above descriptive statistical analysis. The detailed description of each hypothesis is given below:

(a) ***Hypothesis 1:*** *states that there is limited access to formal credit in rural Zanzibar and the financial system is biased against smallholder farmers who are relatively poor in the society.*

The PCA was used to assess outreach of existing formal financial institutions and test the above hypothesis. The methodological procedure of the construction of a Composite Indicator of Multidimensional Poverty adopted was the Principal Component based Factor Analysis in different stages. Firstly, Factor Analysis was used

for all selected variables to identify the significant factors (all with an eigen value [λ] greater than 1) and variance structure or covariance matrix (Σ). Secondly, using a covariance matrix, the original variables (X_i) were rescaled by dividing their respective standard deviation (δ_i) and assigned specified weights (ω_i) into the factor structure of the model using eigen values:

$$X^*_i = Xi/\delta_i \, \omega_i \quad \text{...(4)}$$

Where:

X^*_i = rescaled variable

ω_i = $1/\sqrt{\lambda_{1k}}$

(k = 1, 2 .... ρ)

Thirdly, Factor Analysis was used for rescaled variables and extracted factor scores. Finally, based on these factor scores and the relevant eigen values (all greater than 1) the factors were weighted and those weighted factor scores were used as the final measure of the composite indicator (De Silva *et al.*, 2000).

Based on the ultimate composite poverty indicator, all individuals were ranked in order to understand the poverty status of sampled households. The individuals/households with negative values on the composite indicator were identified as households with severe poverty. The negative values are the results of the lower values of the variables, representing low status of living standards. Thus individuals with negative values were divided into two equal groups: the individuals with high negative composite poverty indicator values were considered as more poor and the other with negative values as poor. The remaining households with positive indicator values represent the less poor

because the positive values, per se, indicate a fair standard of living (i.e relatively better welfare, housing and the right social affinity and networks).

Using the Chi-square test, between the variables household's poverty and formal credit access status, the hypothesis 1 would have been either accepted or rejected. The Chi-square test uses the cross tabulation procedure of which it creates a table of frequencies of data. The difference in these frequencies is how we determine whether a relationship is significant, whether or not it could have just "happened by chance" in the sample. A statistic known as Pearson's chi-square (X^2) provides the evidence for this. The formula for the chi-square is:

$$X^2 = \Sigma \text{ (observed frequency/expected frequency)}^2\text{/expected frequency} \ldots..(5)$$

Therefore, the technique is to square the difference in observed and expected frequencies and divide by the expected frequency and then add all these numbers together to get the total chi-square value.

(b) ***Hypothesis 2:*** *states that household socio-economic characteristics influence smallholder farmers' access to credit in the formal credit market.*

Probit regression model was employed to examine the influence of household socio-economic characteristics on access to formal credit. According to Gujarati (2004), probit model uses the normal Cummulative Distribution Function (CDF), which has been found very useful in analyzing dichotomous variables. In this model, the predicted probabilities for the dependent variable will never be less than (or equal to) zero, or greater than (or equal to) one, regardless of the values of the independent variables. Based on this reality, this study assumed that smallholder farmers was non-credit

constrained, if is able to borrow from formal financial institutions, although for a number of reasons may choose not to borrow. On the other side, a smallholder farmer is considered to be credit constrained if he/she is unable to borrow from formal financial institutions or cannot borrow as much as he/she wants. The dependent variable considered in the study therefore is binary in nature that is it can only have two possible values, one for the occurrence of an event, zero otherwise. In this case, the dependent (binary) variable is one for all smallholder farmers who are non-credit constrained and zero if otherwise. A mixture of continuous and categorical variables may therefore explain this dependent binary variable.

However, to overcome the problem of sample selectivity bias, the Heckman approach was employed. Heckman (1979) develops a simple two stages estimator to correct for the bias that results from using non-randomly selected samples to estimate behavioural relationships. This approach proposes the estimation of expected value of error and its inclusion as an extra explanatory variable in the regression (Green, 2000; Berndt, 1991; Kennedy, 1998; Maddala, 1992; Wooldridge, 2002). In other words, using a probit model coefficients are first estimated by maximum likelihood and having the estimates obtained for each observation they are passed to the second equation to be used as an exogenous variable. This allows the parameters in the second equation to be estimated consistently by least square regression (Radolfo and Kassouf, 2006). The theoretical exposition of the analytical model used in the analysis is as follows:

Consider the following equation, which causes sample selection.

$$C_i^* = \gamma' z_i + u_i \quad \text{.....(6)}$$

Where C_i^* is latent variable indicating whether a household is credit constrained or Not. and z_i is a vector of variables that affects C_i^* The variable C_i^* is not observed, but we observe if the individual has accessed formal credit or not, in that way that:

$$C_i = 1 \quad \text{if} \quad C_i^* > 0$$

and

$$C_i = 0 \quad \text{if} \quad C_i^* \leq 0$$

Let the Y_i represent the natural logarithm of the formal credit use intensity by each individual, assuming that:

$$Y_i = \beta' x_i + \varepsilon_i \quad \ldots\ldots(7)$$

Where x_i is the vector of variables determining the credit use intensity.

Assuming that u_i and ε_i have a bivariate normal distribution with zero means, standard deviation σ_u and σ_ε and correlation ρ, and that C_i and z_i are observed for a random sample of individuals, but Y_i is observed only when $C_i = 1$, i.e. when the individual has access to formal credit, then

$$E(Y_i \backslash C_i = 1) = E(Y_i \backslash C_i^* = >0) = E(Y_i \backslash u_i > -\gamma' z_i)$$

$$= \beta' x_i + E(\varepsilon_i \backslash u_i > -\gamma' z_i) = \beta' x_i + \rho\sigma_\varepsilon \lambda_i(\alpha_u) \quad \ldots\ldots(8)$$

Where

$$\lambda_i(\alpha_u) = \phi(\alpha_u) / 1 - \Phi(\alpha_u) = \phi(-\alpha_u) / \Phi(-\alpha_u) = \phi(\gamma' z_i / \sigma_u) / \Phi(\gamma' z_i / \sigma_u) \quad \ldots\ldots(9)$$

and ϕ and Φ are respectively, the normal density function and the normal distribution function. The function $\lambda_i(\alpha_u)$ is called the inverse of Mill's ratio.

Due to the correlation between x_i and $\lambda_i(\alpha_u)$, a least squares regression of Y_i on x_i, omitting the term in $\lambda_i(\alpha_u)$, would produce an inconsistent estimator of β. If the expected value of the error was known, it could be included in the regression as an extra explanatory variable, removing that part of the error correlated with the explanatory variables and avoiding inconsistency. The Heckman's procedure, in its first stage, consists of estimating the expected value of the error and, in its second stage, using it as an extra variable in the regression equation. In other words, using a probit model, parameters γ of the C_i equation are estimated by maximum likelihood. Having the estimates of γ, λ is obtained for each observation and used as an exogenous variable in the Y equation, allowing parameters β to be consistently estimated by least squares in the regression of Y_i on x and λ.

From the foregoing discussion, the general form of the determinants of access to formal credit was specified as in equation (10).

$$C_a = \beta_0 + \beta_1 EDUC + \beta_2 GEND + \beta_3 LSTOC + \beta_4 LEAD + \beta_5 AGE + \beta_6 BANS + \beta_7 ACRE + \beta_8 FREC + \beta_9 NCRE + \beta_{10} VASS + \beta_{11} ICOM + \beta_{12} EXTI + B_{13} TECH + \beta_{14} HHS + \epsilon_a \quad (10)$$

The explanatory variables included in the empirical model are categorized into three groups. These included physical capital-related variables, human-related variables and social capital-related variables. The detailed explanation of each category is given below.

(a) Physical capital-related variables	
Land holding size (ACRE)	The size of land or farm owned by the household is assumed to be a reflection of the relative wealthiness of the household. The bigger the farm the more the demand for capital to invest. Therefore, increasing the size of land owned increases the chances of being credit constrained. The coefficient of the regression analysis is expected to be negative.
Keeping livestock (LSTOC) (Yes = 1, No = 0)	In rural economy of Zanzibar livestock are used as a form of savings. The size of the livestock is also a reflection of relative wealthiness of the household. Keeping livestock is associated with high cost for feeding and treatment which poorer households can not afford. Therefore keeping livestock is used in this study as an indicator for accessing formal credit. The positive coefficient is expected, implying that those households which keep livestock (mainly cattle) have relatively higher probability of being non-credit constrained than those with no livestock.
Value of productive assets (VASS)	The value of productive assets owned by a household reflects the relative wealthiness of the household and is considered to have a significant effect on household head chances of being non-credit constrained. The more the value of the assets, the more wealthier the household is and hence the increased ability to access and bear the cost burden of the loan. The positive relationship between value of productive assets and the household credit access status is therefore expected.
Household cash income level (ICOM)	Income determines the purchasing power of the households, such that as household income increases, the ability of household to purchase the needed agricultural inputs also increases. Besides, increased income has the potential of increasing likelihood of accessing credit from formal credit markets in the sense that household credit worthiness in the eyes of formal lenders increases.
Number of times one has ever accessed formal credit (NCRE)	The number of times household head has accessed formal credit may also have significant effect on household credit access condition. The increase in the number of times a household head has obtained formal credit increases his or her chances of building up his/her capital base, and also makes one familiar with bank applications procedures and loan conditions. All these increase the level of household awareness on credit availability. This may also increase the household credit worthiness, hence the positive regression coefficient is expected.

Bank savings (Yes = 1, No = 0) (BANS)	Having bank account as captured by the dummy, variable, has the potential of improving the likelihood of the household head of being non-credit constrained. Having a bank account is regarded as important factor for establishing contacts with bank officials and for getting information on credit. Bank savings may also be used as security for loans and therefore may increase bank account holders their chances of accessing formal credit. It is for these reasons that the positive regression coefficient is expected.

(b) Human-related variables

School years of HH head (EDUC)	Better education is assumed to improve access to formal credit as awareness and loan application procedures demand certain degree of formal education. It is also expected that better educated households perform better in their investment activities. Thus better educated households are usually perceived as more creditworthy. On the other hand, however, it could also be assumed that better educated household may demands bigger loans which may not be available from the existing credit arrangements in the rural sector. Thus a priori sign of the coefficient is ambiguous.
Access to extension services (EXTI)	This variable can go in two directions. On the one hand, households who receive agricultural extension are likely to gain better access to improved knowledge and are thus able to increase their human capital. Through extension contacts, household may also establish a social network and this may help gain access to essential credit information. On the other hand, increased access to agricultural knowledge may create credit demands that could not be met by existing credit arrangements in the rural sector and hence may increase the probability of household being credit access constrained. With these two directions therefore, it is impossible to predict the sign of the coefficient a priori.
Household size (HHS)	The household size is an indicator used to capture the socio-economic status of the household. The bigger the household size, the lower the socio-economic status of the household. Households with lower socio-economic status are assumed to have less access to formal credit and the negative coefficient is expected.
Agricultural technology adoption (TECH)	The intensity of agricultural technology adoption was included in the model in order to explain the influence of the household level of agricultural technology adoption

	intensity on access to formal credit. The expectation is the positive relationship between the household agricultural technology adoption intensity and access to credit. The positive relationship is assumed due to the fact that adopting improved farming technologies has the potential of increasing household incomes through increased farm production and productivity. This may also enhance household ability to bear the cost of the loan and hence improves the likelihood of being non-credit constrained.
Keeping financial records (FREC) (Yes = 1, No = 0)	Mchujuko (1991) notes that one of the factors that inhibit small businesses to access formal credit is the inability of the owners to present to the lending agency full accounting record and other required documentation. Due to this factor, keeping financial record of the business is assumed to have an influence in accessing formal credit. Keeping financial records is also associated with the degree of literacy and numeracy of the owner of the business and all these have tendency of improving his/her chances of getting credit from formal credit markets. Therefore, it is expected that regression coefficient will be statistically significant and the sign of the coefficient will be positive
(c) Social capital-related variables	
Age of household head (years) (AGE)	This is also an important indicator for access to credit. It is assumed that older household head are less educated and are more risk averse, implying that they are not ready to enter into debt obligations. While on the other hand the younger household heads may be relatively better educated and more dynamic. Therefore the negative coefficient is expected, implying that the older the household head is the less his or her chances of being non-credit constrained.
Gender (Male = 1, Female = 0) (GEND)	The sex of the household head is also important factor for determining household head credit access constraint condition in the formal credit markets. In this study, it is assumed that female respondents have less access to formal credit than their male counterparts. In this case, the negative coefficient is expected.
Household head leadership role (Leader = 1, Otherwise = 0) (LEAD)	The indicator Leadership role is assumed to be an important factor for accessing formal credit. Being a leader in a community facilitate easy access to credit-related information and establishes the network with outside the boundaries of the community one is living in. Access to information and network established increases

	the probability of household head being non-credit constrained. Therefore the regression coefficient for household leadership role is expected to be positive.

In addition, the marginal concept was used to predict the effect of a change in an explanatory variable on the probability of a favourable attitude toward access to formal credit. For continuous variables, derivatives of the probability function were evaluated at the mean values of the independent variables. The marginal probability was calculated by multiplying the coefficient estimate β_i by the standard probability density function $n(Xi,\beta_i)$ of the probit model evaluated at the mean values of the explanatory variables. For categorical explanatory variables with a value of zero or one, the marginal probability was calculated as the difference arising from $n(Xi,\beta_i)$ for $Xi = 0$ and $Xi = 1$ for the discrete variable (Tambi *et al.*, 1999: Mazuze, 2004). The marginal probability was used to explain the likelihoods towards access to formal credit.

With the Heckman selection equation, same exogenous variables as in probit model were specified. This is so in order to be able to ascertain socio-economic factors that influence household credit use intensity. Therefore the dependent variable was the formal credit use intensity index which was developed from summing up selected indicators as attributes of sampled smallholder farmers in accessing the formal credit. The selected indicators were given weight as scores and later summed and averaged to give intensity scores (see Table 16).

Table 16: Indicators for formal credit use intensity (weighted)

Indicators	Total scores
Have you ever received formal credit (1 = Yes, 0 = No)	1
Source of credit (informal = 1, semi-formal = 2, formal = 3)	3
Form of credit (Kind = 1, cash = 2)	2
Number of times of getting formal credit (not more than twice = 1, more than twice = 2)	2
Average amount of credit received (less than Tshs 500,000 = 1, Tshs 500,000 – 1,000,000 = 2, Above Tshs 1,000,000 = 3)	3
Total Scores	11

The empirical model for Heckman selection equation was therefore specified as follows:

$$C_I = \beta_0 + \beta_1 EDUC + \beta_2 GEND + \beta_3 LSTOC + \beta_4 LEAD + \beta_5 AGE + \beta_6 BANS + \beta_7 ACRE + \beta_8 FREC + \beta_9 NCRE + \beta_{10} VASS + \beta_{11} ICOM + \beta_{12} EXTI + B_{13} TECH + \beta_{14} HHS + \epsilon_a \quad \ldots (11)$$

Where, C_I = formal credit use intensity index

Hypothesis 3: For the smallholder farmer to be able to adopt agricultural technologies he/she needs to be non-credit constrained in the formal credit market.

Switching regression model was used to assess the linkage between access to formal credit and the adoption of agricultural technologies. The switching regression model accounts for the fact that each household has a non-zero probability of being credit

constrained in each period that is probability varies depending on household characteristics, and that only one realization of these probabilities is observed in each period. Consistent estimate parameters can be obtained by following a two step Heckman procedure of estimating credit constraint equation as a Probit and estimating other two equations separately, while correcting for the selection bias by including the inverse Mills ratio from Probit as regressor in the two equations.

In this study, it is hypothesized that socio-economic factors have significant effects on a smallholder farmer's access to formal credit and these socio-economic characteristics influence the adoption of agriculture technologies differently between smallholder farmers with access to formal credit and those without access to formal credit. The analysis in this study was carried out at two levels. The first level was the determination of factors that influence smallholder farmers' access to formal credit. The second level was the isolation of factors that influence adoption of agricultural technologies among credit access constrained and non-credit access constrained smallholder farmers. The detailed description of the steps followed is as follows:

The probit regression was run to determine the socio-economic factors that influence farm households in the survey areas to access formal credit. In this case the model was specified as follows:

$$C^* = \gamma' Z_i + \varepsilon_i \quad \text{.....(12)}$$

In equation (12), C^* is dichotomous (1,0), indicating that whether observation "i", is credit constrained or not; Z_i represent a vector of explaining variables such as household socio-demographic characteristics, households characteristics and

institutional factors, "γ" is a vector of parameters; and "ε_i" is a random error term. Households are credit-constrained if the demand for credit exceeds the supply of credit, which means C*>0. These responses were used to define a criterion function which is an observable: dichotomous variable I, where

$$I = 1;\ iff\ I^* = \delta' Z_i + \varepsilon_i \geq 0 \quad \text{.....(13)}$$

$$I = 0;\ iff\ I^* = \delta' Z_i + \varepsilon_i \leq 0 \quad \text{.....(14)}$$

Where:

Z_i represents household socio-demographic characteristics, household characteristics and institutional factors that determine supply of credit

ε_i is a random error term with zero mean capturing stochastic factors affecting both the demand and supply of credit.

A probit maximum likelihood estimation is used to estimate the parameters δ in equation (13) and (14). It is assumed that var (ε_i) = 1 since δ is estimable only up to scale factor.

In order to determine factors that influence the adoption of farming technologies of the two groups of farmers, that is credit constrained and non-constrained households, the reduced form equations was used and the specification of the model was made as follows:

$$P_{ncc} = \beta_{1i}X_{1i} + \varepsilon_{1i}\ ;\ \text{iff I = 1} \quad \text{.....(15)}$$

$$P_{cc} = \beta_{2i}X_{2i} + \varepsilon_{2i}\ ;\ \text{iff I =0} \quad \text{.....(16)}$$

Where, variables P_{cc} and P_{ncc} represent the degree of adoption of farming technologies for the credit constrained and non-credit constrained households, respectively.

X_{1i} and X_{2i} are vectors of exogenous variables,

B_{1i} and β_{2i} are vectors of parameters, and

ε_{1i} and ε_{2i} random disturbance terms.

Maximizing the bivariate likelihood function for this model is feasible but time consuming (Maddala, 1994). According to Lee (1978), a two-stage estimation method is used to estimate the system in equation (13), (14), (15) and (16).

The conditional expected values of the error terms $\varepsilon_{1i,}$ and ε_{2i} are:

$$E(\varepsilon_{1i} \mid \varepsilon_i = \delta \dot{Z}_i) = E(\sigma 1_\varepsilon \varepsilon_i \mid \varepsilon_i = \delta \dot{Z}_i) = \sigma 1_\varepsilon \quad \varnothing(\delta \dot{Z}_i)/\varphi(\delta \dot{Z}_i) \quad \text{.....(17)}$$

$$E(\varepsilon_{2i} \mid \varepsilon_i = \delta \dot{Z}_i) = E(\sigma 2_\varepsilon \varepsilon_i \mid \varepsilon_i = \delta \dot{Z}_i) = \sigma 2_\varepsilon \quad \varnothing(\delta \dot{Z}_i)/ 1\text{-}\varphi(\delta \dot{Z}_i) \text{..... (18)}$$

where $\varnothing$ and φ are the probability density function and the cumulative distribution function of the standard normal distribution respectively. The ratio $\varphi/\varnothing$ evaluated at $\delta \dot{Z}_i$ for each I is the Inverse Mills Ratio (IMR). For convenience,

$\lambda_{1i} = \varnothing(\delta \dot{Z}_i)/\varphi(\delta \dot{Z}_i)$ is defined for constrained .....(19)

and

$\lambda_{1i} = \varnothing(\delta \dot{Z}_i)/[1\text{-}\varphi(\delta \dot{Z}_i)]$ for non-constrained..... (20)

These terms are included in the specification of equation (15) and (16):

$$P_{cc} = \beta_1 X_{1i} + \sigma_{1u}\lambda_{1i} + \varepsilon_{1i}; \text{ if } I = 1 \quad \ldots\ldots(21)$$

$$P_{ncc} = \beta_2 X_{2i} + \sigma_{2u}\lambda_{2i} + \varepsilon_{2i}; \text{ if } I = 0 \quad \ldots\ldots(22)$$

In order to be able to establish the household intensity of agricultural technologies adoption and the levels of adoption, three main farming activities of each surveyed smallholder farmer were identified and the recommended technologies for each activity listed. Since the agricultural technologies consists of two main components (hard and soft technological components), and because farmers in Zanzibar largely operate at small scale, the study focused only on the soft part of the technological components. Such technologies are the use of improved plant varieties and use of animals of good genetic potentials, use of recommended types of organic and inorganic fertilizers, use of irrigation for crops and pasture plots, use of pests and herbicides, use of mechanization for farm operations, use of improved storage facilities, engage in improved agro-processing, provision of supplementary feeds to livestock, and the use of veterinary and artificial insemination services.

The farming technology packages handbook from the Ministry of Agriculture, Livestock and Environment was used to identify available technologies for each farming enterprise. Based on these technological packages, the sampled smallholder farmers were assessed on their level of adoption for each activity and given scores. The scores were weighted and the weighted scores were summed up and averaged to determine the intensity of technology adoption as shown in Table 17.

Table 17: Indicators for agricultural technology adoption intensity (weighted)

Indicators	Total Scores
A. Crops	
Use of recommended varieties (Yes = 1, No = 0)	1
Use of correct plant spacing (Yes = = 1, No = 0)	1
Planting in time (Yes = 1, No = 0)	1
Weeding (as recommended = 1, not as recommended = 0)	1
Use of inorganic fertilizer (Yes = 1, No = 0)	1
Use of organic manure (Yes = 1, No = 0)	1
Methods of applying fertilizers (recommended = 1, Not as recommended = 0)	1
Pests and diseases control (None = 0, traditional = 1, recommended biological/chemical = 2)	2
Keeping financial records (Yes = 1, No =0)	1
Irrigating crops (Yes = 1, No = 0)	1
Irrigation method used (Bucket = 1, sprinkler = 2, Furrow = 3)	3
Use of improved storage (modern = 1, traditional = 0)	1
Processing (modern = 1, traditional = 0)	1
Practicing mechanized farming (Yes = 1, No =0)	1
Method of mechanization (mechanical = 2, animal = 1)	2
Sub-total	19
B. Livestock	
Types of animal breeds (Improved breeds = 1, local breeds = 0)	1
Raring systems (Intensive = 2, semi-intensive = 1, extensive = 0)	2
Provision of shelter (modern = 2, traditional = 1, none = 0)	2
Feeding (as recommended = 2, partially = 1, not as recommended = 0)	2
Control of parasites and diseases (as recommended = 2, partially = 1, not as recommended = 0)	2
Use of Artificial Insemination (Yes = 1, No = 0)	1
Keeping financial records (Yes = 1, No =0)	1
Use of improved storage (modern = 1, traditional = 0)	1
Processing (modern = 1, traditional = 0)	1
Practicing mechanized farming (Yes = 1, No =0)	1
Method of mechanization (mechanical = 2, animal = 1)	2
Sub-total	16
Total Score (Crops + Livestock)	**35**

From above discussion, the reduced forms regression model was specified as follows:

$$A_i = \beta_0 + \beta_1 EDUC + \beta_2 GEND + \beta_3 EXTI + \beta_4 ACRE + \beta_5 NCRE + \beta_6 HHS + \beta\text{-}LSTOC + \beta_8 VASS + \beta_9 ICOM + \beta_{10} FCUI + \beta_{11} AGE + \epsilon_i \quad \ldots\ldots (23)$$

Where A_i = intensity of adoption of agricultural technologies

Like in probit model, the explanatory variables included in the reduced forms regression model were categorized into three groups. These included physical capital-related variables, human-related variables and social capital-related variables. The detailed explanation of each category is given below.

(a) Physical capital-related variables	
Keeping livestock (LSTOC) (Yes = 1, No = 0)	Keeping livestock (mostly cattle) reflects the household socio-economic status. The more cattle that the household own, the higher its socio-economic status. Thus the variable livestock is assumed to positively influence the adoption of agricultural technologies. However, the influence may differ between credit constrained and non-credit constrained households. The expectation is keeping livestock may induce adoption of agricultural technologies for the non-credit constrained households.
Size of landholding (ACRE)	Under smallholder farming, landholding size could also be regarded as an important factor in influencing technology adoption. However, intensity of adoption is assumed to increase when the landholding size is relatively smaller. Hence, the expected coefficient carries the negative sign in both regimes (credit constrained and non-credit constrained) but significant for credit constrained households.
Value of productive assets (VASS)	The value of productive assets owned by a household reflects the relative wealth ness of the household and is considered to have a significant effect on the household chances to adopt agricultural technologies. The more the value of the assets, the more wealthier the household is and hence an increased ability to acquire and apply the recommended agricultural innovations. The positive relationship between value of productive assets and the household credit access status is therefore expected. However, it is assumed that increasing the value of productive assets may have an effect on agricultural technology adoption for the non-credit constrained households and not for credit constrained households.

Household income (ICOM)	It is widely believed that farmers are unable to apply recommended agricultural technologies because of lack of finance to purchase and apply the required technological inputs. It is therefore assumed that household income has a direct positive effect on the adoption of agricultural technologies for the non-credit constrained households and not for the credit constrained households. The positive and significant coefficient is expected
Number of times of access to formal credit (NCRE)	The number of times household head has accessed formal credit may also have a positive impact on household head farming technologies adoption. Lending procedures of most MFIs have adopted graduating mechanisms of which borrower starts with getting small loans and upon successful performance he/she can qualify for bigger successive loans. With this arrangement, as more loans are accessed, households' chances to adopt improved agricultural technologies also increase. The expectation is therefore to have positive coefficient. It is however assumed that increasing the number of loans that household gets can have an influence on technology adoption only to households who are credit constrained and not those who are non-credit constrained.
Formal credit use intensity (FCUI)	For farmers to adopt improved agricultural technologies, they require sufficient capital. Therefore increase in the intensity of use of formal credit has the potential of enhancing the adoption of agricultural technologies. However, the effect is more pronounced to the credit constrained smallholder farmers. Hence, the positive significant coefficient is expected in the credit constrained regime.
(b) Human-related variables	
School years of HH head (EDUC)	Formal education is assumed to be an important factor for the adoption of agricultural technologies. It is widely argued that understanding extension messages and applying the recommended technological packages require certain degree of formal education. However it is contended that for formal education to be effective in inducing adoption of agricultural technologies, a household head has to be non-credit constrained. With these assumptions, the expectation is to have a positive regression coefficient but becomes significant only for the non-credit constrained regime.

Extension contacts intensity (EXTI)	Access to agricultural extension services has the potential effect on technology adoption. Increase in extension contacts intensity also increases the rate of agricultural technology adoption. However, access to extension has an effect on technology adoption for the non-credit constrained households and not for the credit constrained households. Access to extension services has positive relationship with technology adoption: hence the positive coefficient is expected.
Household size (HHS)	The household size is an indicator used to capture the socio-economic status of the household. The bigger the household size, the lower the socio-economic status of the household. Households with lower socio-econmic status are assumed to have low adoption rate of agricultural technologies. This negative relationship is expected but the coefficient is statistically significant only for the non-credit constrained households. This is because credit constrained households lack adequate capital to adopt agricultural technologies regardless of the size of households.

(c) Social capital-related variables

Age of household head (AGE) (years)	This is also an important indicator for technology adoption. Older people tend to be more risk averse than the young people and therefore prefer to cling to their traditional ways of doing things. In contrary, young people are more dynamic and ready to innovate. This being the case age of the household can be considered as an important factor for technology adoption. However, for the young people to be able to adopt agricultural technologies he/she needs to be non-credit access constrained, while for credit access constrained, age may have no influence for technology adoption. The expected coefficient therefore is negative.
Gender (Male = 1, Female = 0) (GEND)	The sex of the household head is also important factor for technology adoption in smallholder agriculture. Female farmers are assumed to be relatively less endowed with resources (financial capital, productive assets and education) and therefore are disadvantaged when it comes to the adoption of technological packages. In that case, the negative coefficient is expected. However, the coefficient is expected to be statistically significant for the non-credit constrained households only.

From above discussion, diagnostic tests to examine the problems of autocorrelation, multicollinearity and heteroscedasticity were performed. Specifically, Durbin-Watson statistic test and the Maximum Likelihood Estimation (MLE) method were used to test the presence of the above stated problems. In most cases indicated the absence of these problems. Furthermore, the goodness-of-fit of the probit model was measured by the McFadden with likelihood ratio statistics as the basis of inference (Hawassi, 2006) with a chosen significance level of 10% probability level. Similarly the goodness-of-fit of the linear regression model was measured by adjusted R^2 (Maddala, 1988; Guajarati, 1988) with a chosen significance level of 5% confidence level. Inspection of the signs of the estimated parameters was made in order to confirm if they conform to the *apriori* expectation. The inspections were also made on the values of the standard errors of the variables included in the model and to check whether the empirical model was correctly predicted. On the basis of these criteria, the empirical models used in this study were found to be appropriate in determining the main factors that significantly influence access to formal credit and technology adoption between the regimes of households that is credit constrained and non-credit constrained.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter consists of six sections. Section two describes sampled smallholder farmers in terms of demographic and socio-economic characteristics and the relationship between households' characteristics and access to credit. The financial practices of sampled smallholder farmers by access to credit is given in section three, while section four discusses the results from the analysis of sampled smallholder farmers access to formal credit and the outreach of existing formal financial institutions. In section five, the results from the analysis of factors influencing smallholder farmers' access to formal credit is given and discussed. This chapter concludes by analyzing and discussing factors that influence smallholder farmers' intensity of adoption of agricultural technologies, differentiated by access to credit.

4.2 Characteristics of Sampled Smallholder Farmers by Access to Credit

The characteristics of sampled smallholder farmers by access to credit are grouped into two categories namely, socio-demographic, economic and institutional characteristics. Table 18 shows socio-demographic characteristics of sampled smallholder farmers. The results in the table suggest that the average family size of the sampled smallholder farmer is 7 persons. This is the same for credit constrained and non-credit constrained smallholder farmers. The average age of sampled smallholder farmers is 48 years. Again, this is the same for credit constrained and non-credit constrained smallholder farmers. The average number of years of formal schooling for the whole sample is 6 years.

Non-credit constrained smallholder farmers had on average two years more of formal schooling than the credit constrained smallholder farmers.

The average value of productive assets owned by the sampled smallholder farmers is TShs 701 694. The non-credit constrained smallholder farmers on average had productive assets valued three times more than that of credit constrained smallholder farmers. The average total income of the sampled smallholder farmers is Tshs 1.0 million, while the average annual income of non-credit constrained smallholder farmers is two times more than the average annual income of credit constrained smallholder farmers. The extension contacts intensity index was greater for the non-credit constrained smallholder farmers than for credit constrained smallholder farmers (0.5 versus 0.3). Likewise, the agricultural technology adoption intensity index of non-credit constrained smallholder farmers was greater than that of credit constrained smallholder farmers (0.5 versus 0.3).

Further analysis was also carried out to examine the effect of socio-economic characteristics of sampled smallholder farmers on access to formal credit. The results are presented in Table 19. From the table, it can be seen that majority of sampled smallholder farmers were between the age of 31 and 60 years, implying that the sampled smallholder farmers fall in the most economically active age group. From the same table, it appears that the proportion of credit constrained smallholder farmers who were at the age of less than 30 years was three times smaller than the proportion of those credit constrained smallholder farmers who were at the age of 31 – 60 years. Likewise, the proportion of non-credit constrained smallholder farmers who were at the age of less than 30 years were four times smaller than that of non-credit constrained smallholder farmers who were at the age of 31 – 60 years.

Table 18: Socio-economic characteristics of sampled smallholder farmers by access to formal credit

Variable	Credit constrained (N = 587)	Non-credit constrained (N = 163)	Total sample (N = 750)
Age of head of household (years)	48.0	48.0	48.0
Family size	7.0	7.0	7.0
Formal education of the head of household (years)	6.0	8.0	6.0
Value of productive assets owned (Tshs)	494 853.0	1 446 576.0	701 694.0
Size of land owned (acres)	2.9	3.2	3.0
Household total annual income (Tshs)	802 660.0	1 605 000.0	1 048 192.0
Extension contacts intensity index	0.3	0.5	0.4
Agricultural technology adoption intensity index	0.3	0.5	0.3

These results imply that age of smallholder farmers is an important determinant for access to credit in the formal credit market. However, there were significant differences between the age of credit constrained and non-credit constrained smallholder farmers. The Chi-square test confirms the existence of statistically significant differences between age of sampled smallholder farmers and credit access status ($P<0.05$). This finding does not support the hypothesis which states that there is no statistical difference between age of smallholder farmer and credit access status in the formal credit market. Similar notion is supported by Okurut (2006), Mohamed (2003),

Freeman *et al.* (2003) and Zeller (1994). Fig. 10 illustrates the differences between credit constrained and non-credit constrained smallholder farmers with respect to age[2].

Table 19: The proportion of sampled smallholder farmers by socio-economic characteristics and access to formal credit

Socio-demographic characteristics	Responses		
	Credit access constrained	Non-credit access constrained	Total
Age of the household head			
18 – 30 years	11(64)	4(7)	10(71)
31 – 45 years	38(223)	41(67)	39(290)
46 – 60 years	35(207)	41(67)	36(274)
Above 60 years	16(93)	14(22)	15(115)
Total	100(587)	100(163)	100(750)
	Chi-Square (χ^2) 7.854 df 3 P value 0.049		
Household size			
1 – 4 people	22(131)	17(28)	21(159)
5 – 9 people	63(370)	68(111)	64(481)
10 and above	15(86)	15(24)	15(110)
Total	100(587)	100(163)	100(750)
	Chi-Square (χ^2) 2.100 df 2 P value 0.350		
Level of formal education			
No formal education	30(177)	15(24)	27(201)
Primary education	45(262)	31(51)	42(313)
Secondary education	23(133)	48(78)	28(211)
Tertiary education	2(15)	6(10)	3(25)
Total	100(587)	100(163)	100(750)
	Chi-Square (χ^2) 50.467 df 3 P value 0.000		
Gender			
Female	23(132)	17(27)	21(159)
Male	77(455)	83(136)	79(591)
Total	100(587)	100(163)	100(750)
	Chi-Square (χ^2) 2.679 df 1 P value 0.061		

Figures in parenthese are frequencies

[2] The box plot diagram is interpreted as follows: For each box, 50 percent of cases have values within the box and the solid horizontal line inside it is the median. The length of the box is the interquartile range and the lower boundary (resp. upper boundary) of the box is the 25th (resp. 75th) percentile. The circles are outliers and extreme values.

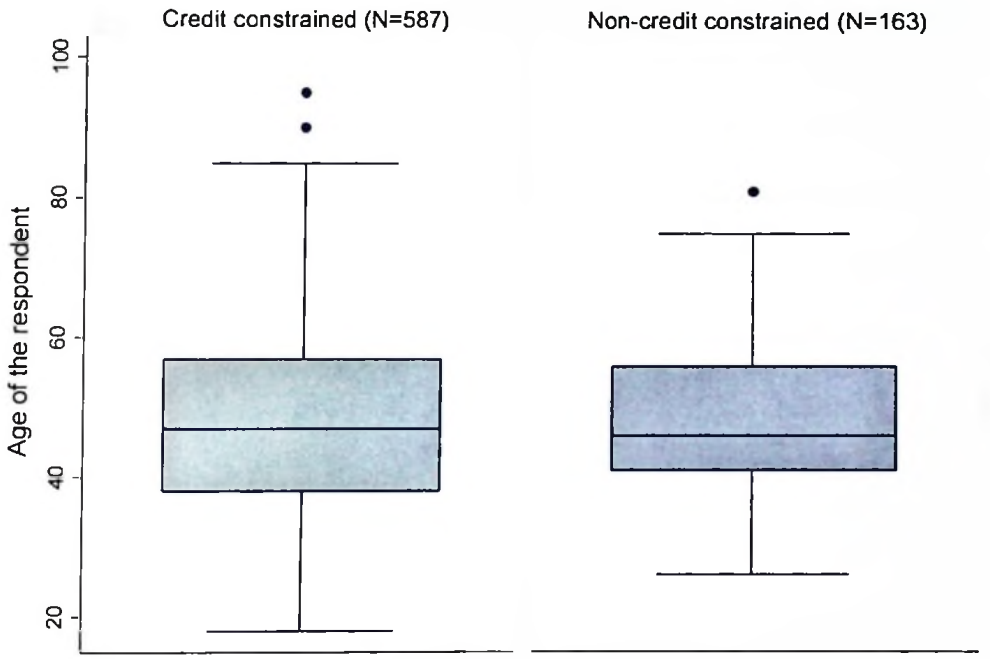

Figure 10: Age of smallholder farmer by access to formal credit

According to Table 19, the majority of smallholder farmers in both regimes (constrained and non-constrained) had the household size which range between 5 and 9 people. Relatively, few smallholder farmers in both categories have household size of 10 people and above. The proportion of credit constrained smallholder farmers who had a household size of less than 5 people were significantly smaller than that of smallholder farmers with household size of between 5 and 9 people and was slightly larger than that of smallholder farmers who had household size of 10 people and above. This trend is the same for the non-credit constrained smallholder farmers. As indicated in the same table, the difference in household size between credit constrained and non-credit constrained smallholder farmers is not statistically significant and therefore supporting the hypothesis which states that there is no statistical difference between household size and access to formal credit. However, similar studies done in other developing countries show mixed results. While Bee (2007), and Freeman *et al.* (2003)

support the former notion, Vaessen (2001) and Nuryartono *et al.* (2005) had the opposite notion that family size is an important factor for influencing smallholder farmer credit access in the formal credit market. The explanation that can be given for this finding is that most rural households have large families regardless of their credit access status. Though with large families households tend to experience high dependence ratios which create higher demands for money, but much of their demands are covered through self-financing rather than depending on credit. Fig. 11 clearly illustrates these findings[3].

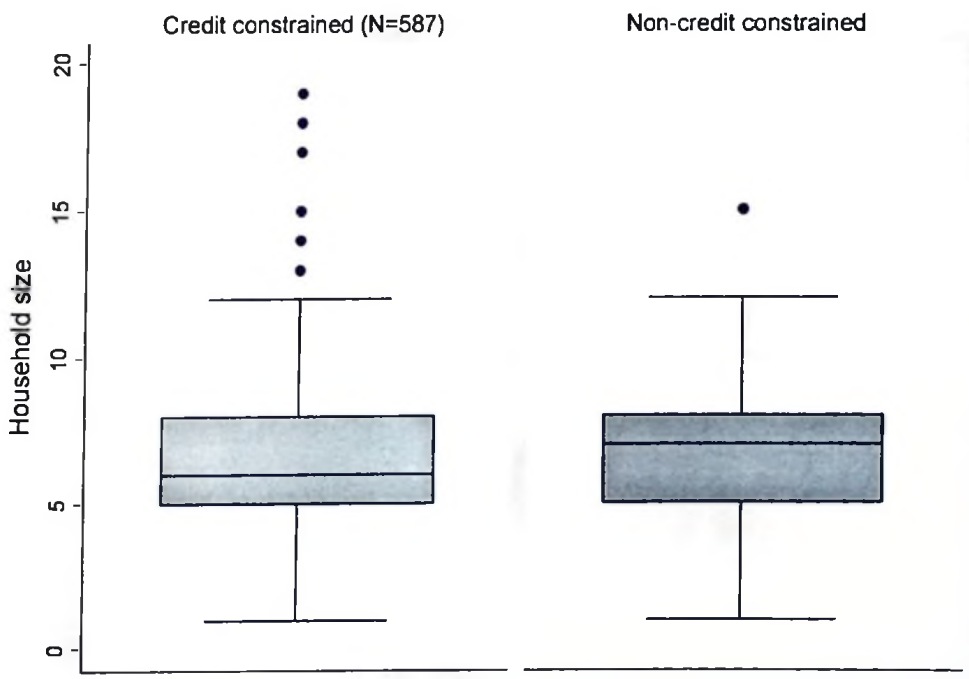

Figure 11: Household size by access to formal credit

Furthermore, the results in Table 19 show that the majority of sampled smallholder farmers had only attained primary level of formal education, indicating having some writing and numeracy skills, while relatively few smallholder farmers had attained post

[3] Same notes as in footnote 2

secondary education. As it can be seen in the same table the proportion of credit constrained smallholder farmers who had no formal education is fifteen times larger than that of credit constrained smallholder farmers who had attained tertiary education. Similarly, the proportion of credit constrained smallholder farmers who attained primary level of education was two times larger than those who had attained secondary level of education. For non-credit constrained smallholder farmers, the proportion of those who had no formal education was two times smaller than of those who had attained primary level of formal education and three times smaller than of those who attained secondary level of formal education. The results in the same table also indicate that there is a significant difference between level of formal education of smallholder farmer and access to credit. Chi-square test confirms the existence of statistical significant differences between smallholder farmer level of formal education and access to credit ($P<0.01$). These findings imply that formal education is important for a smallholder to access credit in formal credit market. With formal education, smallholder farmer can become more aware of the availability of credit and easily follow the loan application procedures and conditions. This finding is in line with the results obtained by Nuryartono (2005), Mohamed (2003), Diagne and Zeller (2001), Vaessen (2001), Otero and Downing (1989), Kashuliza *et al.* (1998), and Maumbe (1993). Fig. 12 illustrates the differences in education levels between credit constrained and non-credit constrained smallholder farmers[4].

Table 19 also shows the relationship between sex of the smallholder farmer and access to credit.

[4] Same notes as in footnote 2

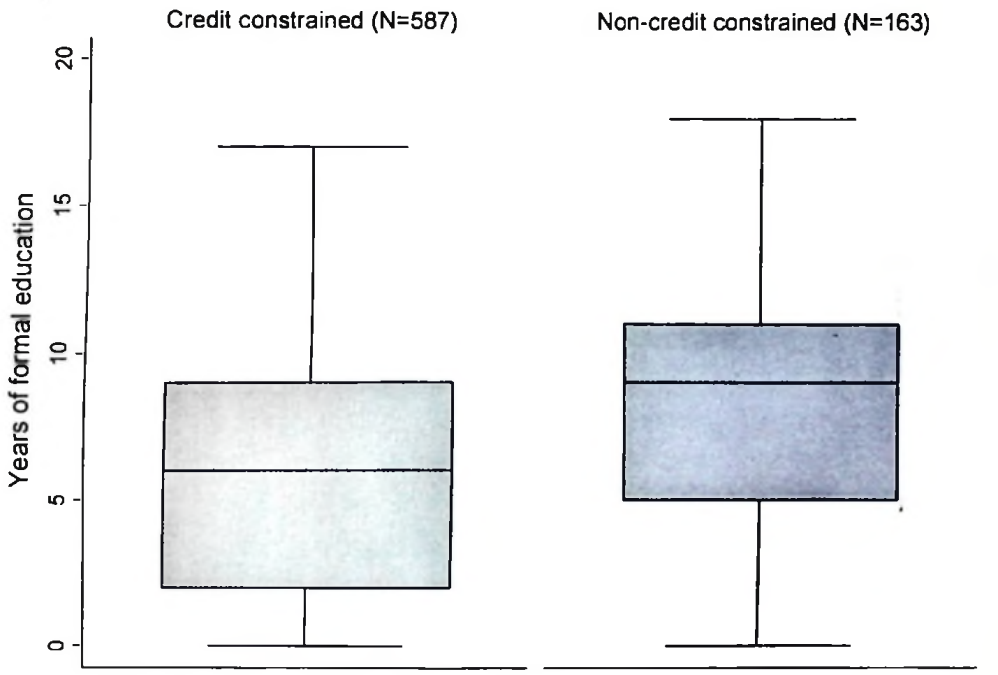

Figure 12: Smallholder farmers' level of formal education by access to formal credit

As it can be seen in Table 19, the proportion of credit constrained smallholder farmers who were males were four times larger than that of female respondents, while for the non-credit constrained smallholder farmers, the proportion of male respondents were five times larger than their female counterparts. The Chi-square test shows the existence of statistically significant differences between sex of the respondents and access to credit ($P<0.1$). These results are in conformity with the findings obtained by Mohamed (2003), Kashuliza *at el.* (1998), McKee (1989) and Tibaijuka *et al.* (1989). Fig. 13 illustrates the differences in proportion of sampled households by access to credit and gender[5].

[5] Same notes as in footnote 2

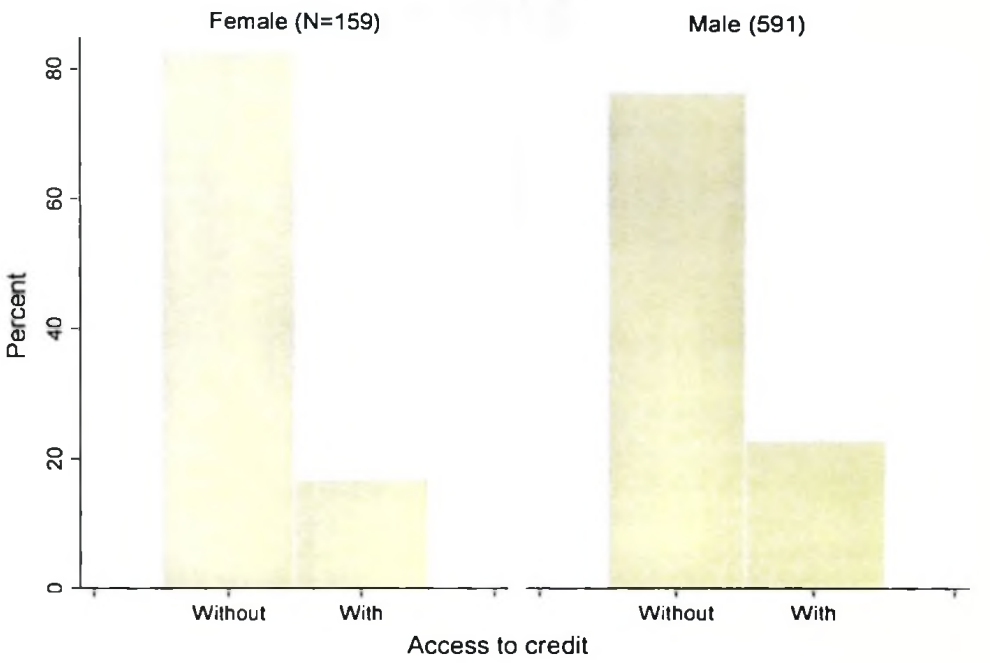

Figure 13: Proportion of sampled smallholder farmers by access to formal credit and gender

Further analysis was done to examine the relationship between economic and institutional characteristics and access to formal credit. The results are given in Table 20. With regard to landholdings size, results in Table 20 suggest that majority of sampled smallholder farmers operate on landholding of less than four (4) acres. However, there is marked difference in the proportion of credit constrained and non-credit constrained smallholder farmers who own landholding size of above 6 acres (see Table 20). Non-credit constrained smallholder farmers are two times more likely than credit constrained smallholder farmers to own land larger than 6 acres. These findings imply that in a situation of land scarcity like in Zanzibar having relatively large landholding size, smallholder farmers need to be non-credit constrained. Similar findings were obtained in research conducted by Freeman *et al.* (2003) and Maumbe

(1993). The difference in landholding size between credit constrained and non-credit constrained smallholder farmers is therefore statistically significant. Chi-square test confirms the existence of statistical difference between landholding size and access to credit ($P<0.05$). Fig. 14 illustrates the differences in landholding size between credit constrained and non-credit constrained smallholder farmers[6].

Apart from total landholding size, results in Table 20 also suggest that relatively large proportion of credit constrained smallholder farmers owned productive assets of value less than Tshs 500 000. The converse holds true for the case of non-credit constrained smallholder farmers. As can be seen in the table that non-credit constrained smallholder farmers were three times more likely than credit constrained smallholder farmers to own productive assets of value of above Tshs 1.5 million. The relationship between the value of productive assets and access to formal credit is statistically significant ($P<0.01$). The Chi-square test confirms the existence of this relationship. These findings imply that increase in the value of productive assets increases the probability of smallholder farmers to become non-credit constrained in the formal credit market. Similar findings were reported by Ibrahim *et al.* (2006). Fig. 15 illustrates the difference between value of productive assets and access to credit[7].

[6] Same notes as in footnote 2

[7] Same notes as in footnote 2

Table 20: Smallholder farmers reported economic and institutional characteristics by access to formal credit (%)

Economic and institutional characteristics	Responses		
	Credit access constrained	Non-credit access constrained	Total
Total landholding size (acres)			
Less than 4 acres	73 (430)	72 (118)	73 (548)
4 – 6 acres	21 (123)	16 (26)	10 (149)
Above 6 acres	6 (34)	12 (19)	7 (53)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 7.829 df 2 P value 0.020			
Value of productive assets			
Less than Tshs 500.000	67(395)	13(21)	56(416)
Tshs 500,000 – 1,000,000	18(106)	29(47)	20(153)
Tshs 1,000,001 – 1,500,000	7(42)	24(40)	11(82)
Above Tshs 1,500,000	8(44)	34(55)	13(99)
Total	100(750)	100(163)	100(750)
Chi-Square (χ^2) 177.193 df 3 P value 0.000			
Keeping livestock			
Keep livestock	47(273)	55(90)	48(363)
Do not keep livestock	53(314)	45(73)	52(387)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 3.873 df 1 P value 0.030			
Total income			
Less than Tshs 500.000	48(283)	3(5)	38(288)
Tshs 500,000 – 1,000,000	27(159)	19(30)	25(189)
Tshs 1,000,001 – 1,500,000	12(72)	36(59)	18(131)
Above Tshs 1,500,000	12(73)	42(69)	19(142)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 173.569 df 3 P value 0.000			
Intensity of extension contacts			
Low	65(384)	29(48)	58(432)
Medium	28(165)	43(70)	31(235)
High	7(38)	28(45)	11(83)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 89.105 df 2 P value 0.000			
Technology adoption intensity			
Low	65(381)	12(19)	53(400)
Medium	34(199)	75(122)	43(321)
High	1(7)	13(22)	4(29)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 167.751 df 2 P value 0.000			
Main type of farming activity			
Food crops	83(487)	64(105)	79(592)
Dairy farming	5(28)	5(9)	5(37)
Vegetables	5(28)	6(9)	5(37)
Tree crops	6(35)	21(34)	9(69)
Poultry keeping	1(9)	4(6)	2(15)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 39.565 df 4 P value 0.000			

Figures in parenthese are frequencies

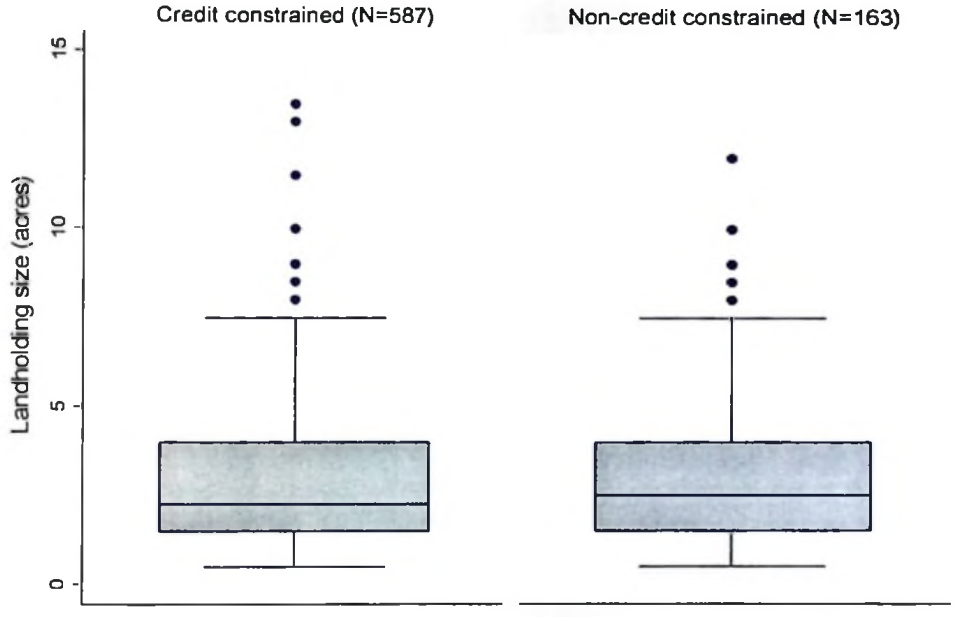

Figure 14: Landholding size of sampled smallholder farmer by access to formal credit

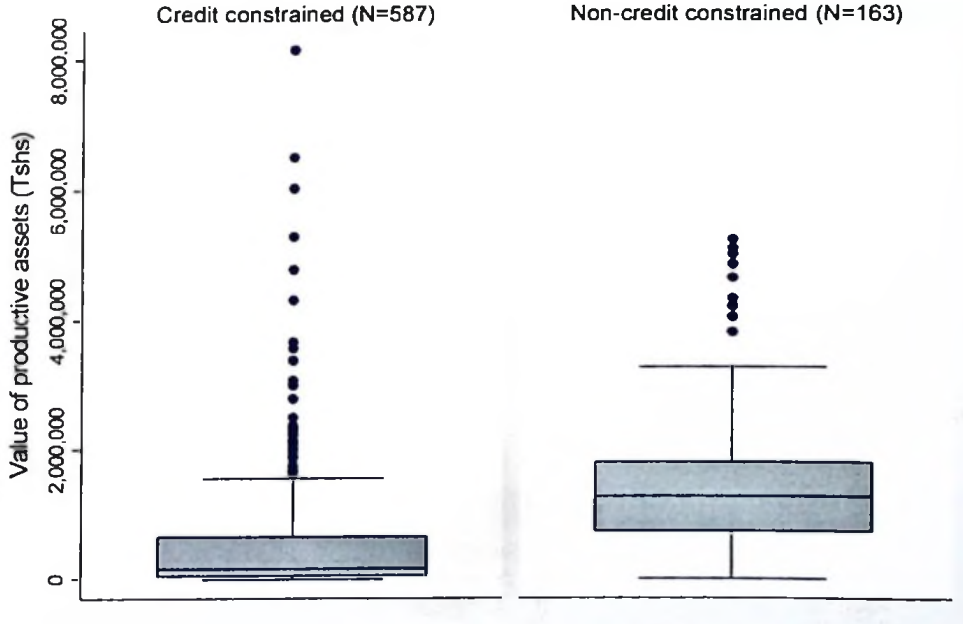

Figure 15: The value of productive assets owned by sampled smallholder farmers by access to formal credit

It is indicated in Table 20 that nearly half of the sampled smallholder farmers were found to keep livestock. However, the proportion of non-credit constrained smallholder farmers who reported to own livestock (mainly cattle) was slightly larger than that of non-credit constrained smallholder farmers who do not keep livestock. The reverse holds true for the case of credit constrained households, whereby the proportion of credit constrained households who do not keep livestock is slightly larger than that of credit constrained households who keep livestock. The Chi-square test confirms the existence of the statistical relationship between having livestock and access to formal credit ($P<0.05$). Fig. 16 illustrates the differences in the proportion of smallholder farmers who keep livestock by their status of access to credit in the formal financial market.

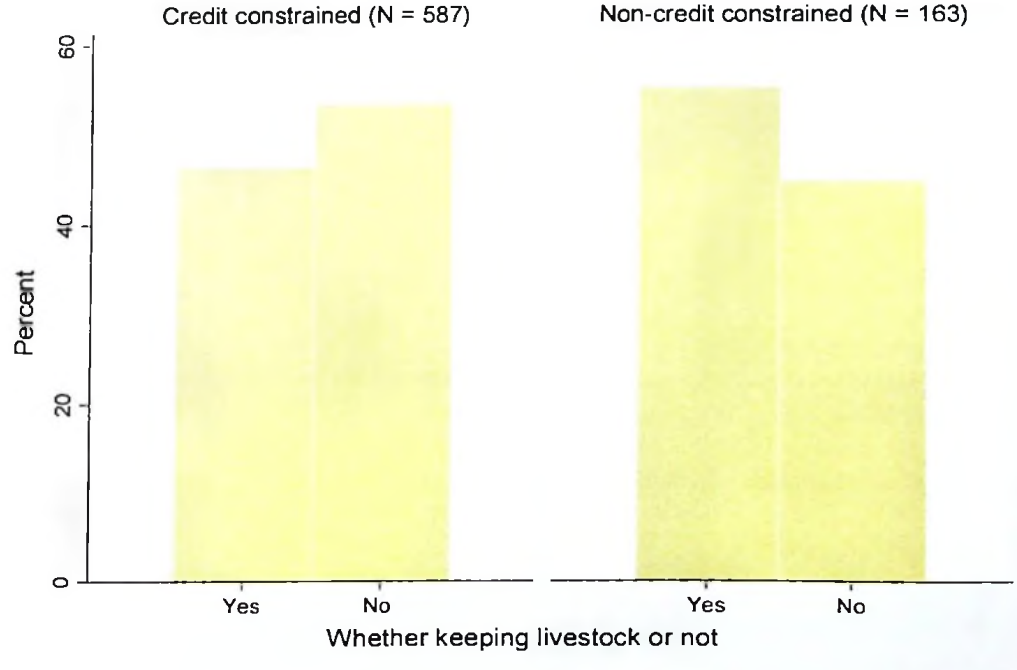

Figure 16: The proportion of sampled smallholder farmers who keep livestock by access to formal credit

Results in Table 20 also suggest that, relatively large proportion of credit constrained smallholder farmers had an average annual income of less than Tshs 500 000. The converse holds true for the case of non-credit constrained smallholder farmers. As can be seen in the same table, non-credit constrained smallholder farmers were almost four times more likely than credit constrained smallholder farmers to have an income of above Tshs 1.5 million. The relationship between annual household income and access to formal credit is statistically significant ($P<0.01$). The Chi-square test confirms the existence of this relationship. These findings imply that increase in the level of income increases the probability of smallholder farmer to become non-credit constrained in the formal credit market. However, it is also argued that access to credit has the potential of increasing income of households. These two variables have therefore two directional relationships and may have causality problems. Similar findings were obtained by Nuryartono *et al.* (2005), Mohamed (2003), and Maumbe (1993). Fig. 17 illustrates the difference in income levels between credit constrained and non-credit constrained smallholder farmers[8].

Regarding access to agricultural extension services, the majority of sampled smallholder farmers (58%) were found to have low intensity of extension contacts. The proportion of credit constrained smallholder farmers who had low intensity of extension contacts was significantly larger than that of non-credit constrained smallholder farmers. The converse holds true for the case of non-credit constrained smallholder farmers. As it can be seen in Table 20 the non-credit constrained smallholder farmers were four times more likely than credit constrained smallholder farmers to have relatively high intensity of extension contacts.

[8] Same notes as in footnote 2

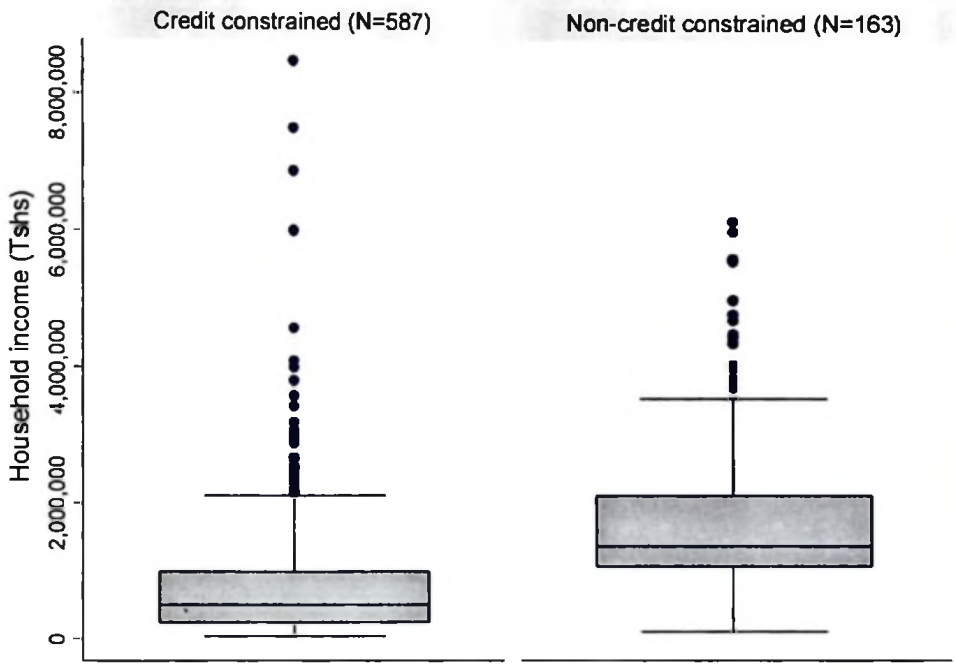

Figure 17: Household annual total income level by access to formal credit

The Chi-square test confirms the existence of significant statistical difference between credit constrained and non-credit constrained smallholder farmers with respect to agricultural extension contacts intensity ($P<0.01$). This finding implies that extension contact is an important factor for determining credit constraint condition of smallholder farmers. Fig. 18 illustrates the differences in extension contacts intensity between credit constrained and non-credit constrained smallholder farmers[9].

[9] Same notes as in footnote 2

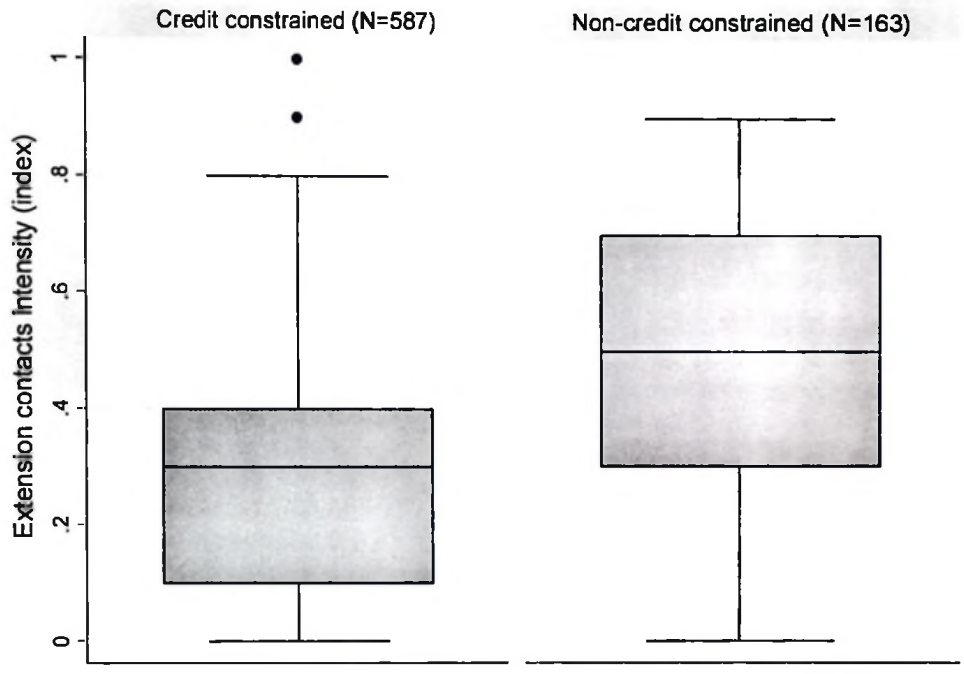

Figure 18: The degree of smallholder farmer intensity of extension contacts by access to formal credit

The results in Table 20 further suggest the existence of marked difference in the intensity of adoption of agricultural technologies between credit constrained and non-credit constrained smallholder farmers. Relatively large proportion of credit constrained smallholder farmers operated at low intensity of adoption of agricultural technologies. The opposite is true for the case of non-credit constrained smallholder farmers. As indicated in Table 20, non-credit constrained smallholder farmers were 13 times more likely than credit constrained smallholder farmers to be operating at relatively high intensity of adoption of agricultural technologies. The Chi-square test confirms the existence of significant difference between credit constrained and non-credit constrained households with respect to the intensity of adoption of agricultural technologies ($P<0.01$). This finding implies that increase in the intensity of adoption of agricultural technologies increase the probability of smallholder farmer to access

formal credit. Fig. 19 illustrates the association between levels of agricultural technology adoption and access to credit[10].

With respect to type of main farming activity, the results in Table 20 show five main farming occupational categories into which smallholder farmers were grouped. These categories are: food crops farming, vegetable production, tree crops, dairy farming and poultry keeping. With these categories, it was found out that smallholder farmers were simultaneously engaged in two or three main occupations in varying degrees. However, the greatest proportion (79%) of sampled smallholder farmers were found to be engaged in food crops farming as their main occupational activity, while the remaining smallholder farmers, were engaged in dairy farming (9%), vegetable production (5%), tree crops farming (5%) and poultry keeping (2%) as their main occupational activities.

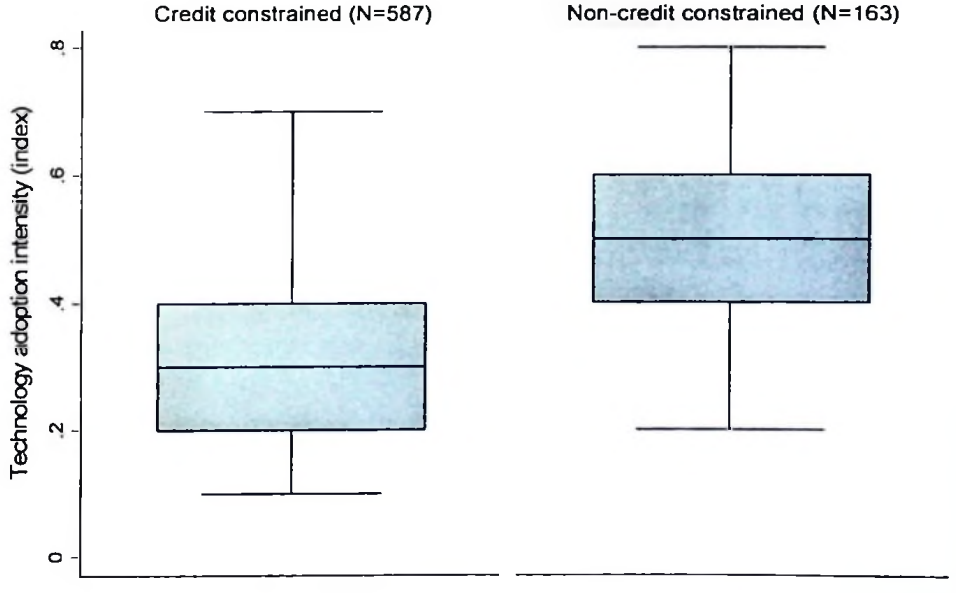

Figure 19: The degree of smallholder farmer intensity of adoption of agricultural technologies by access to formal credit

[10] Same notes as in footnote 2

The results in Table 20 suggest that the proportion of credit constrained smallholder farmers who were engaged in food crops as their main farming activity was relatively larger than that of non-credit constrained smallholder farmers. While on the other hand, the proportion of non-credit constrained smallholder farmers who reported to be engaged in tree crops cultivation is three times larger than that of credit constrained smallholder farmers. Likewise, the proportion of non-credit constrained smallholder farmers who were engaged in poultry keeping was four times larger than that of credit constrained smallholder farmers. The Chi-square test confirms the existence of the statistically significant relationship between main type of farming activity and access to formal credit. These findings imply that type of main farming activity that smallholder farmers are engaged with matters when it comes to their probability of having access to credit in the formal credit market. The finding shows that tree crops cultivation and keeping poultry increase the probability of smallholder farmers to access formal credit. Fig. 20 illustrates the differences in the proportion of sampled smallholder farmers by type of main farming activity and access to credit.

4.3 Financial Practices of Sampled Smallholder Farmers by Access to Credit

Smallholder farmers' financial practices were also related with access to formal credit and the results are presented in Table 21. The results in the table suggest the existence of significant relationship between number of times one has ever accessed formal credit and access to credit. As it can be seen in Table 21, the proportion of credit constrained smallholder farmers who had accessed formal credit at least twice is slightly higher compared to that of non-credit constrained smallholder farmers. In contrary, the proportion of non-credit constrained smallholder farmers who indicated to have accessed formal credit more than two times is four times higher than that of credit constrained smallholder farmers.

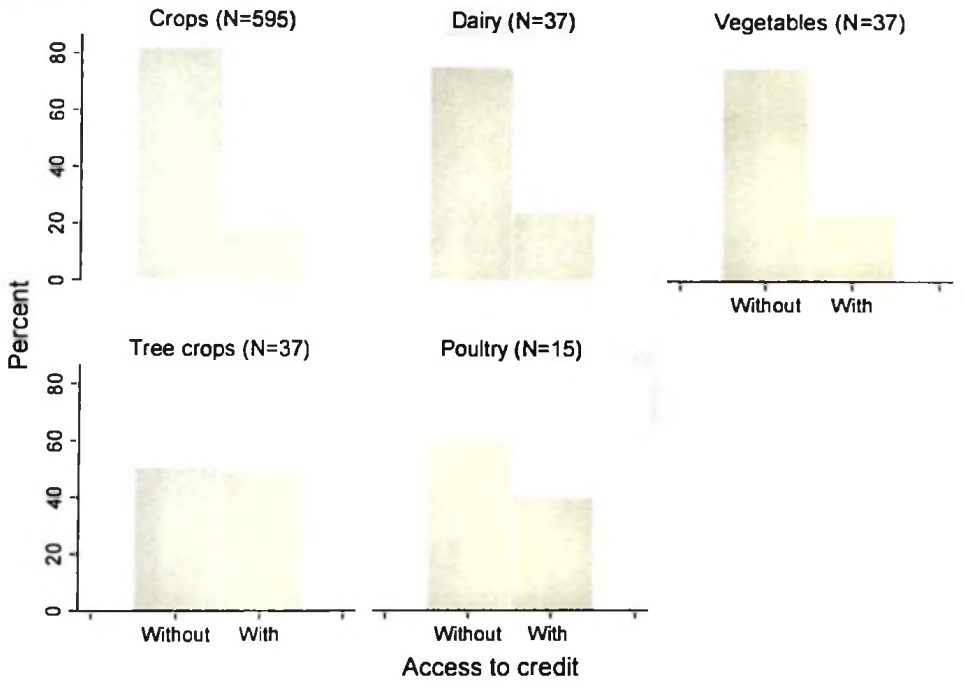

Figure 20: The proportion of sampled smallholder farmers by type of main farming activity and access to formal credit

The Chi-square test confirms the existence of statistically significant relationship between number of times one has ever accessed formal credit and access to formal credit ($P<0.05$). This finding implies that the increase in the number of loans that a farmer receives has a tendency of increasing his/her probability of having access to credit in the formal credit market. Fig. 21 illustrates the relationship between access to credit and number of times one has ever accessed credit.

Furthermore, results in Table 21 indicate that only 16% of the sampled smallholder farmers had bank accounts. However, there is marked difference between credit constrained smallholder farmers and non-credit constrained smallholder farmers in respect to having a bank account. The proportion of non-credit constrained smallholder farmers with bank accounts is five times higher than that of credit constrained

smallholder farmers. Also among the credit constrained smallholder farmers, the proportion of those with no bank accounts is 10 times larger than those with bank accounts. In contrary, among the non-credit constrained smallholder farmers, there is no significant difference in the proportion between those with bank accounts and those without bank accounts. The results from the Chi-square test confirm the existence of statistical significant relationship between having a bank account and access to credit.

Table 21: Sampled smallholder farmers' financial practices by access to formal credit

Variable	Household credit access status		
	Credit access constrained	Non-credit access constrained	Total
Number of times household head has ever accessed formal credit			
Not more than two times	95(21)	80(130)	82(151)
More than two times	5(1)	20(33)	18(34)
Total	100(22)	100(163)	100(185)
Chi-Square (χ^2) 3.185 df 2 P value 0.057			
Having a bank account			
No bank account	91(535)	56(91)	84(626)
With bank account	9(52)	44(72)	16(124)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 115.283 df 1 P value 0.000			
Keeping financial records			
Do not keep financial records	92(542)	69(112)	87(654)
Keep financial records	8(45)	31(51)	13(96)
Total	100(587)	100(163)	100(750)
Chi-Square (χ^2) 63.779 df 1 P value 0.000			

Figures in parentheses are frequencies

This finding implies that having a bank account increases the probability of smallholder farmers to access credit in the formal credit market. Fig. 22 illustrates the relationship between having a bank account and access to credit.

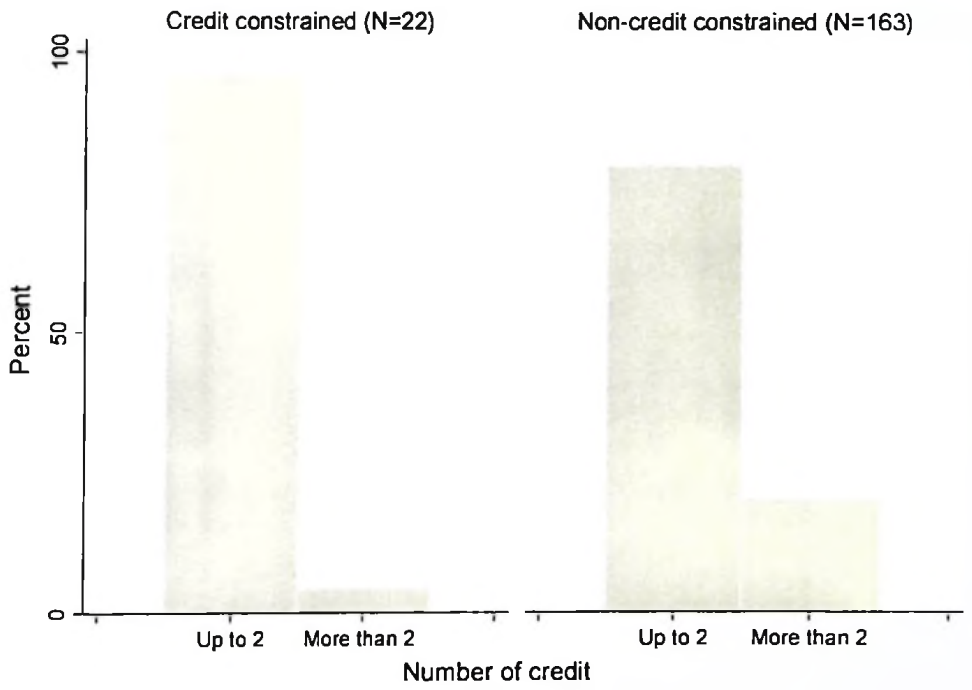

Figure 21: Proportion of sampled smallholder farmers by number of times one has ever accessed formal credit and access to formal credit

Keeping financial records of the farm enterprises was also taken as an indicator of good financial practices and this was also analyzed in relation to smallholder farmers' credit access constraint condition. The results from Table 21 suggest the existence of significant relationship between keeping financial records and access to formal credit. As indicated in Table 21, the proportion of credit constrained smallholder farmers with no financial records is 12 times larger than that of credit constrained smallholder farmers who keep financial records.

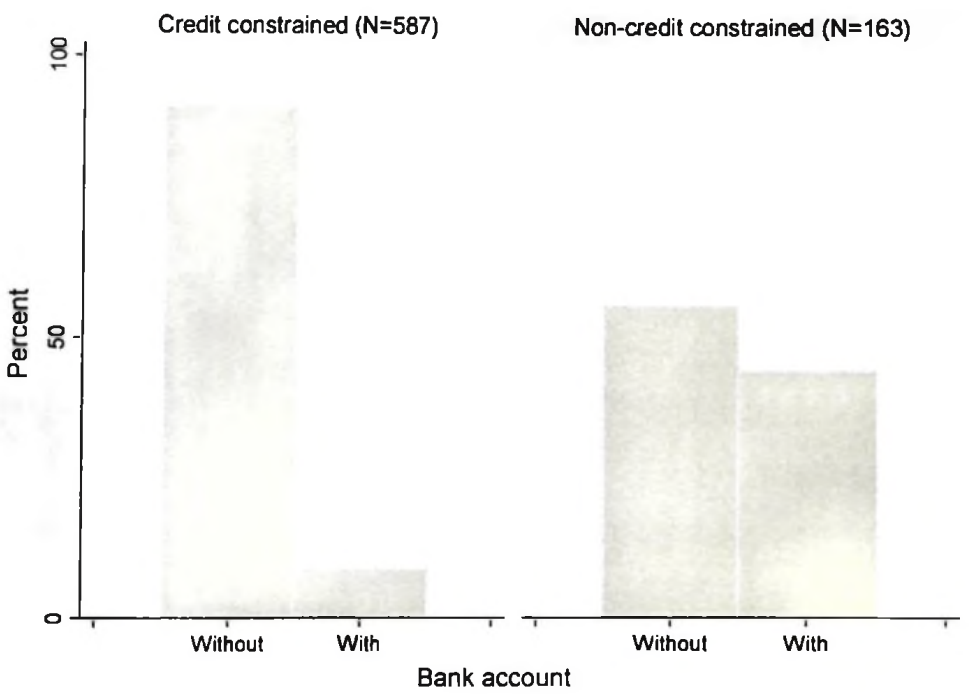

Figure 22: Proportion of sampled smallholder farmers with and without bank account by access to formal credit

However, among the non-credit constrained smallholder farmers the proportion of those with no financial records is only two times larger than those with financial records. Furthermore, the results indicate that the non-credit constrained smallholder farmers are four times more likely than the credit constrained smallholder farmers to be found with financial records. The Chi-square test confirms that there is statistically significant relationship between keeping financial records and access to formal credit ($P<0.01$). The implication of this finding is that keeping financial records increases the probability of smallholder farmers to access formal credit. Fig. 23 illustrates these differences between keeping financial records and access to credit.

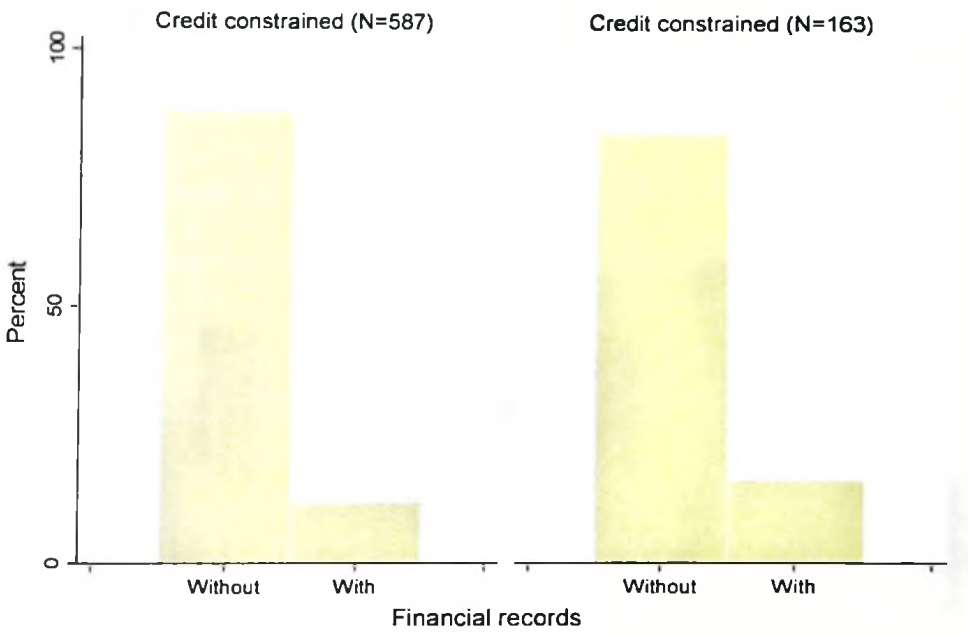

Figure 23: Proportion of sampled smallholder farmers with financial records by access to formal credit

4.4 Analysis of Credit Accessibility by Smallholder Farmers

In general, smallholder farmers are considered to be credit access constrained in the formal credit market. In order to get a better understanding of the situation in the study area, this study was undertaken in order to assess smallholder farmers' access to formal credit and outreach of formal financial institutions. The intention was to test the hypothesis which state that there is limited access to formal credit in rural Zanzibar and the financial system is biased against smallholder farmers who are relatively poor in the society. Whereas, the direct elicitation method was used to identify credit constrained and non-credit constrained smallholder farmers in the sample, the Principal Component Analysis was employed to establish the depth of the outreach of the formal financial institutions.

Sampled smallholder farmers were asked a series of questions in order to establish their financial practices with formal credit market and be able to categorize them as credit constrained or non-credit constrained. The responses are given in Fig. 24. The overall results in the figure indicate that only 22% of the sampled smallholder farmers were non-credit constrained in the formal credit market. Of those who are non-credit constrained, 37 smallholder farmers which is equivalent to 5% of the total sampled smallholder farmers indicated to have obtained credit as they requested and the remaining 126 smallholder farmers which is equivalent to 17% of the total sampled smallholder farmers indicated to have no investment needs that needed credit support. Of those who were found credit constrained, 160 smallholder farmers which is equivalent to 21% were credit quantity constrained and 427 smallholder farmers which is equivalent to 57% had access problems partly due to inability to satisfy credit requirements, lack of awareness on availability of credit, high interest rates and being afraid to be indebted. These results suggest the existence of limited accessibility of formal credit in rural Zanzibar and therefore supporting the findings by GOZ (2006a), Mohamed (2003), and GOZ (2006d). The result is also in conformity with the findings of Krain (1998) who reported that about 91% of credit transactions in rural Zanzibar were with informal lenders.

In order to establish the depth outreach of the formal financial sector, the Composite Indicator of Multidimensional Poverty was developed to capture the non-income dimension of poverty in Zanzibar. As mentioned in several studies on the limitations of income and expenditure as a measure of identification of the poor (Siddhisena and Jayathilaka, 2006), the study analyzed several other socio-economic dimensions including income in the identification of poor households using the sample data.

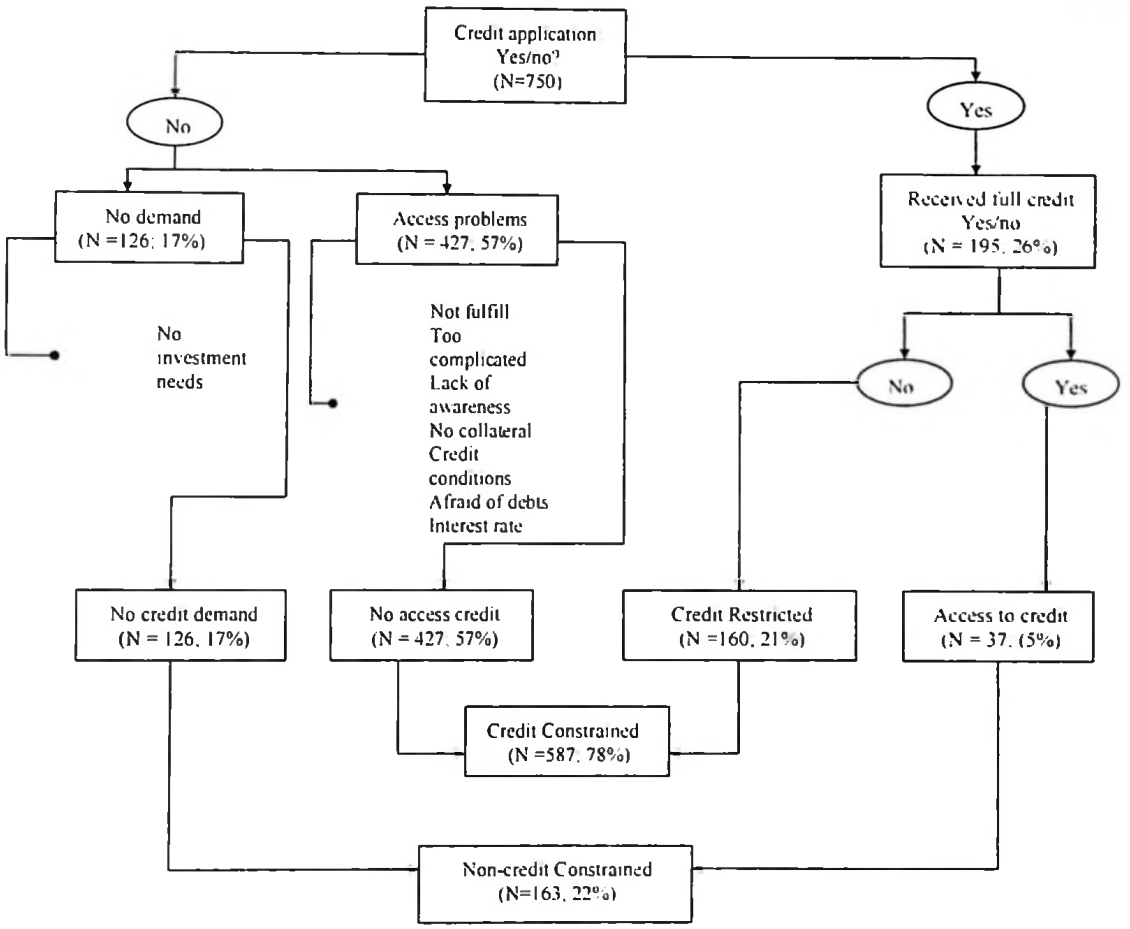

Figure 24: Formal credit constraints in rural Zanzibar

The number of variables such as house status (type of wall, type of roofing material, floor type), income level, size of land owned, value of productive assets owned, owning livestock, leadership status, level of education and size of family were initially used and significant factors were taken into account using the Principal Component based Factor Analysis.

Thereafter, they were weighted and rescaled with the Eigen (more than one) value and accordingly the poverty level of sampled households was identified. The results of the Principal Component based Factor using SPSS are presented in Tables 22, 23 and Fig. 25. Since the three Eigen values (greater than 1) explained 56% of the variability, the

factors provide sufficient explanation of the eight variables listed as indicated in Table 22. Thus, the three factors (F1 = Means to achieve the welfare: F2 = Basic needs: and F3 = Other aspect of welfare)[11]. The composite indicators were developed using the mean value of the three factors, multiplying them with the corresponding Eigen values.

Table 22: Eigen Values (24) and Factor Scores (25) of the Factor Analysis

Eigen Value	Percentage of Variance	Cumulative %
2.288	28.596	28.596
1.136	14.197	42.792
1.061	13.263	56.055
0.850	10.624	66.679
0.819	10.232	76.911
0.741	9.264	86.175
0.644	8.050	94.225
0.462	5.775	100.000

Based on these composite indicators for the sampled smallholder farmers, the variability of household poverty was measured and accordingly smallholder farmers were classified into three categories, namely, more poor, poor and less poor (see Table 24).

[11] The variables included in the factors:

F1 = Ownership of productive assets, including land, household size, income, level of education, Owning livestock
F2 = House status (Type of wall, Type of roofing material, Type of floor, Type of latrine
F3 = social status i.e leadership role

Table 23: Rotated Component Matrix

	Rotated Component Matrix[a]		
	1	2	3
ACREAGE	0.122	0.664	0.229
EDUC	0.481	0.039	0.522
FAMILY_S	-0.022	0.818	-0.017
ASSEE	0.775	0.213	-0.044
INCOME	0.754	-0.024	0.085
HOUSE_ST	0.611	-0.005	0.149
LEAD_S	0.003	-0.122	-0.834
LIVESTOC	-0.480	-0.396	0.290

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser

Normalization

A: Rotation converged in 5 interactions

Note: ACREAGE = Size of landholding (expressed in acres), EDUC = Level of education, FAMILY_S = Number of people in the household, ASSEE = Value of productive assets/farm equipment, INCOME = Average annual household income, HOUSE_ST = The status of the house of the household (which is an aggregate of the Type of wall, Type of roofing materials, Type of floor and Type of latrine), LEAD_S = Household leadership role in the community), LIVESTOCK = Estimated market value of livestock owned by the household.

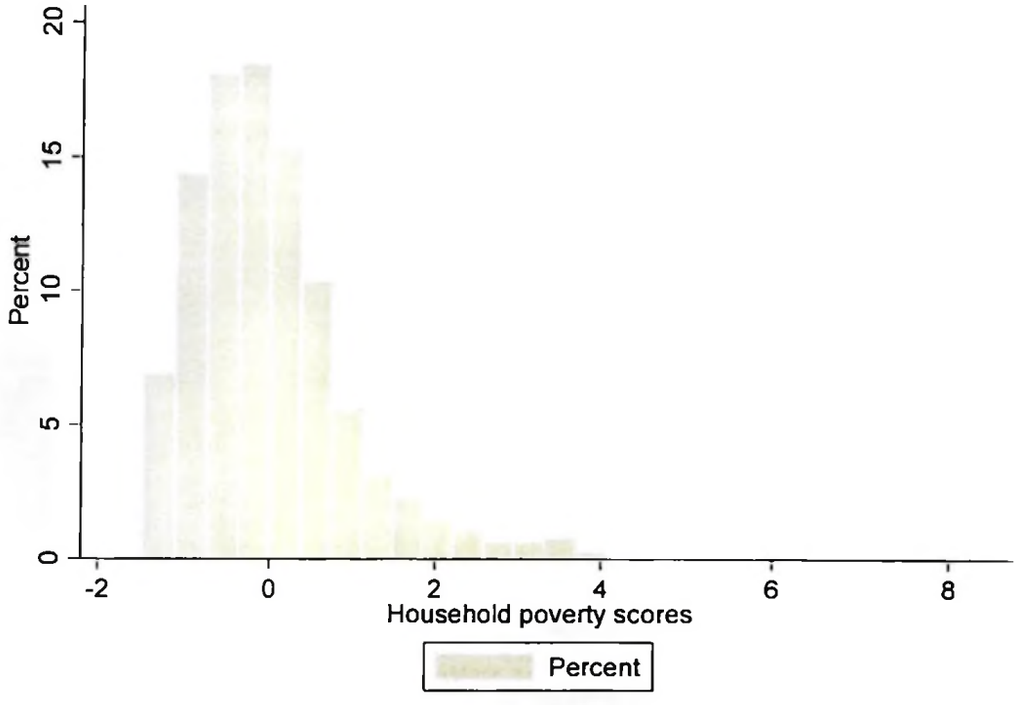

Figure 25: Poverty index distribution among sampled smallholder farmers

Table 24: Access to credit by poverty group in rural Zanzibar

Poverty group/category	Credit constrained	Non-credit constrained	Total
More poor	240 (41)	16 (10)	256(34)
Poor	157(27)	24(15)	181(24)
Less poor	190(32)	123(75)	313(42)
Total	**587(100)**	**163(100)**	**750(100)**

Pearson Chi2 (2) = 100.4850 Pr = 0.000

Cramér's V = 0.3660

Kendall's tau-b = 0.3360 ASE = 0.029

Figures in the cell represent the frequency and column percentages

From Table 24 and Fig. 26, it can be noted that of those household heads who were credit constrained, 240 (41%) belonged to relatively more poor group, 157 (27%) belonged to relatively poor group and 190 (32%) were relatively less poor. On the other hand, 16(10%) of non-credit constrained household heads belonged to more poor group, 24(15%) were found to be poor and 123 (75%) belonged to relatively less poor group.

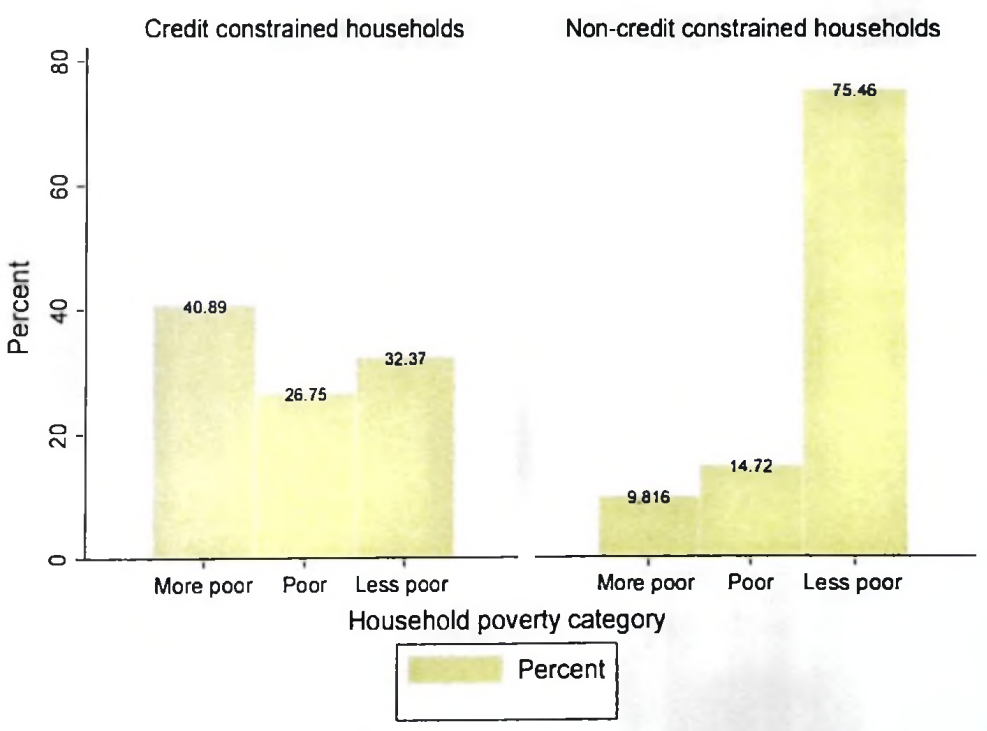

Figure 26: The proportion of credit constrained and non-credit constrained households by poverty group

In comparing the three poverty groups from the sampled areas, the more poor and poor groups were more likely to be credit constrained in the formal credit markets than the less poor group. In order to test this hypothesis we used two variables: the "poverty level" and "access to credit" and performed a Chi-square test of significance on the

data. "Poverty level" records a respondent's relative poverty status and "access to credit" records whether or not the respondent is credit constrained in the formal credit markets.

As indicated from the results of Chi-square test (Table 24), the P-value for the relationship of these two variables is 0.000 (Chi-square = 100.4850 with 2 degree of freedom). Cramér's V is 0.3660 indicating existence of strong relationship between poverty level of the respondent and access to credit. Likewise, Kendall's tau-b of 0.3360 signifies the direction of association to be positive, implying that as poverty decreases the chances of becoming non-credit constrained in the formal credit markets increases. Kendall's tau-b also tells about the strength of the association between respondent's poverty level and his/her status in accessing formal credit. The Kendall's tau-b statistic should have a magnitude between 0 and 1, However, the magnitude of over 0.5 is rare. The value over 0.3 is considered to be "strong" and anything below 0.1 is considered to be "weak". The range value of between 0.1 and 0.3 is therefore considered appropriate.

With these results therefore it can be concluded with great confidence that access to credit has strong relationship with poverty level of farming households in the surveyed areas. Specifically, the relationship is that the credit constrained households are more poor members of the society. This finding is also confirmed by Mohamed (2003), who indicated that the reforms of the financial sector has not benefited the poor of the poorest, who continue to be marginalized by the formal financial sector. The report of BOT (2006), also confirms that the depth outreach of the MFIs is low. Thus, the hypothesis which stated that the financial system is biased against smallholder farmers who are relatively poor in the society cannot be rejected.

4.5 Analysis of Factors Influencing Smallholder Farmers' Access to Formal Credit

In order to test the second hypothesis which states that *household socio-economic characteristics influence smallholder farmers' access to credit in the formal credit market*, two different regression equations were estimated. The first equation was aimed at determining socio-economic characteristics of smallholder farmers that influence access to credit using MLE. The second equation was the use of selection equation (Heckman procedures) to confirm the influence of factors on smallholder farmers' access to formal credit. The results from this estimation are presented and discussed in section 4.5.1 and 4.5.2.

4.5.1 Results from the Probit model estimation

Table 25 summarizes the socio-economic factors hypothesized to influence smallholder farmers' access to formal credit using probit model. As can be seen from the table. the specified probit model fits very well the data as measured by McFadden (R^2). The high value of McFadden (74.7%) suggests a good predictive ability of the model implying that the variables included in the model explain about 74.7% of the variation in the dependent variable. Furthermore, the Chi-square statistic shows the model is highly significant ($P<0.01$), indicating that all variables included in the model are jointly different from zero. The model has also very high predictions about 89.6%. All these confirm that there is a relationship between the dependent variable and explanatory variables included in the model. Even after excluding ancillary variables, five out of fourteen variables included in the empirical model were found to be statistically significant at specified confidence levels. The only variables whose coefficients were statistically insignificant were intensity of extension contacts (EXTI), landholding size (ACRE), years of formal education of household head (EDUC), age of the head of household (AGE), Household size (HHS), sex of the respondent (GEND), household

head leadership status (LEAD), keeping financial records (FREC), and intensity of adoption of agricultural technologies (TECH).

Furthermore, with the exception of household head leadership status (LEAD), all variables included in the probit model possess the hypothesized direction of influence on the probability for smallholder farmer to have access to credit in the formal credit market. It is apparent from the table that the coefficient for number of times one has ever accessed formal credit (NCRE) has a positive sign and statistically significant ($P<0.01$), indicating that increased number of loans received by smallholder farmers increases the probability to access credit in the formal credit market. This finding suggests that repeat loans are important in order to meet the demand for credit of smallholder farmers. This is because in most cases loans extended to smallholder farmers are small in size and therefore one single loan can not be sufficient.

The results in Table 25 also indicate that, the coefficient for livestock keeping (LSTOC) was positive and statistically significant ($P<0.01$) suggesting that keeping livestock increases the probability of household head being non-credit constrained. This is due to the fact that livestock enterprises are relatively less risky and more profitable compared to crop farming and therefore formal lenders are more willing to lend to livestock enterprise. In addition, keeping livestock requires some investment which creates demand for credit. Ellis and Mdoe (2002) reported that in rural economy, keeping livestock, particularly cattle is associated with the relative wealthiness of the households. Relatively wealthier households afford to keep livestock (cattle) and this explains their high probability of being non-credit constrained.

As expected, the coefficient for having a bank account (BANS) was found to be positive and statistically significant ($P<0.05$) which implies that having a bank account increases the probability of smallholder farmers of being non-credit constrained. This is due to the fact that having a bank account is important for establishing contacts with bank officials and for getting information on credit.

Bank savings may also be used as security for loans and therefore may increase bank account holders their chances of accessing formal credit. This finding complements the study done by Mohamed and Temu (2008b) and by Temu (1994) who found that bank account holders have more chances of accessing credit in the formal credit market compared to non-bank account holders.

The coefficient for the value of productive assets (VASS) had also a positive sign and statistically significant ($P<0.01$), implying that increasing the value of productive assets owned by smallholder farmers is likely to increase the probability of being non-credit constrained in the formal credit market. This is due to the fact that increase in asset base enhances smallholder farmers' economic leverage and therefore increases their risk-bearing capacity for the loans. In addition, lenders can take assets as security for loans offered and these contribute to the increased probability of smallholder farmers of being non-credit constrained. This result is in line with the finding by Mohamed and Temu (2008a) and by Schrieder and Heidhues (1995) who found that enhancing economic leverage of smallholder farmers increase their probability of taking formal loans.

Table 25: Probit equation and credit use intensity equation using Heckman's Procedure

Variables	Participation equation (Probit)			Credit use intensity equation (Hekman procedure)	
	Coefficient	Marginal effect	t-value	Coefficient	t-value
Constant	-10.767352	-2.312574	-5.343***	-0.399465	-6.314***
EXTI	0.061775	0.013268	0.144	0.009351	0.601
ACRE	-0.024266	-0.005217	-0.499	-0.001019	-0.575
NCRE	2.279272	0.489534	11.935***	0.144371	27.423***
EDUC	0.0.016476	0.003539	0.612	0.001175	1.167
AGE	0.003348	0.000719	0.415	-0.000043	-0.154
HHS	-0.001848	0.000397	0.052	-0.002254	-1.796*
GEND	-0.169400	-0.038373	-0.611	-0.012627	-1.353
LEAD	-0.087454	-0.018783	-0.413	-0.009491	-1.183
LSTOC	0.569524	0.122321	2.553***	0.034190	4.133***
FREC	0.136496	0.027677	0.467	0.011385	0.993
BANS	0.496274	0.126329	2.063**	0.293693	28.615***
VASS	0.210517	0.045214	2.554***	0.114385	4.881***
ICOM	0.416914	0.089543	2.843***	0.018450	3.852***
TECH	0.161653	0.034719	0.575	0.031691	6.314*
Lambda	-	-	-	0.154740	17.715***

Log Likelihood Function	-99.39903	R-Squared	
Restricted Log Likelihood function	392.6341	0.852591	
Pseudo R-Squared	0.74684	Adj. R-Squared	0.84958
Chi Squared	586.4700	Durbin-Watson Stat.	1.89198
Hosmer-Lemeshow Chi-squared	23.07320	Model test F(15, 734)	283.02
Degree of freedom	14	Log-l	730.61
McFadden	0.74684	Restricted (b=0) log-l	
Threshold Value for Predicting (Y=1)	0.5	12.6542	
Households with access to credit	163		
Households with no access to credit	587		
Total sampled households	750		
Percentage of Right Prediction(%)	89.571		
Prediction failure(%)	10.429		

TECH	=	Intensity of adoption of agricultural technologies (index)
EXTI	=	Extension contacts intensity (index)
ACRE	=	Size of land owned by household (acres)
NCRE	=	Number of credit received by household head
EDUC	=	Level of formal education attained by household head
AGE	=	Age of the head of household (years)
HHS	=	Household size (number of people in the household)
GEND	=	Dummy variable for gender (1 = male, 0 = otherwise)
LEAD	=	Leadership of hh head (1= leader, 0 = otherwise)
LSTOC	=	Whether keeping livestock or no ? (1 = Yes, 0 = otherwise)
FREC	=	Dummy for keeping financial records (1 = Keep records, 0 = otherwise)
BANS	=	Dummy variable for having bank account (1= have bank account, 0 = otherwise)
VASS	=	Total value of productive assets owned by household (Tshs)
ICOM	=	Average household annual income (Tshs)

Note: ***, ** and * Denotes significance at the 1%, 5% and 10% levels

Results in the same table indicate that the coefficient for total income (ICOM), as a proxy for welfare status, had positive sign as expected and statistically significant ($P<0.01$). The interpretation of this finding is that a better-off smallholder farmer affects the decision of the lender to ration the loan or the farmer can have less demand for loan because of having sufficient own equity capital accumulated through past income earnings. The lender also considers the welfare status of a client or potential client before signing a contract to provide the loan. Similar findings were reported by Mohamed and Temu (2008b), Nuryartono *et al.* (2005) and Schrieder and Heidhues (1995).

Marginal effects of variables included in the probit model were computed and shown in Table 25. However, it should be noted that, the marginal probability computed for continuous variables is not comparable with those computed for dichotomous variables. As indicated in the table, 1% increase in number of times one has ever accessed formal credit (NCRE) would result into a marginal probability of 0.4895% of a positive response of the smallholder farmers toward accessing formal credit. It also appears that, 1% increase in value of productive assets (VASS) increases the marginal probability of smallholder farmers of being non-credit constrained by 0.0452%. Similarly, 1% increase in total income (ICOM), increases the marginal probability of becoming non-credit constrained by 0.0895%. Finally, marginal probability of smallholder farmers towards accessing formal credit with respect to keeping livestock (LSTOC) and having a bank account (BANS) are 0.1223% and 0.1263%, respectively. Based on the magnitude of marginal effects, the results of probit model suggest that number of times one has ever accessed formal credit (NCRE) was the most important factor which had positive response towards smallholder farmers becoming non-credit constrained in the

formal credit market. This is followed by having a bank account (BANS), keeping livestock (LSTOC), total income (ICOM), and value of productive assets (VASS).

4.5.2 Results from the heckman selection equation

Further analysis of factors hypothesized to influence smallholder farmers access to credit in the formal credit market were carried out using OLS regression model. This was done specifically to see if these factors have similar effects on the intensity of formal credit use. The estimated coefficients of determinants of smallholder farmers' intensity use of formal credit are presented in Table 25. From the table, the value of the IMR variable (lambda) obtained from the probit equation, was also found to be statistically significant, indicating that its inclusion in the empirical model was necessary to avoid sample selection bias. As can be seen from Table 25, the goodness of fit of the model is high as measured using Coefficient of Determination (Adjusted R^2). The Coefficient of Determination (R^2) for the credit use intensity equations, estimated using Heckman's procedure is 0.85, suggesting that the variables included in the model explain about 85% of the variations in the dependent variable. The F-value is highly significant ($P<0.01$), indicating that the explanatory variables were statistically significant in explaining variation in the dependent variable.

As indicated in Table 25, seven coefficients out of fourteen were found to be significant at various probability levels. The only variables whose coefficients were statistically insignificant were intensity of extension contacts (EXTI), landholding size (ACRE), years of formal education of household head (EDUC), age of the head of household (AGE), sex of the respondent (GEND), household head leadership status (LEAD) and keeping financial records (FREC). With the exception of household head leadership status (LEAD) all coefficients had the expected signs.

The results presented in Table 25 indicate that the coefficient for the number of times one has ever accessed formal credit (NCRE) was positive and statistically significant ($P<0.01$), indicating that the increase in the number of times one has ever accessed formal credit increases the intensity of formal credit use by 0.14%. This is partly due to the fact that as one receives more loans, fears toward using formal loans fade away and this may increase intensity of use of formal credit. Also, with the repeat loans one becomes more aware on the loans procedures and conditions and also has more chances of getting larger subsequent loans which all may increase intensity of formal credit use.

The coefficient for family size (HHS) had a negative sign and statistically significant ($P<0.1$), meaning that the increase in the number of household size decreases the intensity of formal credit use by 0.002%. This could be due to the fact that as household size becomes bigger, it tends to become more vulnerable to economic shocks and therefore their risk bearing capacity for taking loans diminishes. Similar finding was reported by Difhues (2007) in the study conducted in Vietnam. The coefficient for livestock keeping (LSTOC) was positive and statistically significant ($P<0.01$) suggesting that keeping livestock increases smallholder farmers' intensity of formal credit use by 0.03%. This is due to the fact that keeping livestock requires one to be non-liquidity constrained and hence creating more demand for credit.

Similarly, the coefficient for having a bank account (BANS) was also found to be positive and statistically significant ($P<0.01$), indicating that having a bank account increases the intensity of formal credit use by 0.29%. This finding is not surprising taking into account that having a bank account is taken by most lenders as one of the conditions for loan disbursement. Besides, having a bank account implies household integration into the formal financial system and this may remove smallholder farmers'

barriers to access formal credit, which may be caused by lack of awareness, being afraid of formal organizations and lack of collateral. Bank savings can as well be used as security for receiving loans from formal credit market. All these have the potential of increasing the intensity of formal credit use by smallholder farmers.

The coefficient for the value of productive assets (VASS) was also found to be positive and statistically significant ($P<0.01$), implying that increase in value of productive assets has the potential for increasing the intensity of the use of formal credit by 0.11%. This could be due to the fact that, value of productive assets may be used by lenders as collateral or security for the loan. Smallholder farmers with greater value of productive assets, therefore, stand a better chance to get formal credit and this may increase their intensity to use formal credit. Similar results were reported by Mohamed and Temu (2008a), Mohamed (2003), Daniel (2001) and by Kochar (1997).

As was found in the probit model estimation, the coefficient for total income (ICOM) was found to be positive and statistically significant ($P<0.01$), suggesting that 1% increase in total income increases the intensity of formal credit use by 0.02%. Contrary to the results of probit model estimation, the coefficient for the intensity of adoption of agricultural technologies had a positive sign and statistically significant ($P<0.1$) suggesting that 1% increase in the intensity of adoption of agricultural technologies increases the use of formal credit by 0.03%. As already explained, applying improved technological packages, farmers need capital and in the absence of own funds, smallholder farmers may resort to the use of credit. So in case of increased technological advancement, farmers may as well increase their intensity in the use of formal credit.

From above discussion the hypothesis stated that *household socio-economic characteristics influence smallholder farmers' access to credit in the formal credit market* cannot be rejected. This is due to the fact that, the results from probit model and Heckman selection equation, presented in Table 25 confirmed that number of times one has ever accessed formal credit (NCRE), having a bank account (BANS), keeping livestock (LSTOC), total income (ICOM), value of productive assets (VASS), household size (HHS) and intensity of adoption of agricultural technologies were statistically significant at specified probability levels implying that these are most important factors in influencing smallholders' farmers access to formal credit in the study areas.

4.6 Linkages Between Access to Credit and Adoption of Agricultural Technologies

The third objective of this study was to assess the linkages between access to credit and adoption of agricultural technologies. To address this objective the study hypothesized that *for the smallholder farmer to be able to adopt agricultural technologies he/she needs to be non-credit constrained in the formal credit market*. The testing of this hypothesis was based on the use of reduced form coefficient estimates of second stage switching regression models for agricultural technology adoption. The results are shown in Table 26. Despite the model's goodness of fit being low that is to say low adjusted R^2 in both credit constrained and non-credit constrained regimes, the F-value in both regimes is highly significant indicating that all variables included in the model are jointly different from zero. This is quiet acceptable for the kind of study of this nature (See Nuryartono *et al.* (2005). In the estimation, the coefficient of lambda was found statistically significant in both regressions, suggesting that the sample did suffer from sample selection bias and that direct estimation of the model by OLS would have yielded biased estimates.

According to Table 26, the coefficient for intensity of extension contacts (EXTI) had a positive sign but statistically significant (P<0.01) only in the non-credit constrained regime implying that increase in the intensity of extension contacts could influence agricultural technologies adoption only if the smallholder farmers are non-credit constrained. This finding is in conformity with the finding obtained by Bahadur and Siegried (2004) which states that access to extension services has higher potential to influence adoption of agricultural technologies to non-credit constrained than to credit constrained smallholder farmers.

The coefficient for the number of times one has ever accessed formal credit (NCRE) was also positive in both regimes and was statistically significant (P<0.05) for the credit constrained smallholder farmers and (P<0.1) for non-credit constrained smallholder farmers' regime. These findings suggest that increasing number of loans that one receives is more important for enhancing the adoption of improved agricultural technologies for credit constrained smallholder farmers than for non- credit constrained smallholder farmers. These results also imply that formal lenders need to devise mechanisms that will ensure availability of repeat loans in order to improve the adoption of agricultural technologies among smallholder farmers.

The coefficient for household size (HHS) was found to be negative but statistically significant (P<0.05) only for the non-credit constrained smallholder farmers. The negative sign of the coefficient indicates that as household size increases the intensity of adoption of agricultural technologies for non-credit constrained decreases. This is due to the fact that as household size increases the welfare of the households is eroded and therefore their ability to invest in agricultural production declines.

Table 26: Estimated coefficient for agricultural technology adoption distinguished between credit constrained and non-credit constrained households

Variables	Credit constrained		Non-credit constrained	
	Coefficient	Std Error	Coefficient	Std Error
Constant	-0.479278	0.590587	-0.270771	0.203945
EXTI	0.025933	0.184575	0.146199	0.035793***
ACRE	-0.008833	0.022542	0.001224	0.003676
NCRE	3.270460	1.466647**	0.020307	0.0116594*
EDUC	0.000054	0.011365	0.000964	0.002407
AGE	0.0021154	0.003347	-0.00021	0.002407
HHS	-0.001326	0.015224	-0.007144	0.003216**
GEND	0.079750	0.117640	-0.005761	0.0235330
LSTOC	-0.006177	0.103256	-0.014084	0.017672
VASS	0.0179471	0.037841	0.036474	0.009984***
ICOM	0.056883	0.053074	0.019153	0.015572
FCUI	0.618740	0.458456	0.023223	0.050372
Lamda	-1.972086	0.828743**	-0.005755	0.018483
Adjusted R^2-	0.29784		0.39021	
F	21.71***		9.64***	
No. of observations	587		163	

Note: ***, **, and * are significant at 1, 5, and 10 percent level respectively

EXTI	=	Extension contact intensity (index)
ACRE	=	Size of land owned by household (acres)
NCRE	=	Number of credit received by household head
EDUC	=	Level of formal education attained by household head
AGE	=	Age of the head of household (years)
HHS	=	Household size (number of people in the household)
GEND	=	Dummy variable for gender (1 = male, 0 = otherwise)
LSTOC	=	Whether keeping livestock or no (1 = Yes, 0 = otherwise)
VASS	=	Total value of productive assets owned by household (Tshs)
ICOM	=	Average household annual income (Tshs)
FCUI	=	Farm household credit use intensity (index)

As expected, the coefficient for the value of productive assets (VASS) was also found to be positive and statistically significant ($P<0.01$). This implies that one unit increase in value of productive assets owned by non-credit constrained smallholder farmers has the corresponding effect of increasing the intensity of adoption of agricultural technologies among non-credit constrained smallholder farmers.

From above discussion the hypothesis stated that *for the smallholder farmer to be able to adopt agricultural technologies he/she needs to be non-credit constrained in the formal credit market* cannot be rejected. This is due to the fact that, the results from second stage switching regression models for agricultural technology adoption, presented in Table 24 confirmed that intensity of extension contacts (EXTI), number of times one has ever accessed formal credit (NCRE), household size (HHS) and value of productive assets (VASS) were statistically significant at specified probability levels implying that these are most important factors in influencing smallholders' farmers to adopt improved agricultural technologies. In respect to this, the results confirmed the existence of the linkages between credit access and the intensity of the adoption of agricultural technologies through some socio-economic factors which include intensity of extension contacts (EXTI), number of times one has ever accessed formal credit (NCRE), household size (HHS) and value of productive assets (VASS).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Overview

This chapter presents the conclusions and recommendations that emerged from the study. The chapter has four sections. Section two provides the main conclusions from the empirical findings, while section three discusses the implications of the findings of the study and provides recommendations that are likely to support services that will ensure increased access to credit among smallholder farmers in Zanzibar. Section four concludes by highlighting on some limitations of the study and offering suggestions for further research work.

5.2 Concluding Remarks

Several major findings emerged from the analysis in relation to the hypotheses formulated to address the study objectives. These findings are summarized as follows:

5.2.1 Analysis of credit accessibility by smallholder farmers

The results revealed that there is limited access of formal credit in the surveyed areas and that majority of smallholder farmers are credit constrained in the formal credit market. Credit access problems such as lack of awareness on the availability of credit, too complicated loan conditions and procedures, high loan interest rates, lack of collateral and fears of being in debts are some of the reasons that were reported to contribute to the low accessibility of formal credit in the study areas.

The results also reveal that there is low depth outreach of existing formal financial institutions. This being the case, majority of the sampled smallholder farmers who had

access to formal credit tend to be members of less poor households. In respect to this, it can be concluded that there was limited access to formal credit among smallholder farmers and the formal financial system is biased against smallholder farmers who are relatively poor in the study areas.

Factors related to the supply of credit as well as socio-economic barriers facing smallholder farmers were found to be responsible for the limited access to formal credit in the study areas. It was also observed that the ineffective coordination of efforts to build the wealth creation capacity of the smallholder farmers and barriers related to human development had negatively impacted on the inability of smallholder farmers to access credit in the formal credit markets. The reluctance of commercial banks to lend to smallholder farmers was found to persist despite government efforts to relax some banking conditions and establish the credit guarantee funds. The absence of the policy framework and lack of a coherent institutional coordination mechanism for microfinance was also observed to be one of the key factors contributing to inefficient delivery of financial services and hence limited access to credit by smallholder farmers. In the absence of microfinance policy, The ZSGRP could provide an opportunity for coordinated efforts in financial services delivery, but even this has not yet been operationalized.

The study also revealed that capacity weaknesses, particularly for MFIs, in terms of limited funding, coverage and skills in microfinance to a large extent account for the limited outreach of existing formal credit institutions in Zanzibar, and hence inaccessibility of credit by majority of smallholder farmers. In a number of ways, institutional framework for MFIs was found to be weak. The databases, credit reference bureau and information sharing provided for by the existing legislations are still not in

place in Zanzibar. In addition, the capacity of the Department of Cooperatives to inspect, audit, and advise cooperatives (including SACCOs) is quite low in terms of logistics (transport) and skilled staffing with respect to micro-finance issues.

5.2.2 Analysis of socio-economic factors influencing smallholder farmers access to formal credit

Based on the statistical significance and the magnitude of marginal effects, the results of probit model revealed that number of times one has ever accessed formal credit (NCRE) was the most important factor which had positive response towards smallholder farmers becoming non-credit constrained in the formal credit market. This was followed by having a bank account (BANS), keeping livestock (LSTOC), total income (ICOM), and value of productive assets (VASS). It was noted further from the Heckman selection equation, that the number of times one has ever accessed formal credit (NCRE), household size (HHS), keeping livestock (LSTOC), having a bank account (BANS), value of productive assets (VASS), total income (ICOM), and intensity of adoption of agricultural technologies (TECH) were statistically significant at specified probability levels implying that these are most important factors in influencing smallholders' farmers credit use intensity in the formal credit market in the study areas.

Thus, it can be concluded that the most important socio-economic characteristics which had significant influence to smallholder farmers' access and intensity to use formal credit in Zanzibar include the number of times one has ever accessed formal credit, household size, keeping livestock, having a bank account, value of productive assets, total income, and intensity of adoption of agricultural technologies. Therefore it could be argued that these factors influence the demand side of formal credit and therefore

constitute the main socio-economic barriers to the access to formal credit among smallholder farmers in Zanzibar.

5.2.3 Analysis of linkage between access to credit and the intensity of adoption of agricultural technologies

Regarding the linkages between access to credit and the adoption of agricultural technologies, the study results revealed that intensity of extension contacts (EXTI), number of times one has ever accessed formal credit (NCRE), household size (HHS) and value of productive assets (VASS) were statistically significant at specified probability levels implying that these are the most important factors in influencing smallholders' farmers to adopt improved agricultural technologies. In respect to this, the results confirmed the existence of the linkages between access to credit and the intensity of the adoption of agricultural technologies.

On the basis of these findings, it can be concluded that for the smallholder farmer to be able to adopt agricultural technologies in the study area, he/she needs to be non-credit constrained and hence the existence of linkages between access to credit and the intensity of adoption of agricultural technologies.

5.3 Policy Implications and Recommendations

5.3.1 Improving credit outreach and access

From the findings we learn that outreach and access of formal credit in rural Zanzibar is low despite the financial sector reforms initiated since mid 1991. Therefore government needs to implement policy and legislative measures that will enhance increased outreach (breadth and depth) of formal credit institutions in the rural sector. These measures include the recommendations of the second generation of financial reforms that is

introducing measures to reduce lending rates, promote the establishment of smallholder farmers' special windows in banking institutions, develop rural financial facilities and services, establish strategic alliance between banks and MFIs and establish the credit guarantee fund for smallholder farmers. The MFIs appear to have the potential of being used by the commercial banks as channels for mobilizing deposits from savers and for extending loans to clients, particularly the small borrowers. Win-win partnership can be established, whereby MFIs can also benefit from getting loanable funds from commercial banks and through enhancing information sharing and networking.

In order to provide the highly needed policy directions for the microfinance activities in Zanzibar, the government, in collaboration with all stakeholders, needs to take serious actions to develop a microfinance policy specifically for Zanzibar and to put in place an effective institutional coordination mechanism for the microfinance sector. Initially the existing ZSGRP coordination framework could be used to guide the implementation of microfinance activities in Zanzibar.

The existing regulatory and supervisory frameworks need reassessment with a view to simplifying it and make it easier to comply with, in line with the existing institutional capacities both at national and sub-national levels. The customization of the existing regulatory and supervisory framework to suite the peculiarities of Zanzibar, is strongly recommended. There is also a need to enhance capacity building of MFIs, in terms of skills development, increase use of information, communication technologies (ICTs) and networking. In this respect, BOT needs to expedite the process of establishing databases and credit reference bureaus in order to facilitate information sharing and exchange.

Efforts should also be made to build the win-win linkages between MFIs and the banking institutions. Specifically, there is a need to develop SACCOS so that they can be used effectively as channels for commercial banks to extend its financial services to small borrowers. This should go hand in hand with building the capacities of the Department of Cooperatives to make it more able to handle the growing needs of SACCOS and other grassroots microfinance organizations. In order to increase outreach of MFIs and enhance access to credit by the smallholder farmers. there is a need to encourage MFIs to open their centers in rural areas. MFIs should also be encouraged to develop financial products that are demanded by the clients. The private sector also needs to be supported to enable it participate more actively in microfinance activities in Zanzibar.

In addressing socio-economic factors that constrain smallholder farmers to access formal credit, there is a need to devise a system of ensuring the availability of repeat loans for smallholder farmers in the ongoing credit programmes and schemes. Repeat loans are important for increasing smallholder farmers' leverage to use formal credit. Repeat loans are also important for ensuring good loan repayment and hence the sustainability of credit programmes/schemes. Keeping livestock was also found to be an important factor for improving access to formal credit by smallholder farmers. Therefore, mixed farming seems to be a viable option for improving farmers' access to credit. It is therefore recommended that smallholder farmers should be encouraged to integrate crops and livestock enterprises as this may provide a means for income and investment diversification and improve further their chances of having access to formal credit.

Since having a bank account was found as one among important factors for influencing smallholder farmers' access to formal credit, there is therefore a need to develop a saving culture in the farming communities. This will not only pave way for smallholder farmers to access formal credit but will also enable them to realize the full potential benefits of the existing formal financial services. In addition, saving mobilization has the advantage of increasing the availability of loanable funds and therefore expands the loan supply capacity. Notwithstanding, in order to address these challenges, lack of financial literacy and insufficient saving facilities need to be adequately addressed.

Increased household income and value of productive assets are directly related to smallholder farmers' increased access to credit in the formal credit market. There is a need, therefore, to assist the poor smallholder farmers to adopt measures that will ensure increased agricultural productivity and production for increasing farm incomes. Smallholder farmers can as well be encouraged and supported to diversify their income sources within and away from agriculture so as to increase their income base and improve access to credit in the formal credit market. Increased income eventually leads to increased value of productive assets and access to formal credit. Facilitation of poor smallholder farmers to adopt improved agricultural technologies is therefore crucial. The fact that smallholder farmers may be too poor to be able to adopt recommended agricultural technological packages calls for a special mechanism that will provide grant through out the "transition zone" before they are being integrated into the formal financial sector. It is argued that for the more poor farmers, credit may not be an effective way of facilitating them to adopt improved farming technologies. The farming household has to be above certain level of poverty in order to be able to effectively use credit to finance production activities. Any point below this level of poverty, there is high chances for the credit funds to be used to offset the household consumption gaps.

This being the case the use of special safety net measures for the more poor households is therefore highly recommended.

5.3.2 Improving adoption of agricultural technologies

It is obvious from the study results that there is a need of targeting interventions aimed at improving the adoption of farming technologies. For example, for the effectiveness of extension services in enhancing technology adoption, there is a need to target extension interventions to smallholder farmers who are non-credit constrained. This is deemed pertinent otherwise farmers may have knowledge but may fail to apply it due to lack of means to acquire and apply the technology. Repeated loans are important for both credit constrained and non-credit constrained smallholder farmers. However, the effect on technology adoption is more for the credit constrained smallholder farmers than the non-credit constrained smallholder farmers, hence there is a need for targeted interventions for credit constrained smallholder farmers to facilitate them to adopt improved agricultural technologies.

It is therefore recommended that a comprehensive package should be devised so that credit interventions are implemented hand in hand with other interventions aimed at enhancing the adoption of agricultural technologies. Implementing comprehensive packages will not only improve the effectiveness of extension services but will also enhance the effectiveness of credit and the other developed technological innovations.

5.4 Suggestions for Future Research

This study has shed light on factors that influence access to formal credit among smallholder farmers and at the same time has provided empirical evidence on the existence of the linkages between access to formal credit and the adoption of

agricultural technologies. Nonetheless, due to time limit the study was only based on cross- sectional survey data to determine socio-economic factors that influence smallholder farmers' access to formal credit and establish the linkages with adoption of agricultural technologies. In order to acquire more reliable information, it is suggested that more research work on the topic be carried out using both cross-sectional and time series data to validate the findings that have been obtained. It is also suggested that future research on looking at the interlinkages between access to credit and the agricultural technology adoption should be considered in more specific ways so that the influences of access to credit on the adoption of both soft and hard technologies packages are critically investigated and assessed. This study covered only the soft technologies component in an aggregate form. It would be of great interest to the academia and policy makers as well to understand the influences access to credit has on the hard technological packages of agricultural innovations. Hard technological packages referred to are those which include such investments as owning and use of farm machineries such as tractors, power tillers, modern agro-processing equipments (eg. milling machines, food driers, milk processors etc). These technologies are more demanding in terms of capital requirements, and were beyond the scope of this study.

From the findings of this study several issues have also emerged that need critical investigations in order to understand a wide range of factors that influence access to credit among smallholder farmers. Some of these factors could be supply sided and hence the need for a complete study on the designs and operational procedures of existing financial services providers and assessment of their respective outreach and scope. Understanding the scope, lending and operational procedures of existing financial institutions will possibly shed more light on the supply capacity and if at all the procedures used by these institutions by themselves are preventive to smallholder

farmers to access financial services. In order to balance the supply demand equation, it is also suggested that study on the assessment of farmers' credit demands should be conducted. Clear understanding of farmers environments with respect to their requirements of technologies and the financial gaps that needs to be covered by credit will assist in designing effective strategies for credit administration and management and for enhancing technology adoption.

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APPENDICES

Appendix 1: The smallholder farmers' questionnaire

DATE,..... FARMER NO.....

DISTRICT.....SHEHIA/VILLAGE.....

NAME OF ENUMERATOR.....

SECTION A: HOUSEHOLD CHARACTERISTICS

A1. Sex of the farmers:

1. Male
2. Female

A2. Age of the farmer.....(years)

A3. Number of years spent in formal school.....(years)

A4. Marital status:

1. Single
2. Married
3. Divorcee
4. Widow

A5. Social status:

1. Village government leader
2. Village government committee member
3. Religious leader
4. Retired civil servant
5. Member of farmer research group
6. Member of any socio-cultural group
7. Other (specify)

A6. House type:

1. Very good: iron sheet/tile roof, concrete wall, cement floor
2. Good: iron sheet roof, mud wall, cement floor
3. Average: iron sheet roof, mud wall, non-cement floor
4. Poor: tined roof, mud wall, non-cement floor

5. Very poor: thatched roof, mud walls, non-cement floor

SECTION B: HOUSEHOLD COMPOSITION

B1. How many people are living with you (including yourself):

Age	Total	How many time in the	How many in the farm	How many time off-farm
16 – 35 years				
36 – 60 years				
Over 60 years				
Children (7 –				
TOTAL				

SECTION C: TYPE OF FARMING ACTIVITIES AND USE OF AGRICULTURAL TECHNOLOGIES

C1. What are your major crop farming activities?:

1. Crop farming
2. Vegetable production
3. Tree crops farming
4. Dairy farming
5. Poultry keeping

C2. Mention three crops which you grow in your farm (List them in the order of priority)

1.....

2.....

3.....

C3. What varieties of crops do you use in your farm:

1. Improved varieties
2. Traditional varieties

C4. Crops Spacing used:

1. Recommended
2. Not as recommended

C5. Do you use inorganic fertilizers:

1. Yes
2. No

C6. Do you use organic fertilizers:

1. Yes
2. No

C7. Method of fertilizer application:

1. Single application
2. Split application

C8. Do you control pests and diseases in your crops:

1. Yes
2. No

C9. Methods of controlling pests and diseases used:

1. Traditional
2. Cultural/biological
3. Chemical

C10. Do you store surplus crops:

1. Yes
2. No

C11. Storage methods used:

1. Traditional
2. Improved

C12. Do you irrigate your crops:

1. Yes
2. No

C13. Irrigation methods:

1. Bucket
2. Sprinkler
3. Furrow

C14. (a) Do you keep livestock

1. Yes
2. No

(b) If YES, indicate types and number where applicable:

TYPES	NUMBER
Cross breed (dairy)	
Cross breed (dairy bull)	
Local breed (Zebu)	
Goats	
Sheep	
Oxen	
Local chickens	
Layers	
Broliers	
Other (specify)	

C15. Major livestock farming systems used:

1. Intensive
2. Semi-intensive
3. Extensive

C16. Adequacy of livestock housing facilities:

1. Fully meet the basic requirements
2. Partially meet the basic requirements
3. Poorly designed
4. No shelter provided

C17. Do you have a pasture plot:

1. Yes
2. No

C18. Do you provide supplementary feeds to your livestock:

1. Yes
2. No

C19. (a) Do you have storage facilities for the livestock products:

1. Yes
2. No

(b) If YES, what method you use:

1. Traditional
2. Improved

C20. Do you process livestock products:

1. Yes
2. No

C21. If YES, What product and at what scale

1..... .....

2..... .....

3..... .....

C22. Do you control livestock parasites and diseases:

1. Yes
2. No

C23. If YES, explain as to how you undertake the control measures:

.....

.....

C24. Type of livestock breeding method used:

1. Use of Artificial Insemination
2. Improved bull/buck
3. Local bull/buck

SECTION D: RECORD KEEPING:

D1. (a) Do you keep records

(b) If YES, what type of records you keep:

1. Physical records
2. Financial records
3. Both (Physical & Financial records)

SECTION E: FARM MECHANISATION:

E1. What types of farm implements used in land cultivation:

1. Hand tools
2. Ox- drawn implements
3. Tractor drawn implements

E2. Mode of transport used to transport the farm products:

1. Hand/head carry
2. bicycle
3. Animal
4. Motorcycle
5. Vehicle

SECTION F: LAND INFORMATION

F1. Do you own land which you are currently using:

1. Yes
2. No

F2. If No Indicate how you have acquired that land:

1. Leased
2. Borrowed
3. Government 3-acre plot
4. Family plot

F3. Total number of acres owned/cultivated.....

F4. Total number of plots/fields owned/cultivated.....

SECTION G: AGRICULTURAL EQUIPMENT OWNED

G1. What type of agricultural equipment you own. Indicate type, number and estimated value

EQUIPMENT	NUMBER (QTY)	ESTIMATED VALUE

SECTION H: INSTITUTIONAL SUPPORT

H1. Do you have access to any credit source:

1 Yes

2 No

H2. (a) If YES. what are your main source(s) of credit:

1. Cooperative society (SACCOS)
2. Commercial banks
3. Community Development project
4. Government run credit scheme
5. Microfinance NGOs
6. Neighbour, friends, relatives
7. Other (speciy).....

H3. How many times you received credit from each source for the past five years and for what purpose. Also indicate total amount requested and the amount received:

SOURCE	NO. OF TIMES	PURPOSE	AMOUNT REQUESTED (Tshs)	AMOUNT RECEIVED	CASH/KIND

(b) If No, what are your main reason(s) for being unable to access credit from formal credit sources:

1.....

2.....

3.....

H4. (a) Do you have a bank account:

1. Yes
2. No

(b) If No, what are the reasons:

1.....

2.....

3.....

4.....

H5. Have you ever received advice on agriculture from extension services

1. Yes
2. No

H6. (a) From which source(s) do you get the extension advice

1= Government system

2= NGOs

3= Contact Farmer

4= Trader

If you have contact with an extension services, how frequent is it:

1= Very frequent - Once per every 2 weeks

2= Frequent - Once per month

3= Not frequent - Once per 3 months

4= Irregular - When I have a problem

H7. Do you read agriculture bulletin, newsletter or magazine:

1. Yes
2. No

H8. Do you listen to agricultural programmes aired in radio or TV:

1. Yes
2. No

H9. Are you a member of Farmers Research Groups or any informal group:

1. Yes
2. No

H10. How much did you produce in 2004 and 2005 and what proportion was marketed:

Product	Output (in appropriate unit of measure)	Amount sold	Amount obtained

SECTION I. ESTIMATED ANNUAL INCOME:

H11. Indicate relative estimated annual incomes earned from the activities performed by the head of the household

No.	Types of activities	Estimated annual income	Farmer own rank of his/her priority 1 – 4 (High – Least)
1.	Income from the sales of crop		
2.	Income from the sale of livestock		
3.	Casual employment – eg sale of		
4.	Business- Trade and petty trade		
5.	Permanent employment		
6.	Craft and art- including mechanics		
7.	Fishing including seaweed farming		
8.	Firewood collection/charcoal		
9.	Remittances		
10.	Other(s) (specify)		

Appendix 2: Checklist questions for formal lenders

1. Name of the institution
2. Year the institution was established
3. Are there any legislations that support its establishment ?
4. What is the scope of the operations and area covered by the institution?
5. What is the total size of the loan portfolio?
6. Who are the target beneficiaries and preferred sectors for lending?
7. What proportion of the loan portfolio allocated for each sector?
8. Are small farmers also the beneficiaries of your organization?
9. What amount has been disbursed to farmers over the last 5 years?
10. Indicate the number of farmers who have benefited from your credit services over the last five years?
11. Indicate the types of loan provided (short, medium and long-term)
12. Briefly explain the procedures followed for loan application, appraisal and loan disbursement
13. What are the borrowers eligibility criteria in use by your organization?
14. What kind of loan security/collateral used by your organization for lending to smallholder farmers?
15. Is there any grace period given, if yes, how is it set?
16. What are rates used by your organization for lending and for deposits?
17. What is the minimum and maximum amounts that can your organization have set for lending to different categories of beneficiaries?
18. How loan repayment is organized and enforced?
19. What kind of obstacles your organization is facing in extending loans to smallholder farmers?
20. Give your own opinion with respect to credit for smallholder farmers?
21. Indicate what need to be done to improve access to credit for smallholder farmers