IMPACT OF ACCESS TO MICROFINANCE SERVICES ON FARM HOUSEHOLDS' INCOME IN IRINGA REGION, TANZANIA

HARUNI JEREMIA MAPESA

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ABSTRACT

Most development proponents believe that microfinance can change the livelihood of poor households. Microfinance are said to smoothen consumption and alleviate capital constraints of poor people. However, despite these possible roles of microfinance, empirical evidence on its impact on poor households remains divisive. This thesis is about the impact of microfinance services on selected rural farm household crop income and asset accumulations. It provides empirical information in a Tanzanian context on the nature and extent of the impact of access to microfinance services on farm income, farm investments, financial savings, and physical asset accumulation on rural farm households. The study also explored the factors affecting farm household decisions to participate in microfinance institutions and the nature, extent and determinants of demand for credit of farm households. The study involved a survey of rural farm households in Mufindi, Njombe, and Kilolo districts in Iringa region of Tanzania. A sample size of 419 households was involved of which 200 were microfinance members and 219 were non-members. Results show that participation decisions are affected by instability of crop income, level of education, availability of non-farm income, age, and assets endowment. Demand for credit is found to be affected by loan duration, location, and type of microfinance program, education, and dependents ratio. Regarding the impact of MFIs services on households, the study has found mixed results. MFIs services have positive but insignificant impact on crop income levels and farm variable inputs. Results show positive and significant impact on savings and asset accumulation. In order for MFIs services to have impacts on farm households' crop income, three

policy responses are proposed: One, formation of specialized agricultural microfinance banks to deal with unique credit needs of farm households. Two, investment in social, agricultural, and transportation infrastructure in rural areas to enhance agriculture production and transportation. Three, reforms on marketing of agricultural products policies to alleviate volatility of prices. Future researches can use panel data, randomized controlled trials (RCTs) and involve more farm households in more regions of Tanzania.

DECLARATION AND SIGNATURE OF SUPERVISORS

I, Haruni Jeremia Mapesa, hereby declare to the Senate of Sokoine University of Agriculture that, this thesis is my own original work and that it has neither been submitted nor being concurrently submitted for higher degree award in any other institution.

Signature.....

Date.....20/11/2012.....

SIGNATURES OF SUPERVISORS

Signature ..... Date.....21.11.2012.....

Professor Melchior. E. Mlambiti (Supervisor)

Signature..... Date.....21/11/2012.....

Dr. Damas Philip (Supervisor)

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DEDICATION

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LIST OF ABBREVIATIONS

BoT	:	Bank of Tanzania
BRAC	:	Bangladesh Rural Advancement Committee
CGAP	:	Consultative Group for Assisting the Poorest
CRDB	:	CRDB Bank Plc
FINCA	:	Foundation for International Community Assistance
GDP	:	Gross Domestic Product
MFIs	:	Micro Finance Institutions
MuCoBa	:	Mufindi Community Bank
NBC	:	National Bank of Commerce Ltd
NGO	:	Non-Governmental Organization
OLS	:	Ordinary Least Squares
PRIDE	:	Promotion of Rural Initiative and Development Enterprises
PTF	:	Presidential Trust Fund
REPOA	:	Research for Poverty Alleviation
SACCOS	:	Savings and Credit Cooperative Societies

SEDA	:	Small Enterprise Development Agency
SELF	:	Small Enterprises Loan Facility
SIDO	:	Small Industries Development Organization
TAS	:	Tanzanian Shillings
URT	:	United Republic of Tanzania

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Microfinance services is a general tem describing the practice of extending small (micro) loans and other financial services, such as savings accounts and insurance to poor borrowers for income generating self- employment projects (CGAP, 2007). Microfinance institutions (MFIs) which are the core providers of microfinance services seek to pursue a double bottom line- to achieve and demonstrate social as well as financial performance (Morduch,2000). The role of microfinance institutions differs from one context to another: Filling gaps in financial markets, providing risk tools to vulnerable groups or individuals, allowing micro-entrepreneurs to take advantage of economic opportunities, and building social networks (Hartarska and Nadolnyak, 2008). The missions of different MFIs could be seen to vary considerably; some focus on serving the poor clients, others on improving the economic well-being of a more broadly defined target group, and some aim at addressing social as well as economic issues (CGAP, 2004; Schreiner, 2001; Cheston and Kuhn, 2002; Umara *et al.*, 2011; Tchouassi, 2011).

Microfinance institutions are not new in Africa, and worldwide, they have gone through a number of changes from their beginning. In the past it was not given appropriate emphasis as people's development tool, (Robinson, 2001). Informal savings and credit groups that have operated for centuries as microfinance institutions include the Susus of Ghana; Chit Funds in India; Tandas in Mexico;

Arisan in Indonesia; Chetu in Sri- Lanka; Tontiis in West Africa; Panasuka in Bolivia; as well as numerous savings clubs and burial societies found all over the world, (CGAP, 2003).

Morden microfinance institutions evolved in the 1970s. They started as organizations that offered loans and savings to individuals at the margin of financial markets. Some examples are the Bank Rakyat Indonesia, FINCA, ACCION International, and Grameen Bank of Bangladesh, (Koveas and Randhawa, 2004; World Bank, 2003). Today MFIs are organizations that provide a range of small-scale financial services to disadvantaged persons with the aim to improve their capacity to take their development in their own hands (Robinson, 2001). MFIs can be characterized by their clients, their specific mission and objectives (Morduch, 2000; Shahidur *et al.,* 1998; Coleman, 1999; Johnston and Morduch, 2007). Microfinance clients are typically low-income persons who are self employed or salaried employees such as factory workers. In rural areas, they generate some income from farming, food processing or trade at local markets whereas in urban areas they tend to be shopkeepers, street vendors, entrepreneurs, service providers, and craftsmen whose activities may sometimes be seasonal but appear more or less stable (Ahmed, 2009; World Bank, 2003).

In Tanzania, microfinance institutions were not given attention as peoples' development tool until the early 1990s (Wangwe, 2004; URT, 2001). The government extensively controlled the financial sector with the professed purpose of directing financial resources towards socially and economically desirable activities (Temu, 1994; Wangwe, 2004). This involved government ownership of banks,

control on interest rates, and directing credit towards' priority sectors at subsidized rates (URT, 2001). However following major failure of state owned financial institutions (*e.g.* Tanzania Housing Bank-THB) in the early 1990s the government of Tanzania, through the support of the World Bank and the International Monetary Fund (IMF) adopted economic reforms. The reforms aimed at increasing growth, encouraging private sector development, market integration and industrial competitiveness (URT, 2001; Wangwe, 2004). Major financial policy actions included liberization of interest rates, elimination of administrative credit allocation, strengthening the central bank's (Bank of Tanzania) role in regulating and supervising the financial institutions, restructuring state owned financial institution, and allowing entry of private sector banks into the industry (URT, 2006). The reforms underscored the importance of allowing financial institutions to develop their own financial services on the basis of their own objectives and set interest rates according to market forces. This in turn would facilitate faster development of financial markets and services and thus enhancing access of microfinance to majority of Tanzanian especially in the rural areas.

To enhance access to microfinance in both urban and rural areas of Tanzania, the government established a microfinance policy in 2001. The policy invites the donor community to facilitate the development of micro finance institutions. The policy articulates the vision and strategy for the development of sustainable microfinance industry as an integral part of the financial sector, specifying the respective role of the key stakeholders- the government and its principal agencies, institutional providers of microfinance services and the donor community (URT, 2001).

Since the implementation of the national microfinance policy, there has been good progress toward the establishment of the microfinance institutions in Tanzania. There are now more than 1800 microfinance institutions operating in Tanzania (BoT, 2011). These include donor funded microfinance institutions, community banks, village or ward banks, and cooperative societies. The principal microfinance providers (especially in rural areas) are the Savings and Credit Cooperatives Societies (SACCOS), government supported organizations (*e.g.* SIDO, SELF, PTF,) community banks and foreign donor- assisted Non – governmental Organizations such as PRIDE, FINCA, DUNDULIZA, BRAC and SEDA (BoT, 2011).

Indeed ensuring access to credit among rural poor population for augmenting agricultural production, alleviating poverty and improving the efficiency of rural credit delivery systems has been an area of focus in the planning process in Tanzania (*e.g.* Kilimo Kwanza- agriculture First vision, URT, 2001; URT, 2009). The government assumes and believes that microfinance organizations can alleviate financial liquidity constraints, stabilize consumption and thus impact both income and consumption for the poor, thereby augmenting the poor's welfare. The poor are expected to use financial services to invest in health and education, manage household emergencies, and meet the wide variety of other cash needs that they encounter (Littlefield *et al.*, 2003).

According to proponents of microfinance schemes (*e.g.* Yunus, 2006) microfinance around the world can increase household income, build assets, and reduce vulnerability of poor households and individuals. Access to financial services can also translate into better nutrition and improved health outcomes, such as higher

immunization rates. Microfinance institutions services can also allow poor people to plan for their future and send more of their children to school for longer, make women more confident and assertive and thus better able to confront gender inequalities (Makombe *et al.*, 1999; Tchouassi, 2011; Umara *et al.*, 2011).

The potential of microfinance as a development tool to break the vicious cycle of poverty has been widely voiced (CGAP, 2004, 2007; Buckley, 1997). However empirical evidence on rightful impact of microfinance remains controversial. The extent to which microfinance has over their existence contributed to poverty reduction is non-uniform. Previous rigorous studies that report positive relationship between credit and outcome are scanty and face criticisms (Pitt and Khandker 1998; Khandker, 2005; Duvendack and Plamer-Jones, 2011). Nevertheless recent rigorous microfinance impact studies provide less positive evidence of impact on the wellbeing of the poor than earlier studies (Karlan and Zinman 2010; Duvendack *et al.*, 2011).

While the actual impact of microfinance remain partial and contested, the need for microfinance services impact information is increasingly becoming important (Duvendarck *et al.*, 2011; Roodman and Morduch, 2009; Rosenburge, 2010). Establishing the correct causal relationship between microfinance services and the expected outcomes to beneficiaries is becoming a critical issue among practitioners, donors, researchers and policy makers (Osman, 2007; Hulme, 2000; CGAP, 2007; Roodman and Morduch, 2009; Rosenburge, 2010). Empirical evidence is demanded to demonstrate the extent to which small (micro) loans, savings, insurance and other financial services extended by microfinance institutions to poor people transform

their lives. Stakeholders of microfinance are interested in knowing the extent to which microfinance institutions have changed the economic and social lives of the people whom they serve. Microfinance impact assessment studies are seen as medium for renewing the aspiration of proponents of microfinance of putting poverty to the museum in the long term and activating the confidence of both private and social investors in MFIs.

The need for impact studies in the microfinance industry is also the results of some reasons that are specific to the microfinance sector and others reflect the wider current development thinking. First, the global expansion of more commercially oriented microfinance institutions have reinvigorated a longstanding debate over dynamic trade-off between current impacts, financial self-sustainability and long term growth and hence future impacts potential of microfinance (Tucker, 2001; Brau and Woller, 2004; Woller *et al.*, 1999 ; Morduch, 2000; Woller, 2002; Zeller and Meyers, 2002; Copestake and Williams, 2011). Secondly there has been a tendency to underestimate the complexity and diversity of microfinance impact pathways in different context and to different people around the world (Hulme, 1993; Zeller *et al.*, 1997; Diagner and Zeller, 2001; Duvendack *et al.*, 2011; Copestake, 2011), and thus over-generalisation about expected impacts from standard products. The results have been excessive optimism about the likely impacts and an emphasis on overly standard and simplistic models that are easily scaled up through replication (Buckley, 1997; Copestake and Williams, 2011).

Thirdly there is a broader influence in development thinking which include renewed perspective for evidence based policy with more reliable evaluation methodology

and systematic literature review (Roodman and Morduch, 2009; Roodman, 2011; Fischer, 2010; Copestake and Williams, 2011; Duvendack and Palmer-Jones, 2011). Policy decisions involve structural adjustment and consume massive funding at both the micro (MFIs) and macro (government) level, they therefore have to be implemented basing on reliable empirical findings.

Fourthly microfinance has been linked to strategies for achieving the Millennium Development Goals-MDGs (Littllefield *et al.*, 2003; Imai *et al.*, 2010). The MDGs among other objectives seek to improve the welfare of the world's neediest people around the world in the aspects of hunger reduction, elimination of HIV/AIDS and infectious diseases, empowerment of women, improvement in health, education of all children and reduction of children mortality (Littlefield *et al.*, 2003; Imai *et al.*, 2010; Mahjabeen, 2008; Goldberg and Karlan, 2008). Thus microfinance impact studies act as bases for comparing alternative MDGs strategies in the developing world.

1.2 Statement of the Problem

The contention around microfinance is its ability to lift people out of poverty by raising incomes through alleviation of capital constraints and consumption smoothing. At the international and Tanzanian context, high loan repayment rates among borrowers (Malimba and Genasen, 2009; Nawai and Shariff, 2010; Onyenucheya and Ukoha, 2007), repeated uses of microfinance services- the market test (Rosenberg, 2010; Copestake and Williams, 2011) and sustainability prospects of MFIs (Satta, 2006; Brau and Woller, 2004; Schreiner 1999, 2001, 2002) have sometimes been causes for rejoicing and evidence of MFIs impacts (Buckley, 1997;

Cull, *et al.*, 2007; Duvendack *et al.*, 2011). However empirical evidence on the actual impact of microfinance both internationally and in Tanzania is not straight forward. The impacts of microfinance programmes and institutions on participants' livelihood remain partial and contested (Hulme, 2000; Johnston and Morduch, 2007, Stewart *et al.*, 2010; Roodman and Morduch, 2009; Duvendack *et al.*, 2011; Ferreira, 2004).

At one end are empirical studies arguing that microfinance have very positive economic and social impacts (Otero and Rhyne, 1994; Hashemi *et al.*, 1996; Khandker *et al.*, 1998; Pitt and Khandker, 1998; Khandker, 2005; Puhazhendhi and Jayaraman, 1999; Ruben and Clercx, 2004, Mohamed, 2003; Kessy and Urio, 2006; Dupas and Robinson, 2008; Imai *et al.*, 2010; Ghalib *et al.*, 2011). Studies at this end point out that microfinance has assisted participants to raise income, consumption, and net worth, thereby increase the probability that programme participants lift themselves out of poverty.

At the other end there are studies which caution the optimism of microfinance and indicate that microfinance have no or sometimes have negative impact on participants' income and other livelihood variables (Buckly, 1997; Montegomery, 1996; Mosley and Hulme, 1998; Coleman, 1999; Zeller and Diagner, 2001; Kuzilwa, 2002; Kantor and Erna, 2007; Chanana, 2007; Banerjee *et al.*, 2009; Karlan and Zinman, 2010; Stewart *et al.*, 2010; Duvendack and Palmer-Jones, 2011). Studies at this end point out that poor people live in a fragile environment such that returns on their activities are volatile and inadequate to cover high interest on microcredit. In some instances poorer borrowers taking small loans rarely invest

in new technologies, businesses or fixed capital as a consequence micro credit to such borrowers have been spent on basic needs (illness, education and other social expenses) thus insignificant or negative impacts on income levels and other welfare variables (Fischer 2010; Stewart *et al.*, 2010; Duvendack *et al.*, 2011).

The contention of impact studies stems from methodological issues and context (location and sector of economy) of existing studies (Hulme, 2000; Brau and Woller, 2004). Some studies have compared microfinance beneficiaries against non-beneficiaries on outcome variables of interest using descriptive statistics and qualitative analysis without addressing the key methodological issues such as selectivity bias, attribution, and fungibility (*e.g.* Mustafa *et al.*, 1996; Montegomery *et al.*, 1996; Kuzilwa, 2002; Frazer and Kazi, 2004; Mohamed, 2003; Kessy and Urio, 2006). Other studies have employed rigorous econometric analyses which minimize the effects of such methodological issues (*e.g.* Khandker *et al.*, 1998; Pit and Khandker, 1998; Coleman, 1999; Diagner and Zeller, 2001; Imai *et al.*, 2010). Overtime researchers have used different methodologies well suited to and appropriate for the circumstances of the research setting and samples. However, it has been argued that the most appropriate approach for impact studies should control selection bias in order to avoid over or under estimation of the impacts (Hulme, 2000).

In Tanzania most of impact research works have been descriptive and qualitative in nature and have not addressed selection bias problem and other methodological issues (Makombe et al., 1999; Kuzilwa, 2002; Frazer and Kazi, 2004; Mohamed, 2003; Kessy and Urio, 2006). Furthermore, majority of these studies have focused

on beneficiaries whose main economic activities are non-farm businesses and urban or semi-urban based business enterprises (Kuzilwa, 2002; Frazer and Kazi, 2004; Kessy and Urio, 2006; Satta, 2006). The available studies that have studied MFIs services on rural farm households are such as by Temu (1994) and Rweyemum *et al.* (2003). However, these studies are not impact studies but rather investigate outreach structure and performance of rural MFIs respectively.

Using analytical approaches that have not been used in the Tanzanian context to overcome selection bias and attribution issues, this study uses multivariate techniques (instrumental variable), and Heckman Model to address these issues and other impact methodological issues. The study aimed at contributing to the contested and limited information on the extent to which microfinance institutions impact farm households crop income, farm investments, savings, and asset accumulation in rural areas of Tanzania. The study further shows how smallholder farmers' specific characteristics affect participation in MFIs and extent of credit demand of farm households members in rural areas of Tanzania.

Unlike other non- farm economic activities undertaken by the low income earners (commerce, trade and manufacturing) who live and carry their activities in urban and rural trade centres, rural farm households tend to live in remote rural areas characterised by volatile agricultural output (due to droughts and floods) weak and fragmented markets for goods and services, underdeveloped infrastructure, and fluctuating agricultural prices (Siamwala *et al.*, 1990; Khan 1991; Quareshi and Shah, 1992; Conning, 1999). These factors have severe implications on farmers' production costs and return on agricultural activities. MFIs in these areas have high

lending costs, greater risks and high administrative costs due to poor infrastructure and delegation (Schreiner, 2001; Conning, 1999). Given these unique features of the agricultural sector and the rural economy in Tanzania and elsewhere, results from previous impact studies in other sectors of the economy cannot be directly extrapolated to rural farm economy context.

The present study results may be useful for understanding about the facilitating factors for participation in MFIs, the socio-economic factors within or beyond the control of policy makers that determine whether microfinance intervention can benefits poor households in rural areas. Results may be useful in identifying the factors underlying the savings of farm households and the extent to which MFIs can reach farm households savings needs. Thereby designing appropriate policies that can address savings of farm households and enhancing mobilization of resources of the poor and channelling such resources to productive investments in rural areas of Tanzania. MFIs impact results would further be useful for government policy makers and social investors in microfinance to make comparison against other alternative ways of poverty alleviation strategies such direct interventions in health, education and physical infrastructure in rural areas of developing countries.

1.3 Objectives of the Study

1.3.1 Overall Objective

The overall objective of this study was to assess the impact of microfinance services on rural farm households' income and savings in Iringa region, Tanzania.

1.3.2 Specific Objectives

i. To identify the specific socio-economic characteristics of rural farm household which affect the decision to participate in MFIs.

ii. To examine the determinants of demand for MFIs credit among rural farm households.

iii. To examine the impact of MFIs services on crop income of rural farm household

iv. To examine the impact of MFIs services on financial savings of rural farm households.

v. To examine the impact of MFIs services on physical asset accumulation of rural farm households

1.4 Research Questions

The study intended to address the following specific questions:

i. What are the specific socio-economic factors affecting rural farm household from participating in microfinance institutions in Iringa region?

ii. What is the extent of credit demand of farm household and what factors affect demand for MFIs credit among rural farm household in Iringa region?

iii. What is the extent of the impact of MFIs services on crop income of rural farm household in Iringa region?

iv. What is the extent of the impact of MFIs services on financial savings of rural farm households in Iringa Region?

v. What is the extent of the impact of MFIs services on physical asset accumulation of rural farm households in Iringa Region?

1.5 Limitation of the Study

The major limitation of the other study is its external validity. That is, the study was confined to one region of Iringa in Tanzania. Therefore with due recognition of varying climatic, culture and infrastructural developments across the regions in Tanzania, results can only be extrapolated to regions with close or similar characteristics.

1.6 Organization of the Thesis

This thesis contains five chapters. Chapter one deals with the general introduction of the study which covers the background information to microfinance services as a development tool, statement of the problem, objectives of the study, and rationale for the study. Chapter two focuses on the review of related literature. The chapter presents definitions of key terms used in the study, theoretical and conceptual relationship between microfinance and development theories. The chapter further establishes a foundation for the theoretical and conceptual framework of the study, methodological approaches relevant and applicable for the study and tracking previous impact results which can be used for comparing with this study results.

Chapter three provides information concerning the methodological approach of the present study. It presents relevant information on the selected study area, sample size and sampling techniques used in the study. The chapter further discusses in details the analytical approach used in analysing the collected data to achieve the

study objectives. Chapter four presents the analysis, study results and discussion of results. The results are presented in tables while the discussions of results follow an integrative approach that is discussions are presented alongside results of each objective.

Chapter five is the final chapter of the thesis. It summarizes the major findings and provides conclusion based on the findings of each objective. The chapter also provides policy recommendation, contribution of the thesis, limitation of the thesis and suggestions for future research areas.

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition of Key Terms and Concepts

2.1.1 Finance

Finance comprises funds obtained by an economic unit to meet operating and investment needs (Meyer, 2002). An economic unit (Firm or household) needs funds to replace the existing and worn out or obsolete equipment or to acquire additional working capital (Blake, 2000). Several ways exist which can be used by an economic unit to finance its requirements. These include funds from savings or retained earnings from existing activities of the unit, taking out bank loans or issuing equity shares or bonds (Blake, 2000). In this study finance has been referred to as any fund or money procured by household to meet consumption, operating or investment needs.

2.1.2 Microfinance

Microfinance is a supply of loans or savings and other basic financial services to the poor (CGAP, 2003). Otero and Rhyne (1994) defined it as the provision of financial services to low income poor and very poor self employed people. Schreiner (2001) says it is an attempt to improve access to small deposits and small loans to poor households neglected by banks. Generally the definition provided by different authors indicates that microfinance is provision of any financial services for the poor, the major types of such services being loans (credits) and savings. Conceptually this has been the definition of microfinance in this study.

2.1.3 Microfinance industry

Microfinance industry is the sector that involves the provision of a range of small-scale financial services to disadvantaged (poor) persons with the aim to improve their capacity to take their development in their own hands (Robinson, 2001). The microfinance industry can be characterized by its clients, the specific needs and the access to financial services, (Modurch, 2000; Khalily, 2004). Microfinance industry players are the microfinance providers, clients, governments, donor community, and the society at large (CGAP, 2004; Wangwe, 2004). Clients of microfinance industry are typically low-income persons who are self-employed or salaried workers. In rural areas, they generate some income from farming, food processing or trading at local markets whereas in urban areas they tend to be shopkeepers, street vendors, entrepreneurs, service providers, factory workers and craftsmen (Robinson, 2001; Woller, *et al.*, 1999).

2.1.4 Microfinance institutions

Microfinance institutions are organizations designed to provide financial services to the poor (Morduch, 2000; CGAP, 2003). They are institutions that intend to provide financial tools to vulnerable groups of individuals, micro-entrepreneurs, and neglected society groups (Schreiner, 2001; Brau and Woller, 2004; Hartarska and Nadolnyak, 2008).

Chijoriga *et al.* (2009) distinguish six different types of microfinance institutions that exist throughout the world. These are: special commercial bank schemes, intermediary projects, government implemented credit schemes, grassroots savings and credit cooperative (SACCOS), parallel NGOs projects, and poverty focused

development banks. The description of these MFIs as shown by the Chijoriga *et al.* (2009), Wangwe (2004), Rugambey (2005), and Amin and Sheikh (2011) are as follows: *Special commercial schemes* exist when commercial banks run a small window that lends for micro-enterprises under the auspices of the government owned banks. The window is operated as a "credit guarantee Scheme" through which the bank received funds from the government or donors sources. *Intermediary programmes or programmes* are run by NGOs or government agencies and extend credit for micro enterprises that have no access to formal financial systems. *Government Implemented Credit Schemes* are operated under the ministry of agriculture with the local government officials being responsible for running operations.

SACCOS are formal membership organizations governed by state legislation, comprising people having some form of common bond and agreeing to save money together and lending it to one another. *Poverty Focused Development Banks* generally starts out as intermediaries, parallel or SACCOS type projects, but eventually decide to seek official registration as formal banks generally after reaching a sufficient client outreach.

The definition of microfinance institution is embedded in the mission, objective, and scope of the institution. In this study, MFIs have been defined to be any formal organization whose mission is to alleviate poverty through provision of financial services such as savings, credit or insurance to poor clients.

2.1.5 Access to microfinance services

Access to microfinance as Diagner and Zeller, (2001) define it, is a condition when a household is able to borrow from that source, although for a variety of reasons it may choose not to. Diagner and Zeller (2001), and Sharma *et al.,* (2004), measured access to microfinance by reference to credit limit a borrower is given (maximum amount allowed to borrow). Pitt and Khandker (1998) and Khnadker (2005) measured access to credit as the cumulative amount borrowed by the member. Coleman, (1999) measured access to microfinance using membership length (in months) of the farm household in a particular microfinance institution.

In this study, access to microfinance institutions among farm household is measured in two ways. One is the outstanding amount borrowed at the time of survey. Two is the membership time length in months of the farm household with a particular MFI. These two variables were chosen because they were easily observable and collectible during the survey. Credit limit was not observable because farm household could not know how much was the credit limit allocated to them by MFIs officers in a specified period of time. Obtaining credit limit allocated to surveyed households from MFIs officials was operationally difficulty during the survey.

2.1.6 Assessment of Impact of Access to MFIs

Impact assessments, as Hulme (2000) defines it, is the process of assessing the differences in the values of key variables between the outcomes on 'agents' (individuals, enterprises, households, community, populations, policymakers, etc) which have experienced an intervention against the values of those variables that would have occurred had there been no intervention. In the microfinance industry,

Hulme (2000) highlights that MFIs provide different services to client, most commonly in the form of loans and savings. These services modify or change clients' micro-enterprise activities which in turn lead to increased or decreased micro-enterprise or household income.

Literatures on microfinance impact (Khalily, 2004; Hulme, 2000; Khnadker, 1998) classify outcomes into intermediate outcomes and end-outcome. Intermediate outcomes include impact on: income, consumption expenditures, assets accumulation, savings, child education, nutrition intake, and employment while poverty reduction is the end-outcome. These outcomes exhibit themselves differently on the agent. At the enterprise level and household, impacts may include increased revenue, profit, assets, and employment, among others (Sinha and Imran, 1998; Barnerjee and Duflo, 2010). At the individual level, impacts can be seen in form of women's empowerment, increase in personal savings, wages and investments (Khandker, 1998b; Hulme, 2000; Imai *et al.*, 2010).

In this study the definition of microfinance impact stated above has been adopted. The assessment involved analyses of changes on the outcome variables on microfinance members. Impact variables assessed are crop income, savings, and farm variable inputs.

2.2 Description of Microfinance Industry

2.2.1 Models of microfinance institutions

Although the first MFIs appeared in Asia some decades ago, they have since spread to Latin America, Africa, and to former socialist economies in transition and even

the United States (Koveos and Randhawa, 2004; Schreiner, 2002). The organizational forms, scope, funding sources have evolved over time, in large measures through trial and error (Schreiner, 2002).

The work by Koveos and Randhawa (2004) provide a comprehensive review of literature that have tracked the evolution and models of microfinance institutions. In Table 1 the major models and the characteristics of majority of microfinance institutions are summarized. The Table shows that there is a range of models characterizing differences in organizational forms, funding situations, monitoring mechanism, and the nature of regulation- both internal as well as by regulatory authorities. Overtime the defining feature of MFIs is a broad commonality of target groups- low income households and individuals denied access to the formal financial system (Karlan, 2007; Barnerjee and Duflo, 2010). Micro-finance institutions have since evolved to include the provision of a wide range of financial services such as deposits, loans, payments services, and insurance to low-income households and their micro enterprises (Schreiner, 2001; Koveos and Randhawa, 2004).

Table 1: Models of microfinance institutions

	Grameen,Bank Model (Bangladesh)	BRAC Model (Bangladesh)	Co-operative model (Sri-Lanka & South-Pacific)	Village Bank model (Indonesia)
Type of institution	Licensed Bank	NGO	Owner-managed firms	Limited Bank
Target Group	Poor women who do not possess significant assets	Poor households	All households that cannot access financial services from the banking sector	Rural households and micro-enterprises
Type of loan	Small loans for short duration at a rate of interest above inflation rate and cost of capital	Small loans for short duration	Savings mobilization from members and distribute the funds among members at lower cost	Recycling of rural savings through small loans
Regulation of services	Small groups take responsibility for mutual assistance and collection of small amount of money regularly. Can also use the law to protect themselves	Socially oriented where the group approach may not be used to deliver and regulate the services	Members are held responsible as they have equity interest in the performance of the MFI	Legal status enforcing provided
Funding	Financial institutions	NGO supply the funds until group can access funds from the financial system	Savings mobilization of members	Financial institutions but the funds supplied also savings from rural households
Allocation of Funds	'Peer group' procedure for selection clients, risk management and loans repayment commitment	Socially oriented towards the needy based on local circumstances	Allocation to all members where are mutually responsible	Same basis as normal bank except that the bank is not at a fixed place and is closer to rural households

Source: Koveos and Randhawa (2004)

Microfinance model today have evolved along the Grameen Bangladesh and Bank Rakyat Indonesia operational principles and the primary inspiration remains that of

effective poverty alleviation (Koveos, and Randhawa, 2004; Chowdhury, 2010).

2.2.2 The differences between microfinance and traditional banking

Microfinance institutions have evolved to resolve among others, the problem of information asymmetry of poor households when seeking financial services from mainstream banks (Stigliz and Weiss, 1981; Koveos and Randhawa, 2004; Karlan, 2007). There are several features that distinguish microfinance institutions from main stream banks. These features are summarized in Table 2.

Table 2: Distinguishing Features of Microfinance Institutions from Banks

Operational Issues	Banks	MFIs
Lending	Interest rate main issues for borrowers, Moderate interest rates	Access to credit more important than interest rates High interest rates
Client relationship	Arm's length	Intimate knowledge of client's business necessary, active collaboration to ensure client's success
Security	Collateral	Collective monitoring, reputation, etc.
Client base	Small	Large base necessary for viability
Administrative costs	As proportion of total costs-lower than at MFIs	High, reflected in high loan rates

Source: Koveos and Randhawa (2004)

Woller and Parson (2002) indicated that banks and other main stream financial institutions do not address the financing needs of the poor in developing countries; this is due to the nature of the traditional banking. Traditional banking is based on

guarantees, reputation, collateral, timely and accurate information, and a continued maintenance of records (Armedariz de Aghion and Grollier, 2000). In the contrary the projects that most poor borrowers would undertake are small scale, requiring small loans (Snow and Buss, 2001). Therefore the cost of obtaining the necessary information necessary to select borrowers, evaluate their creditworthiness, monitor the use of loans, and enforce repayment outweigh the potential profits to most lending institutions (Coleman, 2006; Barnerjeen and Duflo 2010).

Poor and low-income households and individuals are the primary clients of microfinance institutions (Woller and Parson, 2002; Snow and Buss, 2001; Schreiner, 2002). Microfinance clients do not possess a credit history; have no or little wealth to put up as collateral to back up loans (Robinson, 2001). With innovations microfinance institutions have managed to address the collateral and information asymmetry problems through group lending, social cohesions and the objective behind is self-help and empowerment, not donations (Yunus, 2006; Wydick, 2001).

2.2.3 Microfinance sector policy reforms in Tanzania

The government of Tanzania through the Ministry of Finance initiated a major financial reform in 1991 (URT, 2001). The reform among other issues included the formulation of a national microfinance policy in 2001 that would provide a general framework on the provision of microfinance services in the country. The national microfinance policy's objectives is serving as a guide for coordinated intervention by the respective participants in the sector and describing the roles of the implementing agencies and the tools to be applied to facilitate the development of

microfinance institutions. The overall principals of the microfinance policy 2001 are to achieve widespread access to microfinance all-over the country through the use of institutions; best principles that combine commercial financial techniques with service delivery techniques to the circumstances of low-income clients; pricing decisions not to be intervened by the government; and microfinance programmes use techniques and products to the circumstances of low-income clients.

2.3 Theoretical Framework of the Impact of Finance on Household Economic Development

The role of finance is embedded in macroeconomics theories. Two major macroeconomic development theories exist: The exogenous economic growth theories -the Solow Model (Goldsmith, 1969; Mckinon, 1973; Mankiw, 2007) and the endogenous economic growth theory (Mankiw, 2007). In the exogenous growth theories, factor accumulation is considered as the main driving force of economic growth. Financial development can contribute to economic growth through increasing productivity of total factors of production by either increasing the marginal productivity of capital (Goldsmith, 1969) or improving the efficiency of capital allocation so as to increase the aggregate savings rate and investment level (McKinnon, 1973; Shaw, 1973). However, the assumption that technology is exogenously determined in the exogenous framework, the capital stock suffers from diminishing returns to scale, which in turn limits the impact of financial development (Mankiw, 2007).

The endogenous economic growth theory pioneered by Romer (1986) provides important insights and new theories, underpinning the analysis of relationship

between financial development, productivity and growth. In this context of literature, endogenous economic growth theories take technology as endogenous such that its continuous progress might result into non-diminishing marginal returns to capital through research and development; along with their positive externalities on aggregate enhance productivity (Mankiw, 2007).

Consequently the role of financial intermediation in raising productivity has been re-enforced by various empirical studies on portfolio diversification and risk sharing via the stock markets. Studies such as by Levine (1991), Saint-Paul (1992), Liu and Hsu (2006), Levine (2004), and Snow and Buss (2001) indicate that financial development affects long-run growth through different channels and various aspects of innovations or productive activities. Empirical studies by Levine (1991), Vanroose and Bert (2009), and Mahjabeen (2008) indicate that financial institutions foster capital accumulation and higher productivity by increasing diversification and reducing risks, mobilizing savings, and allocating resources to their best uses. Further empirical support on the positive relationship between finance and growth include studies by Benhabib (2000), Levine *et al.* (2000), and Demirguc_Kunt and Levine (2008), Jeannery *et al.* (2006) and Levine (1997). These studies found that financial development affects growth through factor accumulation or factor productivity as suggested by the exogenous and endogenous development theories.

The economic growth assumption that marginal returns to capital are large when capital is scarce reinforces the proponents of MFIs (CGAP, 2004; Moll, 2005; Yunus, 2006) to suggest that MFIs can be a tool for economic growth and economic poverty alleviation in developing countries where the capital labour ratio is small.

Financial market imperfections in developing countries due to information asymmetry, and transaction costs constrain poor households, micro and small enterprises from accessing mainstream banks' (Stigliz and Weiss, 1981; Karlan, 2007; Fisher, 2010). Such exclusion from financial systems renders the poor to rely on their personal wealth or internal resources to invest in education, health, and productive activities, thus limiting them to take up opportunities and leading to persistent slower economic growth and vicious circle of poverty (Armendariz de Aghion and Gollier, 2000; Yunus, 2006; Moll, 2005; Barnerjee and Duflo, 2010). The evolution of microfinance institutions in the developing countries is advocated to alleviate this deadlock by providing similar products and services as formal sector financial institutions do, though the scale and methodology of delivery of financial services differ (Armendariz de Aghio and Modurch, 2004). The improvements in financial markets through microfinance in turn will foster economic growth and income levels of households through reduction of capital constraints.

2.4 Conceptual Framework of the Impact of MFIs on Household and Hypothesis of the study

2.4.1 Conceptual Framework

Microfinance services (credits, and other services) can affect production technologies choices and investment behaviour of farm households, and hence income of households (Jalilian and Kirkpatrick, 2005). Three major pathways are suggested upon which microfinance credit can affect farm household income and other livelihood variables (Morduch 1995; Diagner and Zeller, 2001; Zeller *et al.*, 1997; Khandker, 1998a; de Mel *et al.*, 2008). The first pathway is through the

alleviation of capital constraints that face poor household during planting and vegetative period of crops, and harvesting. During these periods farmers have cash flow problems to meet inputs and consumption requirements.

The second pathway is through technology adoption and risk taking behaviour of farmers. Farm household can easily adopt new and riskier technologies if they know that in case of crop failure they can resort to credit to mitigate consumption needs. The third pathway is through free cash flow approach. The positive impact of credit on farm output is through technical efficiency. That is the indebted farm households face repayment obligations, which encourages them to increase their efficiency to reduce wastes of factors of production.

Literatures (Pitt and Khandker, 1998; Zeller *et al.*, 1997; Diagner and Zeller, 2001; Khalily 2004; Zaman, 2001; Levine, 1997; Das and Ghoshi, 2006) show that MFIs can affect the behaviours and performance of economic agents such as households, and enterprises in a number of other ways. These include physical asset accumulation, financial savings, vulnerability, and consumption smoothing (health, education, nutrition).

MFIs can affect the saving behaviour of household in a number of ways. Firstly is when interest income is paid for financial assets saved at microfinance institutions. Secondly is when microfinance institutions design policies that link compulsory savings with membership or borrowings (Deaton, 1992; Navarajas *et al.*, 2000; Schreiner, 2001; Basu, 2008; Rosenzweig, 2001). Microfinance institutions can also affect savings and asset accumulation through the direct use of loans to purchase

productive and non-productive household assets (furniture, TV, appliances, radio, sewing machines, and construction of houses).

Theoretical and empirical Literature (Vanroose and Bert, 2009; Zaman, 2001; Morris and Barne, 2005; Pitt and Khandker, 1998) further indicate that microfinance institutions can also affect farm household livelihood through improvement in non-farm incomes. MFIs credits can alleviate capital constraints on rural non-farm petty businesses such as restaurants, local beer bars, food vendor, tailoring, used clothes businesses, consumer goods shops, agricultural implements shops (e.g. fertilizer, hand hoes, knifes, chemicals), and others (Hossain and Knight, 2008).

Despite the potential promises of MFIs (Meyers, 2002; Zaman, 1998b) evidences suggest that the potential impact of MFIs depends on who participates (socio-economic characteristics of participants) and the extent or depth of participation (Evans *et al.*, 1999; Shailesh, 2008)). The eligibility, selection process of members and the socio-economic characteristics of participants together with MFIs and location characteristics determine the extent of credit demand and ultimately the extent of impact (Robinson, 2001; Diagner and Zeller, 2001; Mosley and Hulme, 1998).

The decision to participate in various microfinance institutions among farm household is the outcome of both the demand and supply side factors (Schreiner, 1999). The demand side factors converge into judgements about the ability of the household to cope with microfinance institutions' conditions, factors of productions required and risks involved in the economic activities upon which credits funds are

to be invested (Reardon *et al.,* 1994). Evidences from previous studies show that farm household decision to participate in economic activities mainly depend upon household's asset endowment, household structure, government policy, and other facilitating factors (Reardon *et al.,* 1994; Reardon and Vosti, 1995; Dercon, 1998). While factors affecting participation in various economic activities (fishing, crop farming, and animal husbandry) in rural areas are well documented (Sessabo, 2006; Corral and Reardon, 2001; Masalu, 2000; Dercon, 1998; Reardon and Vosti, 1995), the factors affecting the decision to participate in microfinance institutions among farm households is an area yet to be explored in depth. Limited empirical evidences (Rweyemamu *et al.*, 2003) in Tanzania exist on why some households borrow or save while others do not. The extents to which socio-economic and demographic factors hinder or facilitate microfinance participation in rural areas of Tanzania are not well documented. The concern is therefore on identifying the most significant socio-economic and demographic variables for policy action.

As an economic activity, participation in microfinance institutions may similarly depend on socio-economic and demographic factors as suggested by Reardon and Vosti (1995). Household structure and asset endowment variables may determine the nature and extent of participation in microfinance institutions among farm households. Literature (Zaman, 1998b; Diagner and Zeller, 2001; Hartaska and Nadolnyak, 2008) show that household structure variables such as household size, dependents ratio, age of household head, and sex of household head reflect the experience, production capacity, consumption requirements, and labour force capacity of the household to manage investments in farm and non-farm activities.

This in turn may affect the decision of farm households on whether to seek credits from microfinance institutions to finance their farm and non-farm activities.

Being one of the household structure variables, dependency ratios of households indicate the labour availability in a household. Households with fewer workers may have a positive relationship with joining microfinance as a source of funds (credit) to mitigate labour constraint. The age of household head reflect experience and flexibility to changes and adoption of new idea and innovation (Hossain 1988; Khandker 1998b; Mahmud 2003). Age of household head has dominantly been used instead of experience of the household in most impact studies dealing with farm households (Pitt and Kandker, 1998; Coleman, 1999; Zaman 2001).

The gender of the household head may affect the decision to participate in microfinance institutions. Male and female have different perspectives and responses on social and economic activities in different societies. Empirical studies indicate contradicting findings on the decision to participate in microfinance due to gender of household head. While in Zanzibar context Mohamed (2003) found a positive relationship between male headed household and MFIs membership, Pitt and Khandker (1998) indicate that female headed households had higher propensity to join MFIs than male in Bangladesh context.

The types and the nature of the assets possessed by an individual household also influence the selection of the type of economic activities to be undertaken (Reardon and Vosti, 1995). Ellis (2000) and Carvey (1998) define asset as stock that generates returns in form of cash or in-kind. These assets include: human capital (size,

structure, education status, skills and experience), physical capital (*e.g.* land, and production tools) Social capital (networks and organization), natural capital (physical natural resources), and financial capital.

Asset endowment in form of land owned, total assets (productive, non-productive assets and livestock assets), and house quality reflect the economic ability of household to generate income and economic activity choice and thus decision to participate in microfinance programs (Reardon and Vosti, 1995; Zamani, 2001, Khandker, 1998b, Shahidur *et al.*, 2004). The housing quality of farm household reflects the ability of the farm household to collateralize the loan from microfinance institutions. Normally, possession of a quality house is perceived as security in case of loan default by microfinance lenders (Wenner, 1995). In microfinance institutions with group lending methodology normally peers in a group would sometimes self select on the basis of possession of good house which peers can have recourse in case of an individual group member failing to settle loans and interest due (Schreiner, 2001; Siamwala *et al.*, 1990).

The level of education of the head of household reflects the stock of skill and knowledge in the household. The position is that better educated household are more likely to cope with paper works involved in microfinance institutions and thus likelihood of joining the same (Zaman, 1998b; Khandker, 1998b; Coleman, 1999).

The financial assets of the household affect the participation decision both positively or negatively. Households whose income streams are high enough and considered well off may not be attracted by microfinance institutions because of the small loan

sizes and chain of procedures designed purposely by microfinance institutions to deter most of the rich people (Woller *et al.*, 1999). On the other hand some farm households who are willing and have varieties of non- farm income streams have high rate of participation due to ability to mitigate loan and interest repayment from diversity of income sources (Kantor and Erna, 2007). Thus the effect of non-farm income stream may not be straight forward and the interpretation is more contextual (Binswanger and Khandker, 1992).

Policy issues such as government interest rates, inflation, taxations, subsidies on agricultural inputs, and agricultural produce marketing interventions may significantly affect household economic activity selection (Reardon *et al.*, 1994; Reardon and Vosti, 1995). In that respect government decision such as provision of input subsidies such as chemical fertilizers or pesticides on a sustainable basis may positively or negatively influence input constrained farm household to join microfinance institutions. Similarly agricultural produce marketing policy decision such as production quotas or crops export restrictions and crop prices ceiling are more likely to affect farm household credit arrangements negatively (Buckley, 1997; Shaw, 2004).

The supply side factors that can affect participation of farm households in microfinance services revolve around the decision of the MFIs to locate in a particular village or sector of the economy or special group of poor people (Pitt and Khandker, 1998; Khandker, 1998b; Coleman, 1999). The supply factors are also reflected in the transactions costs such as frequency and lengthy of meetings, paper works, initial deposits, interests and search for group peers acceptable to ones

poverty level/status for group based institutions (Morduch, 1998; Woller, *et al*, 1999; Schreiner, 2001; Aryeetey, 2005).

While participation in microfinance institutions depends on socio economic characteristics of farm households, government policy and MFIs policy, in turn the impact of microfinance institutions depends on the extent to which members use MFIs services such credits (Mosley and Hulme, 1998; Coleman, 1999). The amount of funds procured by borrowers determine the type of investments (farm, non-farm or consumption) undertaken and the nature of capital asset procured and ultimately the extent of impact (Mosley and Hulme, 1998; Coleman, 1999; Copestake *et al.*, 2001).

Adopting the farm household model (Taylor and Adelman, 2003) and the demand theory, farm households are assumed to be economic units with rational decisions on questions such as how much labour to devote in a production process whether or not to use purchased inputs, which crop to grow and in which fields, how much funds to procure and from which source and so on (Reardon *et al.*, 1994; de Janvry and Sadoulet, 2001). From the basic law of demand, when all other factors are held constant, the demand for credit is a schedule of what the household is willing to borrow at different rates of interest (Samwelson and Nordhaus, 2006). When interest rate is fixed and demands for credit changes then the changes in demand for credit is the result of changes in other factors affecting demand. The elasticity of demand with respect to changes in any of the factors affecting demand reflect the degree of responsiveness of credit demand to changes in the particular factor.

Demand for credit can be assessed by looking at the nature of microfinance credit as a commodity. Some literatures (Von Pischke and Adams, 1980; Hulme, 2000) suggest that credit money or any money is fungible. That is money obtained from credit can be used for purposes other than initially intended for. The nature of the actual expenditure would determine the amount and timing of the loan requirements (Shailesh, 2008). If money is to be used for productive purposes as a source of capital to finance land, labour, technology, and capital assets, its demand would be a derived demand. The demand for credit under such circumstances would be a result of a trade-off between interest payments and the marginal returns on the economic activities for which credit is used (Reardon *et al.,* 1994; Lipsey and Christal, 2004; Harper, 2005). In turn the return on economic activities depends on risks involved (Blake, 2000; Harper, 2005). As Reardon *et al.* (1994) indicate the extent of risks depends on the nature of the economic activities undertaken (farm vs non-farm) and the ability of the household to mitigate risks associated with the economic activities.

The lending condition, procedure and capital capacity of the MFIs would also affect the extent of credit demand of household (Pitt and Khandker, 1998; Schreiner, 2001; Morduch, 2000). The lending procedure to members and credit disbursement conditions, and timing (compulsory savings, group lending, and collateral requirements) reflect the transaction cost and nature of investment to be undertaken on the part of household and capital capacity (managerial and financial capacity) on the part of the MFIs.

Conceptually farm household participation decision, extent of credit demand and extent of impact are interrelated. Fig.1 shows that the socio-economic characteristics

of farm households, location characteristics affect participation decisions. In turn MFIs participants' characteristics, location characteristics, and MFIs specific characteristics determines the extent of credit demand and through the production process (labour, land and technology), or otherwise credit demanded determines the extent of impact on crop income and/ or other welfare variables of farm households. The extent of credit demand also determines the extent of impact on non-farm income or asset accumulations though direct expenditure on household assets.

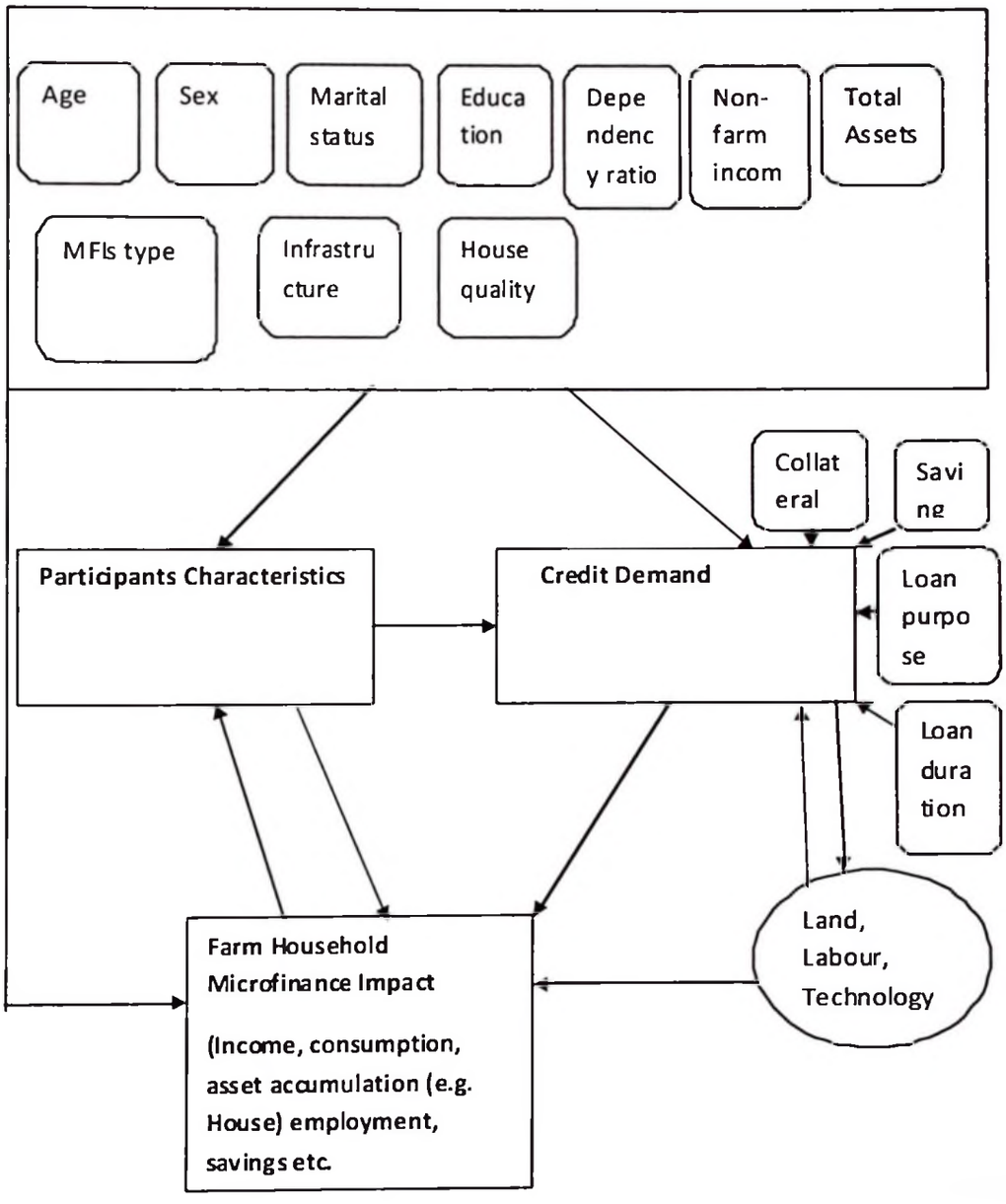

Figure 1: Conceptual framework of participation process, demand and the impact of access to credit on farm households

2.4.2 Hypotheses of the study

To attain the objectives of this study a number of hypotheses were formulated in accordance to the conceptual framework developed. Five hypotheses were

formulated in order to identify the strengths and the direction of the effect of stated variables on the dependent variables of interest.

2.4.2.1 Farm Household Decisions to Participate in MFIs

One of the objectives of this study is to identify factors that affect farm household decisions to participate in MFIs. It was hypothesised that rural farm household specific characteristics and location characteristics affect decision to participate in microfinance programs. To be able to identify the strength and direction of the effect of specific socio-economic and demographic variables, the following hypothesis was formulated as follows:

Hypothesis one: There is no significant relationship between rural farm household socio-economic factors and decisions to participate in MFIs services

2.4.2.2 Farm Household Demand for MFIs Credits

The second objective of this study was to assess the extent of credit demand and identify the major determinants of credit demand of farm household members in the survey areas. As indicated under conceptual framework, demand for credit among farm household who are members may depend on MFIs specific operational characteristics and household location characteristics. To identify the strength and direction of relationships of these variables, the following hypothesis was formulated:

Hypothesis two: *There is no significant relationship between MFIs specific characteristics and rural farm households demand for credit*

2.4.2.3 The Impact of MFIs Services on Crop Income

As indicated in the conceptual framework, MFIs services may affect household crop income through alleviation of capital constraints (both on fixed assets and working capital) facing rural farm households. To determine the nature and the extent to which MFIs services impact household crop income the following hypothesis was formulated.

Hypothesis three: *There is no significant relationship between rural farm household access to MFIs services and crop income.*

2.4.2.4 The impact of MFIs services on rural farm household financial savings and asset accumulation

The study also sought to estimate the nature and extent of the effect of MFIs services on financial savings of rural farm households. As indicated in the conceptual framework the following hypotheses were formulated in order to operationalize the analyses.

Hypothesis Four: *There is no significant relationship between rural farm household access to MFIs services and financial savings.*

2.4.2.5 The impact of MFIs services on physical asset accumulation of rural farm household

The study also sought to estimate the nature and extent of the effect of MFIs services on physical asset accumulation of rural farm households. As indicated in the conceptual framework the following hypotheses were formulated in order to

operationalize the analyses.

Hypothesis Five: *There is no significant relationship between farm household access to MFIs services and physical asset accumulation.*

2. 5 Methodological Issues in Impact Studies

Studies on microfinance impact are fraught with a number of methodological issues that require special empirical attention otherwise the relevance and reliability of impact results may be contentious. Hulme (2000) summarises these methodological issues as attribution, counterfactual, selectivity bias and fungibility.

The problem of attribution

Attribution refers to the process of relating some effects (impacts) to specific causes (interventions). Hulme (2000) points out two paradigms by which different authors in literature demonstrate attribution. The first is the conventional scientific method with its origin in natural science. The second has its roots in humanities and focuses in making reasoned argument supported by theory and scientific specific pieces of evidences. In the past most researches on programme impact have used the later approach, however in recent years the scientific methods has tended to dominate.

The scientific method tries to ensure that the effects can be attributed to causes through experimentation. Unlike the natural science where experimentation is possible, with social sciences experimentation is virtually infeasible, because of the nature of subject matter. The approach has been to adopt quasi-experiment (Casley and Lucy,1982 cited by Hulme, 2000) and employ multiple regression which try to control the effect of other possible causal factors (Pitt and Khandker, 1998;

Coleman, 1999). To address the issue of attribution, this study adopted the multiple regression approach. This is because while it is hypothesised that microfinance institution services (*e.g.* credit) can affect farm household outcome variables such as crop income, other variables (due to heterogeneity even among members) can as well cause crop income to vary between members and eligible non-members (control group) or even among MFIs members. To control the effect of such variables it is important to employ multiple regressions in order to estimate the marginal effect of MFIs services (*e.g.* credit) on rural farm households.

The problem of counterfactual

This problem is about evaluating what the welfare levels would be if the microfinance programme did not exist, (Zaman, 1998a; Zaman, 2001; Khandker , 1998b; Pitt and Khandker, 1998; Khalily, 2004). In Hulme's (2000) words: "*Impact assessments assess the differences in the values of key variables between the outcomes on 'agents' (individuals, enterprises, households, populations, policy makers, etc) which have experienced intervention against the values of those variables that would have occurred had there been no intervention*". The problem is that no agent can experience intervention and no intervention at the same time, thus the problem of counterfactual is associated with finding agents who have similar characteristics but did not experience intervention and compare with those that experienced intervention.

Some empirical studies have addressed the issue of counterfactual by using control groups (Khandiker, 1998; Pitt and Khandker, 1998; Coleman, 1999; Montegomery *et al.*, 1996; Shahidur *et al.*, 2004). The control groups in these studies were created

on the basis of membership status or number/frequency of loans borrowed by households. Montegomery *et al.* (1996) for instance analysed the impact of micro-credit programme by comparing household who have borrowed more than three times and those who have borrowed once with those who are recent members and have not borrowed acting as control group. Another approach to creation of a control group has been to ask non-members household if they could have been able to access other forms of social support through informal networks or obtain micro-credit from any other source. Those non-members who can access micro-credit from other sources would be taken as control group (Zaman, 2001).

Several literatures (Hulme, 2000; Zaman, 2001; Karlan, 2001) report the challenges of creating and shortcoming of control groups in impact analyses. Karlan (2001) shows that studies that use control group by comparing selected impact variables between the treatment group and the control group may suffer from sample selection bias and mis-specification of the underlying causal relationship. The problem suggested is that while it may be evident that the control group is made up of those individual who have recently joined and therefore assumed to possess similar entrepreneurial spirit, the decision to join recently while the treatment group joined earlier suggest that the two groups are not similar. Why did they not join earlier as others?

According to Karlan (2001) the wealthy household (or poorest, depending on the programme policy) are normally served first by MFIs when they first arrived in a particular area before resorting to the poor (rich) thus comparing veteran against new and attributing the average differences on outcome variables to MFIs services

would produce biased estimates as the control group may have different characteristics from the treatment group. While Karlan (2001) asserts valid arguments however empirical studies suggest that participation to MFIs are not only governed by wealth or poverty levels but rather a number of random variables influence participation decisions. Such variable include age, dependants (earners) ratio, awareness, immigration, education, and marital status (Zaman, 1998b; Mohamed, 2003, Diagner and Zeller, 2001; Akram *et al.*, 2008). Thus, late participation does not necessarily suggest less entrepreneurial spirit or inferiority of any form on the part of control group but changes in any of the factors influencing the dynamics in MFIs membership. However the control group approach needs to be combined with adoption of models that conceptualises causation as a two-way process (Hulme, 2000). Some studies have used the two-stage least squares techniques and regression analysis to address attribution and causality (Pitt and Khandker, 1998). In this study the approach involved analyses of a treatment group and a control group using multiple regression and instrumental variable to establish causality and controlling for the effect of other variables (See chapter three on methodology for additional information).

The fungibility of money

The concept of fungibility rests on the premises that money borrowed can be used for intended purposes as well as for unintended purposes. Money can be used to start or further income generating activities, to repay loans, or consumptions, or be given to another individual who may use it the way he/she wishes (David and Meyer, 1983; Von Pischke and Adams, 1980; and Khalily, 2004). The problem posed by

fungibility for impact studies on household welfare is for instance one farmer may use the bulk of loan to meet household consumption crisis and another farmer may use in farm implement which generates long term returns thus the impact of loan on these two households may be different (Zaman, 2001).

Few empirical studies have addressed the fungibility of credits (Hulme, 2000). Some of these studies are those by Mustafa *et al.* (1996) and Zaman (2001). Mustafa *et al.* (1996) addressed fungibility by relying on the law of averages on the data sets. The study obtained fungibility information by interviewing the program officials on the process they monitor applicants' actual use of money against intended purposes. The average percentage of loan spent on intended and unintended purposes by borrowers formed the basis for fungibility estimates in the study. Zaman (2001) addressed fungibility by assuming that 'X' amount of money was borrowed and spent by a utility maximizing household. Controlling for other factors, one could roughly attribute 'Z' amount change in the consumption to this loan.

While fungibility remains to be a critical challenge on impact studies, Hulme (2000) provides a detailed discussion on the extent to which fungibility can be a threat to impact studies. He argues that a concern for fungibility is irrelevant in impact studies that use household or community as units of assessments. In his views it is a problem for studies that focus exclusively on enterprises as a unit of assessment. Hulme (2000) argues that the task of impact assessment is not to pretend that micro-enterprise (farm households) are 'firms' whose inputs and outputs can be precisely identified and measured, but to recognize that the impact of microfinance must be assessed at various levels.

With due recognition of Hulme's (2000) view on fungibility issues, this study did not try to control fungibility. However the methodological approach used in the analyses does not suggest fungibility to be a threat of major concern. The approach in this study was not based on the idea that a certain amount of money was borrowed by a farm household and entirely invested in crop production and that this led to a certain increase or decrease in crop income. Instead the argument has been that since impact is a function of time, then controlling for other factors one can roughly attribute a certain change in crop income (or any other outcome variable) to membership length of a household who was exposed to MFIs services (credit) over a period of time (instrumental variable approach- details see methodology).

The selection bias problem

The process of estimating the impact of an intervention (e.g. antipoverty programme) on outcome variables (e.g. wages, living standard, income, consumption expenditure) can lead to biased attribution estimates (Heckman, 1979; Dubin and Rivers 1990; Pitt and Khandker,1998; Hulme, 2000; Zaman, 2001; Deric, 2004) if the underlying process which governs the selection into the institution or programme is not included in the analytical framework. Previous microfinance impact studies by Khandker (1998b) and Coleman (1999) have found that if the effect of selection process are not taken into account, institution or programme effects may be over (under) estimated if programme participants have more or less production capabilities, due to differences on certain observable and unobservable household characteristics between participants and non-participants which may arise from self selection of participants (Entrepreneurial spirit and socio-economic

characteristics) and non-randomness of microfinance institutions placement.

Microfinance institution placements are sometimes non-random (Karlan and Zinman, 2008a). If MFIs placements are non- random then comparison between a control group drawn from a non-program village could result into biasness as villages or locations tend to have different entrepreneurial or organization than others. Additionally some villages could economically be poorer than other villages or could be prone to environmental conditions such as floods, drought and other factors (Khandker, 1998b; Pitt and Khandker, 1998, Hulme, 2000; Duvendack *et al.*, 2011).

Coleman (1999), Pitt and Khandker (1998), Hulme (2000), Zaman (2001), Kalarn and Zinman (2010), Copestake and Williams (2011) provide extensive discussions on approaches to resolve the selection bias problem. These are the Heckman two-step procedure, panel data, Randomized Controlled trails (RCTs), and pipeline approach.

The Heckman-1979 two-step procedure involves a two stage approach to the impact estimation process. The first step is to model a 'participation equation' which attempts to capture factors governing membership in a programme. The participation equation is used to construct a selectivity term known as the 'Mills ratio' which is added to the second stage 'outcome equation' as an independent variable together with other independent variables (Heckman and Smith, 1999; Lin and Paik, 2001). If the coefficients of the selectivity term (the Millis ratio) are significant then the hypothesis that participation is governed by unobservable

selection process is confirmed. The inclusion of the extra term of the inverse mills ratio causes the coefficients in the second stage to be unbiased (Shahidur *et al.*, 2004; Ross and Rellies, 1997; Zamani, 2001; Puhan, 2000; Dubin and Rivers, 1990).

The strength of the Heckman estimation procedure is that even when there is lack of an identification variable on the two equations (a problem normally encountered in two stage OLS), the mills ratio term since it is non-linear function of the exogenous variables in the first stage equation (Selection equation) can be used as an identification variable and allows all variables used in the first stage equation to enter into the second stage equation (outcome equation) without requiring an additional identification variable. This identification is known as functional form procedure and is normally viewed as the best way of using the Heckman procedure (Heckman and Smith, 1999; Shahidur *et al.*, 2004; Zaman, 2001).

Several empirical works have tested the validity and applicability of the Heckman's (1976, 1979) two–step estimator for estimating selection models. The work by Puhani's (2000) provides an overview of Monte Carlo studies which review the usefulness of the Heckman's model. Puhan's (2000) work recommends that before using Heckman procedure, the degree of censoring and collinearity problems need to be checked. In the absence of high censoring and collinearity between the error terms of the selection equation and the outcome equation, Heckman procedure can be used. If collinearity problems prevail, sub-sample OLS (or Two–Part Model) is the most robust (Discussions on the Heckman's 1976; 1979 model are widely available, see for example Dubin and Rivers; 1990; Vella, 1992; William, 1998; Puhan, 2000; Heckman *et al.*, 1998).

The second method for correcting selection bias is to use panel data so that differences in the pre-treatment outcome variables can be taken into account (before and after studies). In this method a base line survey is normally established on the selected variables on selected population before the intervention. Subsequent surveys are made on intervals (could be annual/ semi annually) to collect data on the selected variables to record the changes on the treatment and control populations. This approach tracks the effect/changes on participant and non-participants control group overtime and after lapse of the specified period of time the effect are established by comparing the two groups (Coleman, 1999). Examples of microfinance impact studies that have used panel data are such as by Dunn and Arbukle (2001), Morris and Barne (2005), and Berhane (2009) conducted in Peru, Uganda and Ethiopia respectively. The main problem with panel data is the difficulty and high expenses of collecting such a panel (Coleman, 1999). Respondents' migration, death, drop outs, stereotype information, and others are field problems to be overcome in panel data preparations (Creswell, 2003; Woodridge, 2000; Morris and Barne, 2005). Despite its substantial financial and time requirements, panel data approach is able to track long term effect of intervention and can difference out time variant effects more precisely when accompanied with rigorous econometric analyses (Pitt and Khandker, 1998; Shahidu *et al.*, 2004; Diagner and Zeller, 2001; Berhan, 2009; Duvendack *et al.*, 2011).

The third method of controlling selection bias in impact studies is the randomized control trials (RCTs) which is an experimental approach (Karlan and Zinman 2010; Duvenduck *et al.*, 2011; Dupas and Robinson, 2008; Karlan and Zinman, 2008b).

Randomized controlled trials involve randomly grouping households into control group and treatment group in advance of microfinance services being given. Both groups are drawn from potential clients whom the microfinance program has yet to serve (Duvendack *et al.*, 2011; Copestake and Williams, 2011). The treatment group is exposed to microfinance services (credits, savings, insurance etc) while the control group is denied access. RCTs ensure that households (individuals) in treatment and control group have similar observable and unobservable characteristics except the treatment status (access to microfinance services) while eliminating the contamination between treatment and control groups. The program impacts in RCTs are then determined through means differences of the two groups on outcomes variables of interest after elapse of a specified period of time (Karlan and Zinman, 2010; Banerjee *et al.*, 2009; Dupas and Robinson, 2008). Evaluation using randomized control trials approach is generally believed to provide the most robust results (Duvendack *et al.*, 2011). However RCTs are fraught with a number of limitations including double blinding, ethical issues, pseudo-random methods, attrition, inability to control spill-over effects and lack of external validity (Blundell and Costa Dias, 2000; Berhane, 2009; Copestake and Williams, 2011; Duvendack *et al.*, 2011).

The fourth method of addressing selection bias problem is to use pipeline approach (Hulme, 2000; Copestake and Williams, 2011; Kondo *et al.*, 2008). Pipeline approach involves analysing microfinance members only (households or individuals) basing on length of membership to the programme. The control group is composed of programme accepted 'clients – to –be' or newly joined members while

the treatment group should contain old members (Coleman, 1999; Khandker *et al.*, 1998; Montegomery *et al.*, 1996; Kondo *et al.*, 2008). The control group is generally assumed to have similar unobservable attributes (entrepreneurial spirit) as the treatment group. The critical challenge with this method is how to create the control group that matches the treatment group in terms of location characteristics when the control group is drawn from a different location (Hulme, 2000; Zaman, 2001). In addition new members and old members may have different observable and unobservable characteristics due to drop out (Karlan, 2001).

This study has used the Heckman model and the pipeline approaches to address selection bias. The Heckman model was selected because of its robustness in addressing selection bias even when there is problem in creating the control group. The pipeline approach was also selected because of its ability to produce reliable results when combined with regression analyses through instrumental variable econometrics. The panel data approach was not feasible due to financial implication beyond the study capacity. RCT are normally experimental in nature and therefore was inapplicable for this study due to much resource and time requirements.

2.6 Evidence of MFIs Impact from Previous Studies

In this section a review is made on evidences of impact studies at the micro level (household, individuals, and micro-business) from studies published in different journals. Scholarly journals such as Small Enterprise Development; Journal of Microfinance; World Development; Journal of Development Entrepreneurship, and others have published a number of microfinance impact studies (Morduch, 1998, 2000, 2005, 2009; Brau and Woller, 2004; Oke *et al.*, 2007). Existing studies report

microfinance impact at micro-level, meso-level and macro-level on employment and income. Although microfinance institutions have poverty reduction as their main objective, but impact on participants have been judged in terms of income, consumption, and net worth of households (Hulme, 2000; Khalily, 2004). To capture a general and broader view of MFIs impact the review involves literature of the impact on income, employment, vulnerability, consumptions, and poverty situations on households, individuals, and micro-businesses.

Evidence of impact on income, saving, consumption, and asset accumulation

Mustafa *et al.* (1996) conducted an impact study in 1992-93 on Bangladesh Rural Advancement Committee (BRAC) participants. The survey involved selected programme members and eligible non-members control households. The study found that older programme members were better off than younger members and non-participating control group. The older members were found to have average gross assets values which were 112% higher and average weekly household expenditure which was 26 % greater than that of newer members.

Montegomery *et al.* (1996) used retrospective questioning to determine changes in household income' since the last loan' for a sample of 96 BRAC (Bangladesh Rural Advancement Committee) borrowers. They found that improvement in household income is greater for third time borrowers (6%) compared to first time borrowers (1%). Growth in productive enterprise assets indicated a 95% growth for third time borrowers during the course of the loan last period and 24% for first time borrowers.

Mosley and Hulme (1998) analysed a sample of 13 different MFIs, coming from 7

countries namely; Bolivia, Indonesia, Bangladesh, Sri Lanka, Kenya, India, and Malawi and found that programmes that targeted higher-income households (those above the poverty line) had a greater impact on household income. The study found that higher income borrowers could invest in technologies that improved the effectiveness of their activities and consequently generated higher income flows. On the other hand, poorer borrowers who took smaller loans rarely invested in new technologies or fixed capital. They used their loans as working capital or for consumption. The poorest tended to be more averse to risk-taking, as a result micro credits to such borrowers had little, no, or sometimes negative impact on their level of income.

Coleman (1999) investigated the impact of group lending micro-credit programmes in Thailand. The study found that program loan had no impact on income, asset accumulation and expenditure variables after accounting for self-selection and endogenous programme placement. Coleman asserts that the poorest take very small loans to be productively invested. Micro loans were mostly consumed and did not make any economic effects.

Copestake *et al.* (2001) assessed the impact of microfinance in Zambia. They found that borrowers who were able to obtain two loans consecutively experienced high growth in profits and household income compared to a control sample. However borrowers who never qualified for the second round loan were found worse off because of improper MFIs loan collection mechanisms.

Morris and Barne (2005) assessed the impact of microfinance program in Uganda.

The objective of the assessment was to examine whether participation in microfinance programs lead to improvements in the economic welfare of households and enterprises growth and stability. The study found that clients were able to offer new products and services, improved or expanded enterprise sites and markets, reduced costs of inventory purchases, and increased sales volume. Household-level impacts included; new enterprises were started, increased amount spent on durable assets, agricultural inputs, increased amount of cultivated agricultural land, and increased amount of household income from crops. Microfinance programs were found to reduce financial vulnerability through diversification of income sources and accumulation of assets.

Zeller *et al.* (2001) presented evidence that credit access had a significant and strong effect on income generation and nutrition intake. According to their study every 100 taka of credit access generated an additional 37 taka of annual household income among ASA and BRAC micro-credit programmes members in Bangladesh.

Mahjabeen (2008) examined the welfare and distributional implication of microfinance institutions (MFIs) in Bangladesh in a general equilibrium framework. The study found that MFIs raise income and consumption levels of households, reduce income inequalities and enhance social welfare. Results further indicate that microfinance is an effective development strategy and has policy implication regarding poverty reduction, income distribution and achievement of Millennium Development Goals (MDGs).

In Kenya the randomized controlled trials study by Dupas and Robinson (2008)

indicated that microfinance members invested more money in land for cultivation though was not statistically significant. Results also showed mixed findings on impact. While there was significant impact on savings and business investments among women members no effect was found on individual level of expenditures. In Ghana a study by Adjei *et al.* (2009) found a positive effect of MFIs on household asset accumulation (refrigerator, sewing machines etc), and accumulation of financial savings (mostly from involuntary savings).

In India Banerjee *et al.* (2009) assessed the impact of microcredit in Hyderabad areas using randomized controlled trials (RCTs) by randomly selecting households who were registered to be first members of Spandana MFIs branch. Data were collected 15-18 months afterwards. Results indicated that business profits, inputs and revenue increased although not statistically significant. Household expenditure was noted to slightly increase but similarly not significant. The study further noted that there was a decrease in expenditure on temptation goods. The study finally highlighted the inter-temporal effects of micro-credit on business expansion not leading to immediate wellbeing effects.

Also in India Imai *et al.* (2010) examined whether household access to microfinance reduces poverty or not. Using national household observational data the study found significant positive effects of MFIs productive loans on multidimensional welfare indicators on microfinance client households. Loans for productive purposes were more important for poverty reduction in rural areas than in urban areas.

Kondo *et al.* (2008) analysed the effect of microcredit in the Philippines using

pipeline approach. The study compared participating households and qualified households but not yet receiving loans. The study found statistically significant increase in total income, total expenditure, food expenditure and savings. However no effect was noted on wider wellbeing or education and health indicators. In the same Philippines context Karlan and Zinman (2010) used randomized controlled trials (RCTs) to investigate the effects of individual loans given by the First Macro Bank. The study found statistically significant increase in business profits resulting from increased credit for male borrowers with higher incomes. However the study found no strong causal link between access to microfinance and poverty reduction (income and food quality) for the poor.

In Ethiopia, Berhane (2009) employed panel data and propensity score matching to investigate how microfinance effects depend upon the timing of becoming a borrower. He found that per capital consumption increased as a result of taking even a single loan. Improvements in housing were evident on borrowers with multiple borrowings. The results also showed that early participants generally did better than late joiners thus illustrating the importance of observing the impact over time.

A systematic review by Stewart *et al.* (2010) on MFIs impact studies conducted in 15 Sub-Sahara countries (Africa countries of Ethiopia, Ghana, Kenya, Madagascar, Malawi, Rwanda, South Africa, Zanzibar, Uganda, and Zimbabwe) found mixed results on the impact micro-credit on income levels of poor microfinance client households. A positive impact was observed on clients' expenditure, savings, and asset accumulation. However the study concluded that microfinance make some people poorer, and not richer because they consume more instead of investing in the

future; their businesses fail to produce enough to pay high interest rate; and the context in which microfinance clients live is by definition fragile.

In Zanzibar, Mohamed (2003) assessed the impact of microfinance among small holder farmers and artisan fishermen households who were borrowers and non-borrowers of formal and quasi- formal credit schemes. Using descriptive statistics on a sample of 300 households randomly selected from some villages of Unguja and Pemba, Mohamed found a significant difference between credit users and non-users in relation to income levels, and value of productive assets owned by the respondents. Credit users had more income and productive assets compared to non-credit users.

Kessy and Urio, (2006) investigated the impact of MFIs to poverty reduction in the urban and semi urban areas in the regions of Dar es Salaam, Zanzibar, Mwanza, and Arusha Tanzania. The study analysed Small and Medium Enterprises (SMEs) supported by the selected MFIs which were randomly selected. Qualitative analysis and simple descriptive statistics were used to analyse the data. Results indicated that MFIs have managed to change the life of their clients (poor people) in a positive way. MFIs clients increased their income, capital invested and therefore expansion of their business. Despite the observed achievements it was further observed that some conditions like lack of grace period for loan repayment, collateral requirement and distance in location of MFIs have limited poor people from accessing MFIs services.

Evidence of Impact on Employment of Labour, Land and Farm Inputs Utilization

Employment of factors of production is a reflection of both their supply and demand. Employment can rise or fall depending on the extent to which the micro-credit programme affect farm and non-farm production. Pitt and Khandker (1998) indicated that given the small size of loans and the type of activities engaged by micro-entrepreneurs, it is unlikely that capital intensity has increased. They added that given that the labour and the capital intensity of rural farm and non-farm production were unchanged, increase in micro-credit implies that employment of labour can be expected to rise.

The empirical study by Khandker *et al.* (1998) in Bangladesh showed that borrowings creates self-employments for those who were wage-employed previously, so the immediate impact of borrowing is the possible reduction of labour supply in the village wage labour market. The study further indicated that village level averages of household production, income, employment hours, individual labour force participation rate and others increased as result of micro-credit programme intervention. However impact was more significant on average household income and production in the rural non-farm activities.

At the enterprise level Kuzilwa (2002) found mixed result on the effect of micro-credit in Tanzania. Using case studies material in combination with survey design on NEDF small businesses borrowers, he observed that fair amount of job for self and members of families were created by businesses. Business growth was in the form of working capital and minimum investment in physical assets (Only 14% of credit was spent on physical assets). Results further indicate that over 80% of the enterprises studied were found to be surviving even after receiving loans. Credit effect on

business growth was not statistically significant although a positive impact was noted in terms of increased firm's output. The study noted that many of the problems facing entrepreneurs in Tanzania are not related to lack of access to credit, but rather are caused by macro and institutional constraints, including demand, supply, tax regime, and energy.

Shahidur *et al.*, (2004) investigated the effect of micro-credit on employment of land in Bangladesh context. The study was a survey of households from seven randomly selected villages with at least one of the DDRS, BRAC and ASA micro-lending programmes. Using varieties of econometric specifications formulated within the Heckman's two-step method, the study found significant impact of access to credit on High Yield Varieties (HYV) of crops cultivation. The study further observed that access to micro lending increases the use of inputs such as fertilizers and pesticides. The study also observed that the focus of most programmes in Bangladesh has almost exclusively been on income generation through non-farm activities while majority of small farm household continue to rely on informal sector for their credit needs.

Olagunju and Adeyemo (2007) investigated the link between production efficiency of small holder farmers and the use of credit in South-Eastern Nigeria. The study found that more loan funds made available to micro-credit farmers increased agricultural production efficiency and thus gross output value.

Masawe (1994) analysed the effect of credit programme on technology adoption and utilization of tractors in Morogoro region in the districts of Kilosa and Morogoro

rural in Tanzania. The credit programme provided tractors to farmers together with other forms of credits. The main objective of the study was to draw on valuable experiences from the credit project by identifying its strengths and weaknesses for the benefit of rural credit programmes in Tanzania. The credit programme distributed tractors to individuals, co-operatives societies and village governments.

Using qualitative and descriptive statistics analysis the study found that almost 62% of tractors were poorly maintained. Most of the tractors were completely out of order after two to three years of use, well below the projected durability of six years. Loan defaults rates were as high as 60%. Most of the tractors were repossessed by the credit program. Unavailability and high costs of tractor spare parts severely affected the productivity of tractors. Furthermore farmers in the project area owned farms too small to profitably utilize a tractor. The situation was exacerbated by poor infrastructure in rural areas (poor roads, lack of crop produce storage facilities, processing facilities and others), changes in crop prices lagged behind changes in cost of tractors maintenance and agricultural inputs by grater margins.

Evidence of impact on vulnerability

Zaman (2001) investigated the relationship between access to micro-credit and reduction of poverty and vulnerability by focusing on BRAC microfinance programme in Bangladesh. Using a survey approach the study found that increase in income or consumption can occur if credit is used for an income generating activity and returns are in excess of the loan instalment repayments. In a situation where the credit financed investment does not generate a significant net profit, an asset is created which reduces vulnerability but does not reduce poverty. This creates a

situation where by loan instalments repayments take place through reduction in consumption and not from the returns on investments. The study also found that a short-term reduction in poverty can occur if credits are used for non-investment purposes such as repayment of existing debt, improving housing or social obligations. However, future consumption will have to be sacrificed to meet repayment obligations. The author concludes that there may be threshold cumulative loan size beyond which micro-credit can make significant dent on poverty.

Kantor and Erna, (2007) employed a qualitative technique in investigating the impact of microfinance on livelihood outcome in Afghanistan. The study found several interesting issues. Many of the microfinance clients found the weekly repayment extremely difficult because loans were used for consumption or because cash flows from productive investments did not match the repayment period. Clients struggled over repayments. Repayments were sometimes achieved by clients through informal borrowing (debt circles), selling livestock, going hungry, and even holding back of a portion of the loan to use for repayment. Clients' numbers in the village declined as interest rates and other costs charged outweighed clients' returns on investments. Economic activities of clients were generally affected by droughts and conflicts. Credits offered were thus not suited to client needs and therefore microfinance was generally perceived as not the best intervention.

Evidence of impact on women and education of children

Microcredit programme make it possible for participants mostly women who were unemployed before, or involved in household chores to become self-employed in micro-financed small enterprises (Swain, 2004). Studies also show that new income

from microenterprise is invested in children's education (Littlefield *et al.*, 2003).

Evaluating the credit programmes of Grameen Bank, Bangladesh Rural Advancement Committee (BRAC), and Rural Development Board's (BRDB) Rural Development RD-12 program, Pitt and Khandker (1998) found that participation in such programs significantly increased expenditure on boys' and girls' schooling. Credit provided to women was more likely to influence these behaviour than credit provided to men. Yet Robinson (2001) shows that micro-credit programmes empower women and enhance their household economic decision making roles. Evidence from Khandker (1998) indicates that micro-credit programmes improve children schooling, especially for boys. Furthermore credit given to women enhances nutrition status of households and general well-being of male and female children.

2.7 Other Related Studies in Microfinance Industry in Tanzania

Temu (1994) investigated the outreach structure of rural financial markets in Tanzania. Though not an impact study but it shades light for understanding the rural financial structure in Tanzania and indicates the expectation from rural MFIs impact. Temu hypothesized that the financial reforms in 1990s lacked clear focus regarding the development of rural financial markets (RFM). That is the reforms assumed that rural dwellers would benefit from changes made to urban based institutions. The author further hypothesized that there was socio-economic biases on services offered by financial institution especially in rural areas such that some rural poor were excluded from accessing the financial services.

The study by Temu was a survey carried out in Kilimanjaro region in Tanzania over a period between 1989 -1992. The study analysed 230 households from primary cooperative societies in the region. Using discriminant analysis and cluster analysis, the study found that the formal financial institutions were urban based and were not tailored towards the socio-economic setting of rural dwellers. The informal finance practices were underground in nature and link only over short distance. The semi-formal institutions offer an embryonic stage of a potential network of rural financial institutions. Temu finally recommended that there was a need for establishment of a policy that would result into establishment of sustainable and efficient rural based financial institutions which are designed to offer not only credit but also other financial services such as savings, insurance, and member based advisory services.

Sixteen years later (2011) in Tanzania a number of microfinance institutions have been established both urban and rural based , more or less in line with Temu's view and all focusing on providing financial services to the poor. Examples are the PRIDE, FINCA, SEDA and many others. To what extent have these MFIs addressed the financial needs of the rural and urban poor? To what extent have they improved farmers' livelihood? Indeed these are important policy questions whose answers require backing from impact assessment studies.

Rweyemamu *et al.* (2003) investigated the performance of semi-formal MFIs and the constraints facing rural farmers in Mbeya (Mbozi) and Mwanza (Ukerewe) region of Tanzania. Their study was not an impact assessment but shades light for understanding the deadlock facing MFIs that deal with the rural farm households in the Tanzanian context. The study was a survey of 222 farm households who were

members in the selected MFIs. Results showed that high interest rates, credit procedures, and inadequate funds distributed were significant barrier to participation among farm households. The study further observed that MFIs members experienced poor loan repayments due to poor crop yield, low crop prices and poor infrastructure.

Fraser and Kazi , (2004) investigated the differences in the level of poverty between MFIs clients and non- clients in Dar es salaam and Coastal regions in Tanzania. Although it was not an impact study, the study shades light for impact studies. Results indicated that MFIs in Tanzania mainly serve the middle (poor) group and the highest (least poor) group. Majority of MFIs were afraid of serving the poorest group. The study questioned whether MFIs have poverty alleviation as their mission. The tendency to avoid the poorest was detected as an evidence of the desire and the real need for MFIs to become sustainable, and thus a sense of mission drift was reported by the authors.

2.8 Summary of Evidence on Impact Studies

The above reviewed literatures suggest the following conclusions. First, majority of the studies have been conducted in Bangladesh where microfinance programmes were pioneered as people's development tool (Brau and Woller, 2004; Stewart *et al.* 2010). Secondly impact studies focus on different outcome variables. While some focus on income variables (farm and non-farm) others focus on asset accumulation, savings, and expenditure (consumption in food, health, education). Still some studies have focused on vulnerability, employment (human capital and land), technology adoption, and women empowerment. Findings show that microcredit programmes

have different effect to different outcome variables. Literatures also show that microcredit may have effect on non-farm income but not on farm income or may affect men and not women and vice versa. Thirdly researchers have used different units of assessment to measure impact of micro-credit. Some have used households, others individuals, community (village), or enterprises. Literatures show that impact may be evident at enterprise level but not necessarily at a household level and vice versa. Still micro-credit may affect urban households and not rural household and vice versa. This shows that impact depend on the pathways though which the intervention is directed and the beneficiaries' socio-economic characteristics.

Some studies show positive impact and others none or negative impacts. While methodological mainly issues cause varied impact results (Hulme, 2000; Coleman, 1999), length of intervention, length of membership, and other location fixed effects also attributed to this variant result and therefore microfinance impacts are contextually specific as Brau and Woller (2004) put it.

Finally in Tanzania while it is evident that some studies have investigated the impact of MFIs in both urban and rural areas, most of the reviewed studies have been descriptive in nature (mean comparisons of control group vs treatment group) and generally fail to address selection bias and attribution issues adequately. Yet the available impact studies have focused on non-farm enterprises and households. The exclusive impact of microfinance on farm household outcome variables (crop income, asset accumulation and savings) which takes into account of selection bias are still matters of concern.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Nature of the Research Issue and Selection of Research Method

Four research objectives were under investigation, namely microfinance participation decisions, credit demand, savings, and impact of microfinance institutions on farm income and farm investments. Qualitative and quantitative approaches were adopted in this study. Qualitative analysis was used to obtain non-quantifiable information in order to gain more insights on research issues. For instance to assess household participation decision on microfinance institutions and the nature of credit demand require aspects of qualitative inquiry. The nature and extent of MFIs impact on variables of interest such as crop income, savings, and assets accumulation can appropriately be estimated using quantitative approach. Quantitative approach was necessary in order to establish the statistical significance of the results.

3.2 Research Strategy

3.2.1 Research design

The impact of microfinance intervention occurs over time on socio-economic variables. Two approaches are possible namely: the prospective longitudinal approach in order to obtain panel data and two the retrospective longitudinal approach in order to obtain historical data at a point in time. Panel data method can provide consistent estimates by differencing out the time-invariant unobservable household and location effects (Pitt and Khandker, 1998; Khandker, 2005). Creating

a panel data however requires more time to search for the same units of investigation over the desired period of the panel and have high financial implications to researchers. For these reasons it was not possible to design the study to create panel data and therefore the decision was to use retrospective longitudinal approach.

Retrospective longitudinal approach comprised of a cross-sectional survey of farm households to obtain historical, current, and projective information at a point in time on the necessary variable through semi-structured interview schedule. This approach was appropriate for collecting both qualitative and quantitative primary data. Though may fail to track time variant unobservable household and location effects, however when combined with appropriate econometric methods cross sectional survey design can produce reliable results and are both cost and time effective (Coleman, 1999; Khandker, 2005).

3.2.2 Unit of inquiry

In order for the assessment to be carried out a unit of inquiry or investigation needs to be determined before undertaking the survey (Neuhauser, 2007; Cresswell, 2003). This study used households as units of inquiry. Unlike other units of inquiry such as individuals, enterprise, and community, a household can easily be defined and identified (Hulme, 2000). Additionally, as Honohan (2008) indicates the penetration of microfinance is still too low in most countries to draw reasonable inferences about broad (*e.g.* community) economic impact, such that the challenge at this point is to establish basic household level impact of microfinance.

The population of the study was all the rural farm households in Iringa region

Tanzania. However, due to time and cost constraints it was not possible to survey all districts of the Iringa region and therefore selection of districts from which a sample would be drawn was necessary. Consequently, Mufindi, Njombe, and Kilolo districts were selected as study areas.

3.2.3 Type of data required

Farm households' information covered during the survey were such as household demographic variables, asset ownership and composition, agricultural output, crops prices, input prices, farm expenditures, credit, savings, wages, non-farm income (see questionnaire in appendix 1). Qualitative information obtained was related to participation decisions in microfinance, problems associated with microfinance involvements, and benefits so far obtained by microfinance participants and others.

3.3 Study Area and Sampling Procedures

3.3.1 Study area

The study was conducted in Iringa region. The location and socio-economic profiles of Iringa region is described in this section. The description covered includes an overview of geographical location, culture, economy, social services and financial services. The information presented in this section have been extracted from the Iringa Region Socio- Economic Profile document, (IRSEP, 2007) prepared by Iringa regional planning office in collaboration with the National Bureau of Statistics of Tanzania.

Iringa region is one of the "Big six" regions well known for producing surpluses in food crops such as maize and potatoes in Tanzania (IRSEP, 2007). Other regions in

the big-five group are, Mbeya, Ruvuma, Morogoro, Rukwa, and Kigoma. These regions are known as typical agrarian regions in Tanzania and also are served by various microfinance institutions (BoT, 2009) and therefore suitable for the study.

Being one among the well known big six agricultural region in Tanzania Iringa region was purposively selected because it is a home to one of the well known community banks in Tanzania– the Mufindi Community Bank. Mufindi Community Bank (MUCOBA), is a community based bank that deals with farmers as well as small and medium enterprises. It is one among the few community banks in Tanzania that provide microfinance to small and medium businesses in farm and non-farm businesses. Others are Dar es Salaam Community Bank, Mwanga Community Bank, and Mbinga Community Bank (Chijoriga *et al.*, 2009).

Geographical location of the study area

The region comprises of seven districts (Fig 2. and Fig.3) of Iringa Rural, Kilolo, Makete, Mufindi, Njombe, Ludewa and Iringa Urban. The region is part of mainland Tanzania, found in the southern highlands zone and located between latitudes 6^0 $55'$ and 10^0 $30'$ south of Equator, and between longitudes 33^0 $45'$ and 36^0 $55'$ east of Greenwich. To the north the region borders Singida and Dodoma regions and in the east it borders Morogoro region, while in the south is Ruvuma region and in the west is Mbeya region.

The region's total surface area is 58 936 square kilometres, made up of 53 342.8 square kilometres of land area and 7 254.2 square kilometres of water areas. The surface area makes Iringa region the seventh largest region in Tanzania.

Figure 2: A map of Tanzania indicating all regions including Iringa

Source: Iringa Region Socio-Economic Profiles (2007)

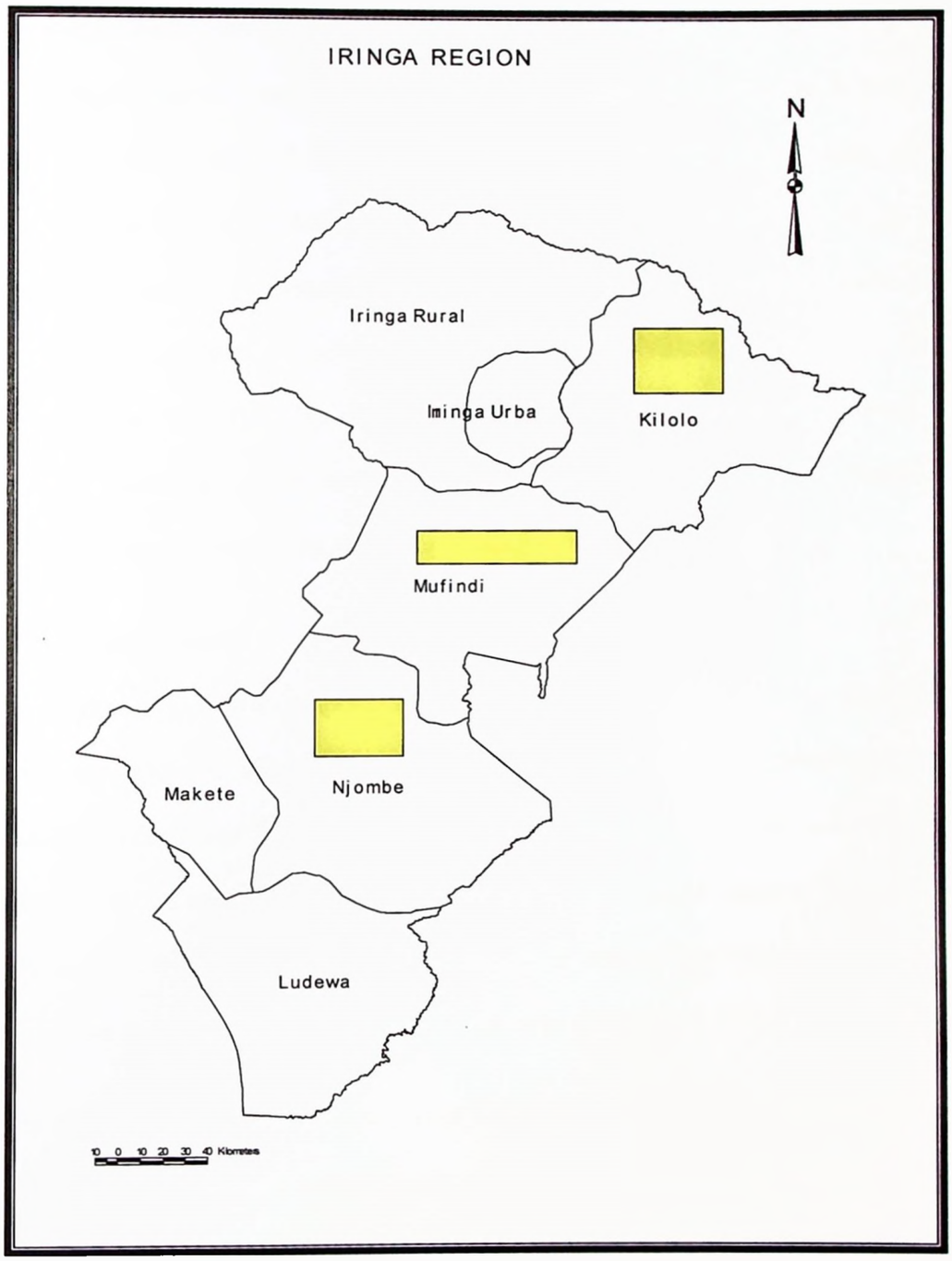

Figure 3: A map of Iringa region showing the location of districts, 2010

Key: Surveyed districts

Population of the study area

According to the 2002 census, the population of the region was recorded at 1 490 892 (Iringa Rural, 245 033; Makete, 105 775; Ludewa, 128 155; Iringa Urban, 106 371; Kilolo, 204 547; Mufindi 282 071 and Njombe 419 115). The region's population density was estimated to average 31 people per square kilometre (Mufindi, 48; Njombe, 45; Kilolo, 34; Iringa Rural, 13; Makete, 34; Ludewa, 25; Iringa Urban, 719). The 2002 region census also indicated that there were 346 815 private households with an average household size of 4.3 persons (The national household size average in the same year, was 4.9 persons).

Weather Conditions

The region is generally composed of three climatic zones. These are the highland zone, the Midlands and the Lowlands zone. The highland zone includes part of Kilolo, Mufindi and eastern and central part of Njombe, Ludewa and Makete districts. Temperatures are normally below 15^0C with rainfall ranging between 1 000 mm to 1 600 mm per annum, falling in a single season from November through May. The dry and cold season occurs after the rain season, from June to September.

The Midlands zone covers central part of Iringa rural district, part of Mufindi, parts of Njombe, Ludewa and Makete districts whose temperatures range from 15^0C to 20^0C with average rainfall between 600 and 1 000 mm per annum. The low lands zone covers part of Iringa rural mainly the Ruaha River with Temperatures varies between 20^0C and 25^0 C with low rainfall ranging from 500 to 600 mm per annum.

Economic activities

Agriculture is the largest sector in the economy of the Iringa region followed by livestock keeping and fishing. The region's GDP per capita in 2004 was TAS 394 449 at current prices. This was 23% higher than the national average GDP per capita of 320 044.

The agricultural sector contributes over 75% to the regional income and employs about 90% of the working population in the region. The sector is dominated by peasantry farming. Maize production in the region accounts for about 53% of total volume of major food crops harvested in the region followed by round potatoes at 27%. Other food crops of great importance include: sweet potatoes and beans. Cash crops include: Tobacco mainly in Iringa rural district, sunflower which is grown in Iringa rural and Njombe districts, tea which is grown mainly in Mufindi and Njombe districts.

Horticultural crops are mainly vegetables such as tomatoes, cabbages and onions. Horticultural crops are mainly grown in Iringa Rural and Kilolo districts and provide peasant farmers with significant regular income.

Major crops that enter the formal markets are cash crops such as tobacco, tea, and pyrethrum. About 57% of the marketed crops in the region is tea followed by tobacco at 38% and the remaining 5% from pyrethrum.

Livestock keeping is an important economic activity in the region and plays a significant economic role in the lives of the region's rural population after agriculture. Major animals kept include cattle, goats, sheep, pigs and donkeys. The

region had total number of 588 048 cattle in 2005. Traditional methods of raising animals are still dominant in the region.

Timber production and other forest product is one of the high revenues yielding economic activity in Iringa region. The region has a forest cover totalling 2 473 570 hectares. The forest cover is about 46% of the regional land area. This includes natural forest grasslands and forest plantations. The total land covered by forest plantations as of 2005 was 179 345 hectares making Iringa the leading region in Tanzania in forest plantations. Forest plantations are dominant in Mufindi with 102 369 hectares or 57% of regional forest plantations, followed by Njombe with 53 000 hectares or 29.6%. The rest of the rural districts share the remaining portion in small varying proportions. Major tree species are the eucalyptus, pine and acacia meamsii.

Fishing in the region takes place mainly in Lake Nyasa of Ludewa district, at Mtera Dam of Iringa Rural district, Lake Ngwazi in Mufindi and at Itombolo Dam. Some fishing activities take place also in Great and Little Ruaha Rivers. Fishing in Lake Nyasa is the most important, contributing some 95% of regional fish catches, followed by fishing in the Mtera Dam. Fishing provides employment to a number of people living near or along fishing resource areas in the region. Fishing in the region is carried out entirely at artisanal level.

Infrastructure development

The region has a low allocation of tarmac roads. Only eight percent of the roads in the region are tarmac, followed by gravel roads at 29.1% while 63% of the roads are earth surface. Earth surface tend to last the shortest duration after construction. They

normally get corrugated or even rutted, rendering them difficulty for traffic to negotiate and even totally impassable. The absence of bridges and culverts also render roads unusable during rainy season. According to available regional statistics, Njombe district had the best passability rate at 100% of its network passable the year round. Ludewa district has the next best pass ability rating at 66 % though has the lowest combined tarmac and gravel surface roads. On the other hand Makete district has the lowest passability rate at 33 %. Railway transport is limited to some places of the region where the railway services of the Tanzania Zambia Railways Authority (TAZARA) are available.

Social services

Electricity is the major source of energy for commercial, industrial and urban lighting. Generally electricity is limited to district head quarters and few urban centres in rural areas. Villages in the rural areas are generally not connected to electricity except in places where there are larger scale industries engaged in agricultural produce processing, such as in Mufindi and Njombe district. Fuel energy (Petroleum products) and fire wood remain to be the major source of energy in rural areas.

The region has health facilities in form of Hospitals, health centres and dispensaries. According to 2005 regional statistics, there are 298 health facilities in the region, 15 being hospitals, 35 health centres and 248 dispensaries. Of these health facilities, Njombe had the largest share and Mufindi the lowest share in the region. Regional records also reveal that the five most common killer diseases are uncomplicated malaria, complicated malaria, pneumonia, diarrhoea and tuberculoses in that order.

HIV/AIDS is among the top ten killer diseases in the region. Malaria dominates in all districts except in Makete where pneumonia tends to dominate.

Financial services are generally available at Iringa municipality and district towns of Mufindi, Njombe, Ludewa, Makete and Kilolo. Financial services are attainable by urban dwellers and some residents near urban centres. The major banks providing financial services are the CRDB Bank, NMB Bank, NBC Bank, EXIM Bank, Barclays Bank and Mufindi Community Bank. NMB bank is the only bank with branches in all district towns and provides financial services to majority of government transactions, public service employees, business men and small and medium businesses in the region. CRDB Bank has two branches only in the region; one in Iringa municipality and the second is in Njombe town. NBC, EXIM and Barclays banks have branches only at Iringa municipality. Mufindi Community Bank, a community based bank has only one branch in the region and is in Mufindi district. The bank is popular for its provision of financial services to small and medium borrowers especially farmers in rural areas of Mufindi district and neighbouring villages from other districts.

Along with the mainstream banks are the microfinance institutions of different types. These MFIs provide financial services to small and medium enterprises in town and in rural areas. Some of these MFIs are PRIDE, FINCA, PTF, SELF and SACCOS. In the rural areas financial services are generally dominated by Savings and Credit Co-operative Societies (SACCOS). The number of SACCOS and its membership has been on the increase over time. From 2003 to 2005 the increase has been at 69%, however in some places a decreasing trend has been noted.

Njombe district had the highest number of SACCOS members than any other district in the region according to 2005 records. Records also indicated that Mufindi district ranked second while Kilolo and Ludewa districts had the lowest membership. Table 3 provides a profile of SACCOS membership by district in Iringa region as at the end of 2005.

Table 3: Iringa region: SACCOS profiles by districts

District	Number of SACCOS	Total number of members	Total Funds as,at 31.12.2005 (Million Tshs)		Average value, per member (In Tshs)	Total loaned to Members (Million Tshs)
			Amount	%		
Iringa Rural	5	975	226.689	3.6	232 502	N/A
Kilolo	4	798	594.688	9.2	745 223	N/A
Makete	16	1 640	169.761	2.6	103 513	N/A
Mufindi	32	5 181	1 344.578	21.0	259 521	1 076.404
Njombe	26	5 530	3 503.352	54.2	633 518	3 307.554
Ludewa	11	760	228.028	3.6	300 037	156.559
Iringa Urban	21	1 801	366.290	5.8	203 381	20.177
Total	115	16 685	6 473.386	100	387 976	4 560.695

Source: Iringa Region, Socio-Economic Profile (2007)

3.3.2 Sampling Procedures

A good sampling design or procedure is that which should result into obtaining a sample that is representative of the population. The plan should have minimal sampling errors, viable in the context of funds available for the study, capable of

controlling systematic bias, and more importantly produce results capable of making generalization on the entire population or other population with similar settings at a reasonable level of confidence (Phillips and Burbules, 2000; Baker, 2003; Creswell, 2003; Kothari, 2004).

In order to attain the above characteristics the study first created a sampling frame. The number of districts in Iringa region is seven. Due to financial and time constraints it was not possible to survey all the seven districts of the region. The decision was to select three of the region's districts based on number of microfinance members in the district. To ensure good representation, two districts with the highest number of microfinance institutions were selected and one district with the lowest (to alleviate sample biasness) number of microfinance institutions was selected. According to regional statistics (IRSEP, 2007) and Bank of Tanzania (BoT, 2009) there were 115 SACCOS, two microfinance- NGO (PRIDE, FINCA), governmental microfinance (SIDO and SELF) and two microfinance banks (Mufindi Community Bank, and NMB). Mufindi and Njombe districts had the highest number of microfinance institutions operating in rural areas especially SACCOS. There are 32 and 26 SACCOSs in Mufindi and Njombe districts respectively. The lowest number of SACCOS was in Kilolo district where there were only four SACCOS. Therefore the survey districts selected for the present study are Mufindi, Njombe and Kilolo.

To ensure randomness on the selection of microfinance institutions, a list of all 121 microfinance institutions in the districts was obtained from the Iringa regional office. To attain the desired sample size, two microfinance institutions were

randomly (ballot procedure) selected from each district. In addition to Mufindi Community Bank which was purposively selected due to its unique features in dealing with farm households. In Mufindi district Madibira SACCOS and Tujikomboe SACCOS were selected. In Njombe district Ng'anda SACCOS and Mlevere SACCOS were selected. In Kilolo PRIDE and SIDO were selected.

One of the objectives of the present study was to analyse the participation decision of farm households in microfinance programs. To attain this objective it was necessary to obtain a sample from both members and non-members upon which inquiry could be carried out.

The sample for farm households who were participants in microfinance institutions was obtained from a list of all members in particular MFIs office in a village. Members of MFIs not only come from the villages where there are physical offices but also come from other nearby villages within the wards and sometimes outside the ward. MFIs member respondents for the study were randomly picked from different villages.

The random sample of farm household who are non-participants in microfinance required the involvement of Village Executive Officers (VEO) in program villages. The VEOs were requested to identify to the researcher all hamlets (Vitongoji) making up the village. Hamlets leaders were called up for cooperation and facilitate data collection. Hamlet leaders made introduction of researchers to respondents.

3.3.3 Sample size and composition

According to the nature of the study the appropriate methodological approach was to

have two types of samples. The first sample was to be composed of farm households who were participants in microfinance institutions and the second sample was to be composed of farm households who did not participate in microfinance institutions (for naïve analysis). Hair *et al.* (2006) suggest that a guiding rule in estimating the sample size in quantitative studies is to consider the ratio of explanatory variables to observations. The minimum ratio of observations to variables should be 5:1 but preferably 15 to 20 observations for each independent variable for econometric analyses. Since this study was mainly quantitative, which was expected to use econometric regression analysis with at most 10 explanatory variables, therefore to conform to this guiding rule the decision was to have at least 150 respondents (15 observations for 10 variables) in non-participant sample and 150 respondents in the microfinance participant sample. In the end the study managed to collect a total of 540 farm households of whom 457 farm households qualified for use in the analyses. As indicated in Table 4 the final sample was composed of 210 (46%) farm household who were members of microfinance institutions and 247 (54%) who were non members.

Table 4: Distribution of the households sampled by district and by microfinance participation status

Location	Participants		Non-participants		Total	
	Number	%	Number	%	Number	%
Mufindi- High	68	14.9	81	17.7	149	32.6
Mufindi-Low (Madibila)	59	12.9	58	12.7	117	25.6
Njombe	51	11.2	64	14	115	25.2
Kilolo	32	7	44	9.6	76	16.6
Total	210	46	247	54	457	100

The largest number of respondents was drawn from Mufindi district, followed by Njombe district and lastly Kilolo district. The sample from Mufindi district was larger than the other district because first it is the district served mainly by Mufindi community bank, an institution that deals with poor rural households and secondly it was drawn from two large different places of Mufindi highlands and Mufindi low lands. Mufindi highlands covered the mountainous areas of Mufindi in Mudabulo division served by Tujikomboe SACCOS and Mufindi Community Bank while the Mufindi low lands covering areas of Malangali wards and Madibila wards mainly served by Mufindi Community Bank and Madibila SACCOS.

Table 5 presents the distributions of the household participants by type of microfinance membership. The sample of microfinance participants was composed

of SACCOS members at 42.3%, bank members at 33.9% NGOs -MFIs and Governmental institutions with a combined proportion of 16.3%. It was also noted that 7.5% of the participants had multiple memberships

Table 5: Distribution of sampled household participants by type of microfinance institutions

Microfinance Institution	Number	%
Banks (MuCoBa, NMB Bank,)	77	33.9
SACCOS (Tujikomboe, Mlevere, Ng'anda, Madibila)	96	42.3
NGO (PRIDE& FINCA)	15	6.6
Governmental (SIDO)	22	9.7
Multiple Membership	17	7.5
Total	**227**	**100**

3.4 Data Collection Instruments and Collection Procedures

The data collection instrument used in the study was the semi-structured questionnaire. The questionnaire was designed to capture all necessary information based on study objectives and the conceptual framework of the study. The questionnaire was pre-tested to ten households in Iringa Rural district and ten household in Mufindi districts in December, 2009. After the pre-testing of the questionnaire some questions were deleted and others were introduced based on the

problems encountered.

The data collection exercise involved research assistants and the researcher. Respondents were interviewed in isolation in order to ensure confidentiality. Normally if all spouses were available they were interviewed together. This approach yielded maximum response rate and ensured filling of all information required. The data collection exercise was conducted in February, 2010 and March, 2010. The information collected was for the calendar (season) year of 2009.

3.5 Data Management

After the field work questionnaires were edited to determine the completeness of the information. The questionnaires data were entered into STATA computer files for processing and further statistical diagnostics. Some descriptive statistics such as cross tabulation, means and standard deviations were performed in order to identify irregularity and errors that were committed during data entry process. Incomplete questionnaire were deleted. The number of useful and duly filled questionnaire was 457 households.

3.6 Data and Analytical Models for the Study

This section presents the variables, data, and the analytical models employed in the analysis in order to attain the study objectives.

3.6.1 Analytical approach on factors affecting farm households decision to participate in MFIs

Two approaches were used to analyse the factors affecting the decision to participate in MFIs. One is the qualitative inquiry and the second is the quantitative approach.

Qualitative inquiry involved analysing the answers provided by respondents on questions that were asked in the questionnaire. Quantitative approach involved descriptive statistics and regression equations.

Qualitative approach

The questionnaire was designed to include questions that would capture the respondents' opinion on factors determining their decision to participation in MFIs. Both the demand side and the supply side of microfinance services decision factors were examined. On the demand side non-participant farm household were asked to state reasons for not applying for membership in microfinance institutions. Five reasons were listed in the questionnaire to address the demand side, namely: i) satisfied with private capital, ii) do not like any kind of credit, iii) no assets to use as collateral due to our poverty condition; iv) our application was rejected; v) other reasons. On the supply side three alternatives were indicated in the questionnaire; namely i) cumbersome procedures; ii) high interest rates iii) microfinance institutions are located far from our village.

The questionnaire also included questions directed to households who are participants in microfinance institutions in an attempt to capture factors that would affect participation decisions. The questionnaire included questions on whether collateral was required, and what types of collateral was most preferred or used; purpose of loan; opinion on interest rates; whether they experienced problems on loan repayments and interest, and reasons for delays or failure to repay loans. What type of microfinance lending methodologies were used; whether training was given and what was the type of training; the time lag between loan application and loan

disbursements; whether initial deposit was required before borrowing. Other questions included in the questionnaire required respondents to indicate whether interest charged was very high, high, moderate or low.

Quantitative approach

In order to estimate the effect of demographic and socio-economic variables that affect farm household decision to participate in microfinance institutions, logistic regression models were used. The primary objective of logistic regression analysis in this context was used to identify which explanatory variables are most significant in influencing farm household decision to participate in microfinance institutions. Logistic coefficients would predict the likelihood (probability) of a farm household to join a microfinance institution when the identified socio-economic and demographic factors are changed through policy interventions.

Logistic regression was appropriate because the dependent variable is non-metric and categorical. The dependent variable for the analysis represented the two groups of microfinance participants and non-participants. These two groups of interest were assigned binary dichotomous variables of 0 for non-members and 1 for members.

Unlike multiple discriminant analysis which also analyses regression model with non metric dependent variables, logistic regression does not face much restrictions as those faced in discriminant analysis. Logistic regression does not face restrictions such as multivariate normality, equal variance and covariance and is much more robust when these assumptions are not met and also can handle both metric and non metric independent variables.

The logistic econometric equation used to estimate the coefficients for the determinants of participation decision was as follows:

$$Y = \beta_0 + \sum_{i=1}^{n} Hi + \sum_{i=1}^{n} Ai + \mu \quad \ldots\ldots (1)$$

Where:

Y= 1 when a household is a member to any microfinance institution, and 0 for non-member; β_0 is constant term; Hi is vector for household structure variables; Ai is vector for household asset endowment variables; and μ is the error term, representing other factors omitted in the model.

Sample used in the analysis

Descriptive statistics and regression analyses are not appropriate if done by comparing participants and non-participant samples without making adjustments. Estimating participation decision based on the whole sample (Members versus non-members) without adjusting the participants and non-participants samples would produce biased estimates due to endogeneity of household economic endowment variables. This is because variables such as house quality, household non-farm income, livestock, and non-productive household assets are generally correlated with microfinance membership. This is to say comparing members who have already used MFIs services against non-members to assess participation determinants on these variables would be misleading as some of these variables must have changed on members as a result of membership (impact). Therefore adjustments were necessary in order to obtain comparable farm households sample from the two main samples.

The plan and procedure was to have one sub-sample from each of the main samples of members and non-members. A sample of newly joined MFIs members hereby referred as control group sample and an equivalent non-participants sub-sample. The control sample was designed to come from among the farm household microfinance members on the basis of microfinance membership duration. The assumption was that the effect of microfinance membership on farm household is a function of membership time to a particular microfinance institution. Accordingly it was assumed (based on survey information) that the effect of microfinance membership had not made significant effects/changes to newly joined members. The cut–off point was members whose membership duration was less than three months were considered new members and formed the control group sample. Household members with duration less than three months are assumed to possess the minimum possible entry characteristics of microfinance institutions eligible members to be compared with non-program members in order to identify the factors affecting MFIs participation. The size of the control group obtained in this process was 75 farm household participants (equal to 35% of the 210 participants).

The non-participants sub-sample was drawn from among the 247 non-participants. The procedure was designed to ensure a random sub-sample was drawn. A systematic sampling procedure with equal interval was used in which case the third housed hold was selected from the list (Kothari, 2004). A sub-sample of 88 (247 x 35%) non-members household which is equal to 35% of the non members' household was obtained. This was composed of 30 household from Mufindi; 21 household from Madibila; 22 household from Njombe; and 15 households from

Kilolo. The combined overall sample size of the control group and the sub-sample of non-members was 163 (75 + 88) farm household.

Operationalization of variables

Dependent variable

The dependent variable as indicated in equation 1 is a dummy variable with value of 1 for a farm household who is a member to any microfinance institution (SACCOS, MUCOBA , NMB, PRIDE, FINCA ,or SIDO) and value of 0 for non-microfinance participants households.

Explanatory variables

The conceptual framework was used to classify and identify the specific explanatory variables for the analysis. From the conceptual model the explanatory variables were categorized into three major categories, namely household asset endowment, Household structure, and policy variables.

Household structure variables

To measure the impact of household structure on the participation decision, four variables were used; namely the household size, the dependant ratio, age of household head, and sex of household head. These variables were adequately captured using the questionnaire.

Physical asset endowment

Asset endowment was measured using three variables namely: size of household land owned, total assets (productive, non-productive assets and livestock assets), house quality. The market prices of household assets were easily estimated during

the survey because they were traded in local markets.

Household human assets

One variable was used to represent the human asset of the household. This variable was the level of education of the household head. Respondents were found to fall into three main categories, namely no formal education, primary school education, and secondary school education. There were no significant variations in years of schooling among household heads. Thus dummy variables were found appropriate to represent education categories of households.

Financial assets of the household

The assumed that non-farm income variable reflects the financial flow of resources of a household. The variable was obtained by taking the household annual value of income from all sources other than crops (e.g. shop, kiosk, restaurant, and house rent income, sale of milk, alcohol, casual works, and regular employment). The current market value or price was used to calculate the total annual non- farm income of all members in the household.

The measurement and the expected direction of the influence of the explanatory variables are presented in Table 6.

Table 6: Description of explanatory variables used in participation decision analysis and expected influence

Variable Name	Description, and Measurement	Expected Influence	Reason
Household size	Total number of household members	+	Reflects the consumption and production needs of household
Dependents ratio	The ratio of dependants to total household members	+ / -	Indicate household labour shortage or adequacy
Age of household head	Age of household head in years	+ / -	Age reflects experience, economic activeness and adoption of innovations
Sex of Household head	This reflects the gender of the household head.(dummy, 1= male; 0= female)	+/-	Gender reflects differences in decision process between male and female
Land owned	Size of land in hectares owned by a household	+/-	Large land sizes reflects wealth of household/ land shortage
Total household assets	The market value of all assets owned (excluding land and house)	+/-	Reflect wealth and ability to collaterize loan and acceptance by peers. Also well off household may dislike microcredit..
House quality	The type of house of household. (dummy variable. 1 =for house with metal roof, burnt/cement blocks walls, and cement floor; 0= otherwise)	+	Reflects wealth of household and ability to collaterize loan and acceptance by peers
Education of household head	The highest education of household head dummy variables (no formal education; primary school ; secondary school or above)	+	Education reflects the stock of skills and knowledge , thus ability to deal with training and paper works in MFIs
Non-farm income	The total annual market income from all non-farm sources (shop, restaurant, sale of milk, alcohol sale)	+	Income reflects ability to mitigate loan and interest repayments

Data and model diagnostics

Econometric estimation using logistic regressions is not affected by assumptions such as normality, linearity, equality of variance which affect multivariate analysis such as ordinary least squares regressions, and discriminant analysis (Jacques, 2007). However, Hair *et al.* (2006) suggest that before logistic regressions are undertaken issues of sample sizes, outliers, influential variables, and multicollinearity need to be considered.

The sample data were tested for influential variables and outliers using studentized residual. A test OLS equation was run on the data. The log of crop income (this was the key impact outcome variable for the study and thus ensuring that household involved in any analysis had normally distributed crop income) variable was regressed on household demographic and socio-economic variables. Observations (households) whose studentized residual were above 2.5 were removed from the samples, as retaining them could significantly influence regression results. Twenty eight observations were removed in this procedure and the sample size declined from 163 household to 135 household out of which 72 were sub-sample non-participants households and 63 were in the control group participant households.

Logistic regression is sensitive to the relationship between the groups sample sizes to the number of predictor variables (Hair *et al.*, 2006). As a practical guide the sample size per category should have at least 20 observations and the small group category must exceed the number of independent variables (Hair *et al.*, 2006). The groups sample sizes were above the minimum practical required conditions (72 non-members and 63 members), and thus it was possible to obtain unbiased estimate in

the analysis.

The last model diagnostic test was on multicollinearity. To test multicollinearity, the pair-wise correlation matrix of the independent variables and variance inflation factors (VIF) are normally used. As a guiding rule multiple correlations above 0.9 is considered an indication of high correlations and thus multicollinearity among variables for pair wise correlation matrix while VIF above 10 is considered an indication of severe multicollinearity.

VIF is a post estimation procedure applicable under OLS regression models. The VIF can only be obtained after running a regression. The VIF among explanatory variables can then be established in the model. Since the analysis used logistic instead of OLS, then estimation of VIF was not possible, thus only the pair wise correlation matrix was used.

The Pearson correlation matrix results indicated figures below 0.9 in most pair wise correlations except between dependents ratio and labour force ratio which was above 0.9 and that between non-productive assets and total assets (See appendix 3). The decision then was to drop labour force ratio variable and use only dependents ratio to measure the extent of labour constraints in the household. Similarly the non-productive assets and livestock assets variables were dropped in the model and only total assets variable was used in the model to measure household resource endowment. Furthermore, logistic regression is robust to the extent that it is able to drop one variable in the model that is found highly correlated to another variable.

3.6.2 Analytical approach on farm household demand for MFIs credit

To estimate the determinants of demand for microfinance credit among MFIs members, the Ordinary Least Squares (OLS) regression models were used. OLS regressions were selected because the dependent variable (household outstanding credit) is metric in nature. The econometric equation used to estimate the determinants of credit demand of farm household microfinance participants is in the following form:

$$\ln B = \beta_0 + \sum_{i=1}^{n} Xi + \sum_{i=1}^{n} Zi + \sum_{i=1}^{n} Mi + \sum_{i=1}^{n} Li + \sum_{i=1}^{n} Gi + \mu \quad \text{.....(2)}$$

Where B = outstanding amount of borrowed money at the time of survey for the household; β_0 is constant term; X, is a vector representing the control variables of household structure and asset; Z is a vector representing household location characteristics (districts) in form of dummy variables; M is a vector representing microfinance institution type (dummy variables), L is a vector representing loan transaction characteristics variables; and μ is the error term, representing other variables not included in the model that influence demand for credit.

The sample used

The credit demand equation (2) was estimated on farm households who were members of microfinance institutions only. Households who were non-microfinance members were excluded in the analysis because demand for credit by this group was not observable and was exogenously constrained to be zero. Thus only the control group (newly joined microfinance members) and the treatment group (i.e old microfinance participants) farm households surveyed were used in the analysis. The

sample was composed of 210 MFIs members of which 75 farm household (new microfinance members) were in the control group and 135 farm households were from the treatment group (old members).

Description of variables for the analysis

The analysis for the factors affecting demand for credit among farm households used the explanatory variables indicated in the hypotheses and some control variables of socio economic and demographic variables of farm households. The conceptual framework and the hypotheses developed were followed to identify the specific independent variables to be included in the model for analysis. The expected signs of the relationships and the measurement of the variables are indicated in Table 7. Other discussion on the variables used is provided in the following sections.

Dependent variables

The dependent variable used was the household current loan amount at the time of survey. The current loan amount of member households from various microfinance institutions was obtained during the survey without material errors.

Explanatory variables

The explanatory variables analysed are the location characteristics, MFIs characteristics, actual use of loans, and government agricultural subsidy.

Table 7: Explanatory variables used on credit demand analysis and the expected influence

Variable Name	Description and Measurement	Expected Influence	Reason
Location variables (Mufindi, Madibira, Njombe, and Kilolo locations)	Dummy variables=1 for respective location and 0= otherwise	?	Reflects how differences in location characteristics (e.g. markets, infrastructure) affect credit demand
Duration of loan	The length of the period of loan repayment in months	+	Reflects how loan duration affect credit demand
Collateral requirement	Whether the household provided/ indicated collateral: dummy 1= yes; 0= No	+	Reflect how collateral condition affect credit demand
Membership duration	The length of the period for which a household have been a member to MFIs (in months)	+	Reflects how experience of household with MFIs services affect demand
Type of MFI	The type of MFI for which a household is a member. Dummy variables (Bank, SACCOS, NGO, Governmental)	?	Reflects how lending conditions of MFI affect credit demand.
Education of household head	The highest education of household head dummy (no formal education; primary school ; secondary school or above)	+	Education reflects the stock of skills and knowledge , thus ability to bargain for loan in MFIs and hence affects demand

MFIs characteristics variables

To represent the influence of the various microfinance characteristics on demand for credit among farm households the study used dummy variables. Four dummy variables were formulated to represent each type of MFI surveyed. The four types of MFIs involved are namely; First, banks (Mufindi Community Bank, NMB); second, SACCOS (Madibira, Mlevera, Tujikomboe, Ng'anda); third, NGOs (FINCA, PRIDE, SELF); fourth Governmental programmes Programme (SIDO).

Household location characteristics

Four location dummy variables were identified in the surveyed areas to represent the effect of factors such as availability of crop markets, price of inputs, price of output, infrastructure development (roads, and electricity), weather conditions, availability of non-farm economic activities, and other geographical location characteristics. The locations identified in the survey areas are: First, Mufindi highlands areas of Mudabulo dividion, Malangali division generally served by Tujikomboe SACCOS and Mufindi Community Bank; second, Madibira wards served by Mufindi community Bank, and Madibira SACCOS; third, Njombe areas, served by the Ng'anda SACCOS and Mlevera SACCOS; and fourth, Kilolo areas mostly served by SIDO, NMB and PRIDE.

Control variables

Control variables included in the analyses are the household structure variables (age, marital status of house head, dependents ratio, and household size) and household endowment variables (education of household head, size of land cultivated , value of total household assets, quality of household house, and annual value of household non-crop income). The measurements of these control variables are the same as presented in Table 6.

Data and model diagnostics

Ordinary least square regression techniques require some multivariate analysis conditions to be fulfilled in order to produce consistent and unbiased estimation results. These conditions or assumptions are: freedom from outliers and influential variables, normality, homoscedasticity, linearity, and multicollinearity. Econometric

and multivariate data analysis literature suggests several procedures to test these OLS assumptions (Hair *at el.*, 2006; Woodridge, 2000; Ndunguru, 2007; Jacques , 2007; Gujarati, 2006; Pindyck and Rubinfeld, 1991).

Outliers and leverage variables

Variables were tested for outliers by use of studentized residual. Observations whose studentized residual had absolute values greater than 2.5 were removed from the analysis as this could exaggerate the relationship (Woodridge, 2000). Four observations indicated studentized residuals greater than 2.5 and were therefore removed from the analysis. This procedure reduced the sample from 210 to 206 households. Leverage values (independent variables with influential observations) were detected by use of cook's Distance (D). The higher the Cook's D the more influential the point is. The conventional cut-off point for leverage values is when the Cook's D is greater than 4/n. When this procedure was applied, three more observations had Cook's D greater than 4/n, (Where n=206), and hence were removed from the sample. The remaining sample after these two procedures was 203 farm households.

Normality, heteroscadasticity, and multicollinearity

Normality of residuals is generally required for valid hypothesis testing. That is the normality assumption assures that the p-values for t-tests and F-test will be valid. Some literatures suggest that normality is required on predictor variables in order to obtain unbiased estimates of the regression coefficients. Some literatures, however, suggest that OLS regression merely requires that the residuals (errors) be identically and independently distributed. Thus there is no assumption or requirement that the

predictor variables be normally distributed. If this were the case then it would have not been possible to use dummy coded variables in regression models (Woodridge, 2000).

Normality of the dependent variable, independent metric variables, and the residuals was tested by visual plots and the Shapiro-Wilk test (swilk). The dependent variable and some of the independent variables were found not normally distributed and were transformed into logarithmic forms (natural log). However, some variables such as age, household size, dependants ratio were generally normally distributed thus log transformation was not necessary. Heteroscadasticity was tested using Bresch-pagan test. The model had no severe heteroscadasticity, however it was adjusted through White's heteroscadesticity robust adjustment available with STATA package. Linearity was automatically attained after normality was achieved.

Multicollinearity is a post-estimation test. The fitted OLS demand equation was tested for multicollinearity using variance inflation factor (VIF). The maximum variance inflation factor among regressed variables was found to be less than 3.0. This was within the tolerable range of 10.0 (Woodridge, 2000; Hair *et al.*, 2006). Thus there was no multicolinearity threat in the model.

3.6.3 Analytical approach on the impact of access to MFIs on crop income, savings, and asset accumulation.

The empirical specification of microfinance impact on farm household variables of interest was derived as follows:

$$B_{ij=} \quad X_{ij}\Theta_B + Z_j\beta_B + e_{ij} \quad , \qquad \text{..... (3)}$$

$$Y_{ij} = X_{ij}\Theta_y + Z_j\beta_Y + B_{ij}\Omega_y + \mu_{ij}, \quad \text{.....(4)}$$

Where $B_{ij=}$ the outstanding amount borrowed from the microfinance institutions by household i in district j; X_{ij} is a vector of household characteristics; Z is a vector of district (location) characteristics; Y is an outcome variable on which impact is to be measured; β, Ω, and Θ are parameters to be estimated , e, and μ are errors representing unmeasured household and location characteristics that determine borrowing and outcome respectively. Ω is the primary parameter of interest as it measures the impact of microfinance credit on the outcome Y.

Econometric estimation of these equation systems may yield biased parameter estimates if the error terms are correlated (e and μ). The correlation on the two error terms arise due to self-selection into the microfinance institution and non-random microfinance placements. Self-selection arises when some households have selected to be members in a microfinance institution (and they then decide, within conditions imposed by the institutions, how much to borrow), and others will have selected not to be members. If for example more entrepreneurship household join the microfinance, then unmeasured 'entrepreneurship' would influence both the decision to become a member and the amount to borrow, and further would impact outcome measures (income, farm investments, savings, assets accumulation, and others). Alternatively, if more of the relatively poor and with less entrepreneurial endowment join the microfinance than the rich who might feel stigmatized in a group with the poor people, then the error terms would be negatively correlated, and the estimation of microfinance institution impact would be biased downwards.

To address the self-selection problem in the analysis two multiple regression approaches were used. The OLS approach and the Heckman model approach.

The Heckman sample selection model, which estimates the effect of an endogenous variable, was used on the whole sample (members and non-members sample). The Heckman model creates a variable known as 'inverse mills ratio' which compensate for sample selection bias associated with voluntary participation programs such as MFIs (Heckman, 1979; Heckman and Jaffery, 1999; Zaman, 1998b; Shahidu *et al.*, 2004). In the first stage in the model, access to MFIs is estimated by a probit model and the inverse Mill's ratio is generated and used to compensate for selection bias in the second stage outcome equation. The Heckman procedure has been discussed in lengthy in chapter two under literature review.

The OLS approach appropriately minimized selection bias when the non-members sample is excluded in the analyses and the sample composed of microfinance members in the form of treatment group and control group was used (known as pipeline approach). However estimating the impact of amount borrowed on outcome variables of interest using OLS would produce biased estimated due to endogeneity of the amount borrowed. This necessitated the use of an instrumental variable instead of amount borrowed variable. Household membership time length variable was used as an instrumental variable instead of household amount borrowed variable. The variable was tested to see whether it fulfils the instrumental variable conditions and it was found to be appropriate (the current household borrowings were regressed on membership time length variable, the result indicated that R^2 = 0.57; see Woodridge, 2000). The assumption is that households' borrowings (loan

size) tend to increase over time and therefore the impact of borrowings on borrowers is a function of time. With this survey design equations (3) and (4) were replaced by a single impact equation as follows:

$$Y_{ij} = X_{ij}\Theta_y + Z_j\beta_Y + D_{ij}\varphi_y + \mu_{ij} \text{, } \ldots\ldots (5)$$

Where Y, Z, and X are as defined before; $\Theta_y, \beta_Y,$ are parameters to be estimated; the variable D measures availability of the program services (credits) to households in terms of months since joining microfinance program for household members (instrumental variable). Unlike the amount borrowed, the membership time duration in months a household has been with microfinance institution is exogenous to the household characteristics and to outcome variables. With this specification φ_y measures both the short term and long term microfinance impact of making the program available to them (for an additional month) rather than the impact per amount borrowed which is endogenous variable to household characteristics and outcome variables. Additionally, the membership duration variable can capture non-monetary indirect benefits of MFIs services such as training, group peer shared skills, experience and technology adoption. In the data set, if Y is uncensored, then OLS is appropriate; if Y is censored, then Tobit estimation is appropriate (Gujarat, 2006; Ndunguru, 2007; Woodridge, 2000; Hair *et al.*, 2006; Tobin, 1958). The model so specified assumed that there are no spill-over effects to non-members, to the extent that such spill-over effect are captured by location fixed effect rather than program effects.

The nature of the operations of MFIs surveyed did not suggest the presence of

program placement problem. SACCOS microfinance institutions are member-based and are generally organized on wards bases. Membership is open to all households in the wards and to other villagers outside the wards. The administrative system of Mufindi Community Bank, SIDO and PRIDE or FINCA was different from SACCOS systems. These financial institutions had one main office at district head quarters and operational branch offices in selected rural areas centres where members from nearby villages came for the services on selected days of the week. Membership was open to all households from any villages in the district although borrowing was done through group or individual approach depending on agreed lending conditions. The nature of the placement and operations of the microfinance institutions surveyed in the study do not suggest village placement endogeneity. Therefore the MFIs surveyed could be assumed to have random village placements.

The use of the control group in equation 5 also addressed the issue of counterfactual. The control group was composed of the newly joined microfinance members with less than three months membership duration. Three months was considered to be the appropriate cut-off point for newly joined members. The assumption was that newly joined household who had passed the screening mechanism but for whom benefits of microfinance participation would have not accrued at the time of survey was an appropriate method of creating the control group than using non-members as a control group (Similar proxy was used by Maldonado and Gonzalez-Vega, 2008)

Regarding fungibility of money, this study assumed that household are not firms in a strict sense such that fungibility is a strategy to be encouraged to enhance impact at household level (See Hulme, 2000). The bases of the analysis was not on the

premises that 'X 'amount of TAS was borrowed, invested entirely in farm activities and this led to a 'Y' amount of TAS change in income (or any outcome). Instead two assumptions were made: one, a certain amount of money borrowed (from various MFIs) by a utility maximizing household and that controlling for other factors can roughly be attributed to a certain change in crop income (or any outcome variable of interest) to this loan; Secondly impact is a function of time such that the impact of MFIs services is correlated with the period of time a household is exposed to MFIs services, thus controlling for other factors through multiple regressions a unit change in outcome variable can be attributed to a unit change in membership duration.

In addition to the above premises this study was designed to assess the impact of total flow of financial resources to households from microfinance institutions in aggregate terms rather than trying to assess the impact of credit disbursed by an individual microfinance programme (as some studies do in order to address specific donor requirements). The objective was to estimate what had been achieved by microfinance institutions in aggregate terms and thus provide basis for policy interventions in the microfinance industry as a whole.

Main variables used in the analysis

The dependent variables of interest were the household annual crop income, agricultural investments, and savings. The explanatory variables of interest were the amount of loan outstanding at the time of survey, and the duration (in months) of household membership in MFIs. The control variables included in all analyses were the household structure variables (size, age, dependency ratio, marital status of

household head, sex of household), the asset endowment variables (education of household head, non-crop income, total assets, land owned) and the location variables. The measurements of dependent variables used in the model are presented in Table 8 while the measurement of the other variables included in the model (control variables) are the same as presented in Tables 6 and 7.

Table 8: Description of the variables used on the impact analyses

Variable Name	Description and Measurement	Expected Influence	Reason
Crop income	The total annual monetary value of all crop income of a household (in TAS)	+	Crop income is the major source of income of farm households in Iringa region and in agrarian economy areas (IRSEP, 2007;Diagner and Zeller, 2001; Harper, 2005). MFIs credit are expected to affect crop income
Access to MFIs credit	Two variable were used: 1=The total value of current loan amount of household (in TAS), 2= length of household membership (in months)	+	Large size of loans and longer periods of membership are expected to significantly affect outcome variables.
Location variables (Mufindi, Madibira, Njombe, and Kilolo locations)	Dummy variables=1 for respective location and 0= otherwise	+/-	Reflects the differences in, location characteristics (product markets, infrastructure, land quality, etc)
Agricultural investments	The variable was measured as the annual value in TAS of farm variable input expenditure (fertilizers, labour, pesticides, and seeds)	+	Reflects the effect of MFIs credit in alleviating capital constraints in form of machinery and working capital.
Savings	Total financial savings with MFIs; (in TAS)	+	Membership conditions and incentives may affect savings behaviour.
Asset accumulation	The total monetary value of household assets (both productive and non-productive- in TAS)	+	Micro-credit are expected to enhance assets building (direct use or returns from investment)

Data and model diagnostics

The sample used in the Heckman model was the whole sample composed of 457 farm households of which 210 were MFIs members and 247 were non-members farm households. In the OLS analyses, two types of samples were used as per equation 5, namely; the whole sample of 457 farm households (for naïve estimates) and the members sample composed of 210 farm households.

Econometric estimations using OLS models require testing of data to meet the econometric assumptions of influential variables (outliers and leverages), normality of the dependent variable and of residuals, multicollinearity, and heteroscadasticity. According to the nature of the study, the two samples of household members and non-members were tested for econometric assumptions separately.

Normality of the dependent variable and residuals was tested using visual plots and Shapiro Wilk test for normality. Results indicated that crop income as a dependent variable was not normally distributed and so the variable was transformed into natural logarithm in order to attain normality. Log transformation was also done on all metric independent variable to enhance normality of their distribution. Outliers and influential observations (leverages) were detected by use of studentized residuals and the Cook's Distance. Observations with studentized residual greater than absolute values of 2.5 were removed from the sample and also observation whose Cook's distance was greater than 4/n (where n= number of observation in the regression) were also removed from the sample. When these adjustments were made the remaining sample was 419 of which 219 household were non-member and 200 household were microfinance member. Multicolinearity was tested using Variance

Inflation Factor (VIF) procedure and correlation matrix. Multicollinearity figures obtained through VIF were within tolerable ranges of less than, 10.0 (Hair *et al*, 2006). In most cases VIF was not more than 3.0. The models were tested for heteroscedasticity using Breusch-pagan/Cook- weisberg test and most regression equations were found heteroskedastic. To correct for heteroscedasticity, the robust white's correction procedures were employed.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 General Characteristics of the Sample

This section describes the general demographic characteristics of the sample obtained in the survey. The section provides information on the composition of the sample in terms of sex, age, marital status, and education. It acts as stepping stone toward more detailed descriptive analyses of the study objectives as presented in the subsequent sections of this chapter.

4.1.1 Characteristics of the sample by sex of household heads

Table 9 shows that 78.8% (360) of farm household heads sampled were male while 21.2% (97) were female. The Table also shows that the composition of male household heads was 84.2% for microfinance members sample compared to 74.2% for non-members sample. The gender composition of household heads sampled indicated that more of the households' heads were male. The high percentage of male household heads in the members sample suggests that male headed households had more access to MFIs than female headed households.

Table 9: Distribution of respondents by sex of household head and by MFIs membership status

Membership	Sex				Total (N= 457)	
	Male		*Female*			
	Number	%	Number	%	Number	%
Members	176	38.5	34	7.4	210	45.9
Non-members	184	40.3	63	13.8	247	54.1
Whole sample	360	78.8	97	21.2	457	100

4.1.2 Age of sampled household heads

Table 10 shows that 25.6% of the household heads aged between 18 to 30 years. This group was made up of young families. Approximately 41% of household heads aged between 31 to 40 years, while 23% and 10% aged between 41 to 50 and 51 to 65 years respectively. The Table also shows that almost 90% of households' heads aged below 50 years and only 10% were aged above 51 years. The age wise group distribution of the sample by microfinance membership of household was generally similar with slight differences. The age distributions statistics of the sample suggest that households involved in the survey were economically active and therefore suitable for the nature of this study.

Table 10: Distribution of the age of sampled household heads by MFIs membership status

	Members		Non-members		Whole sample	
Age (in years)	Frequency	%	Frequency	%	Frequency	%
18- 30	53	25.4	64	25.8	117	25.6
31- 40	87	41.6	101	40.7	188	41.1
41- 50	49	23	55	22.2	103	22.6
51-65	21	10.0	27	11.3	49	10.7
Total	210	100.0	247	100.0	457	100.0

4.1.3 Level of education of household heads

Table 11 shows the distribution of sampled household heads by education level by microfinance membership. Approximately 84% of the household heads had primary school education, 12% had secondary school education or above. Household heads with no formal education or had attended adult literacy classes was marginally small at four percent of the total sample. Table 11 also shows that the sample was mostly composed of household with primary school education. It can also be observed that microfinance members sample had more proportions of household heads with secondary school education or above (at 20%) compared to no non-members sample (at 6.5%). This observation suggests that access to MFIs among farm household was associated with education level of household heads.

Table 11: Distribution of sampled household heads' level of education by microfinance membership status

Level of education	MFIs Membership				Total	
	Members		Non-members			
	Number	%	Number	%	Number	%
No formal education	4	1.9	13	5.2	17	3.7
Primary education	163	78.0	219	88.3	382	83.6
Secondary school education and above	43	20.1	15	6.5	58	12.7
Total	210	100.0	247	100.0	457	100.0

Descriptive statistics in Table 11suggest that majority of the respondents surveyed had primary school education, followed by secondary school or above and the least those with no formal education. The distribution of educational level of the household heads in the sample generally reflects the general composition of educational level of rural population in Tanzania.

4.2 Factors Affecting Farm Household Decision to Participate in MFIs

4.2.1 Qualitative analysis

To be able to identify the qualitative factors affecting farm household decision to participate in MFIs, the respondents were asked to indicate the major problems or reasons that hinder or facilitate participation in MFIs services as described in the methodology chapter. The reasons were categorized into two; demand factors and

supply factors. Results on respondents' responses are as presented below:

Non-participants responses on participation decisions

Demand factors

The analysis was carried on non- microfinance participants sample of 247 farm household. Table 12 shows that 9% of the non participant farm households said that they were satisfied with their private capital in carrying out their farm and non-farm activities, 56% said that their poverty status would not allow them to cope with microfinance conditions (initial deposits, and collateral).

Table 12: Factors affecting farm households' participation in MFIs (non-members sample)

S/No	Factors	Number of Observations	% (N= 247)
	Demand factors		
1.	Adequacy of private (personal) capital	23	9
2.	Lack of any collateral	139	56
3.	Aware of where MFIs are located	16	6
4.	Unreliable agricultural activities	25	10
5.	Lack of non-farm businesses	15	6
	Supply factors		
6.	Cumbersome procedures (initial deposit, compulsory savings, frequent meeting, search of peers)	129	52
7.	High interest rate	84	34
8.	Distance between household and location of MFIs	3	1
9.	Fear of confiscation of assets	16	6

Six percent (6%) of the respondents indicated that they were not aware of the services offered by microfinance institutions. About 10% of the respondents' stated that unreliability of agricultural activities hinders participation. Lack of diversification in non-farm activities to mitigate loan repayments in case of crop failures was a constraining factor among 6% of the non-participant respondents. Lack of awareness of the presence of MFIs services in local areas was cited by 6%

of the non-participant sample. None indicated that their applications were rejected or did they dislike debt.

Supply factors

On the supply side, 52% of the non-microfinance participant respondents complained on the cumbersome procedures set by the microfinance institutions to get the services (initial deposits, compulsory saving, frequent meetings, and lack of peers). High interest rate was cited by 34% of the non-microfinance participants. Six percent of non-microfinance participants pointed out that small loan sizes issued by MFIs was a reason for not participating, while about 6% of non-participants cited fear of confiscation of assets in case of loan repayment failure. Long distance of microfinance institutions location from villages was pointed by almost one percent of the non-microfinance participating respondents.

Participants' responses on participation factors

Lending conditions

Microfinance participants were asked to give their view on some operational characteristics of MFIs. Table 13 shows that 44% of the microfinance participants used group borrowing methodology, while 56% used individual borrowing methodology. Results also show that 56% of MFIs participants were required to provide collateral every time they wanted to borrow from microfinance institutions. Out of the households who provided collateral, 53% indicated that they used houses as collateral, and the remaining 47% indicated to have used land (mostly with perennial crops) as collateral.

Table 13: Factors affecting farm household participation in MFIs (members' sample)

S/No	Factors	Number of Observations	% (N= 210)
1.	MFIs require borrowers to be in groups (Group lending)	93	44
2.	Preference for individual loans	117	56
3.	Collateral requirement	66	31
4.	No collateral requirement during borrowing	94	44
5.	Use of house as collateral	105	50
6.	Use of farm as collateral (tree farm)	12	6
7.	Initial deposit at the time of joining the MFI	191	91
8.	Training given/received after joining MFIs	168	80
9.	The type of training given is book keeping	168	80
10.	Type of training received is agricultural issues	0	0
11.	Loans processing time less than 30 days	160	76
12.	Loans processing time more than 30 days but less than 60 days	50	24
13.	Satisfied with the loans received	63	30
14.	Interest rate is very high (high= 25.7%; normal= 43%)	66	31.3
15.	Hardship experienced on loan repayments	65	31
16.	Hardship in loan repayment due to crop failure (low prices, droughts, floods)	59	28
17.	Hardship in loan repayment due social affairs (sickness, bereavement etc)	6	3

About 91% of farm household microfinance participants indicated that they were required to make initial deposits (compulsory savings), before being allowed to apply for any loan. It was further noted that 80% of the microfinance members were subjected to initial training on book keeping and general business skills but not related to agriculture.

Loan processing factors

Results from the survey indicated that 76% of the participants' loan applications were processed within 30 days, and the remaining 24% loan applications were processed in more than 30 days but less than 90 days. SACCOS microfinance loans were found to be processed within 30 days while majority of participants' applications in other microfinance institutions are processed beyond 30 days. Regarding loan duration, it was found that the average loan duration is 9 months, while the maximum and shortest loan duration was 36 months and 1 month respectively.

Loan adequacy

Interviews with microfinance officials and respondents indicated that borrowers would borrow a maximum of three times the amount of their savings (a policy applied by MuCoBa and SACCOS). Results on whether respondents were satisfied with the amount of loan received indicated that: 70% of the respondents stated that the amount given was small and not satisfactory for their needs, while 30% indicated that they were satisfied with the amount they received.

Interest rates charged

The results on the perceptions of participants on interest rates charged by microfinance institutions showed that 31.3% of respondents said that interest rates were very high, 25.7% said it was high, and those who cited it to be normal were 43%. None of the respondents indicated that interest rates were low.

Loan repayments Hardships among farm households MFIs participants

Microfinance members were asked to indicate whether they experienced hardships in loan repayments for any reasons. About 69% of the microfinance participants indicated that they had never experienced hardship while 31% confessed that they faced hardships. Those who experienced hardships were further requested to indicate the main cause of problems: 90% stated crop failure or low crop prices to be the major cause of repayment hardships; the remaining 10% indicated social emergencies such as diseases and family/relatives bereavement to be the cause for loan repayment hardships.

Implication from qualitative analysis

Qualitative inquiries indicate several important factors that influence microfinance participation decision among farm households and have policy implications. From the demand side perspective, the level of poverty of farm households is a cause for fear of participation among majority of farm household non participants. Fear of asset confiscation among farm household in case of failure to repay loan seem to affect a portion (6%) of farm households from membership. Participation is also hampered by lack of diversification in non-farm activities among farm households. Those who solely depend on crop production indicated lack of confidence in

agricultural activities due to volatility of crop yield and prices thus inability to cope with loan repayments. These results find support from Pitt and Khandker (1998), who found that micro-credit program participation requires a minimum level of entrepreneurial ability which poor people need to have in order to benefit from microfinance. Only those among the eligible individuals who are risk-takers and confident enough to use the credit productively in varieties of economic activities join the credit programme.

On the supply side results indicate that compulsory savings requirement before loan application and initial deposit deter majority of poor farm households from participating. The situation is further complicated in some instances when borrowers are required to have collateral for loan applications. Collateral is a limiting factor toward accessing some microfinance institutions among farm households in the survey areas. Although group lending and village authority guarantee are used to alleviate this collateral problem, survey inquiry reveal that some very poor farmers find it difficult to be accepted by group peers even when group lending methodology is allowed by microfinance institutions. This is because in case of default group members usually had recourse on assets of a group member (See also Siamwala, 1990).

Loan processing time and loan repayment procedures are two important aspects of usefulness of credits. A loan that is intended to be used to purchase fertilizers or pesticides to control disease outbreak if not made on time would be useless to farmers. The loan processing time of 30 days is commended by members because it allows them to cope with crop requirement before planting season as application are

made some months before the rainy season (July to September), however this loan processing time is inappropriate for emergency requirements of funds for expenditures such as pesticides and chemical fertilizers when needed during the farming season (October to May). It was also found that some MFIs give one month grace period while others up to six months. When loan repayment is required before harvest or sale of crop output, it deters some borrowers and sometimes causes repayment problems for borrowers. Shorter grace periods of less than six months is inappropriate for agricultural loans as repayments are required before harvesting season thus limiting the ability of farm household to mitigate repayments. With regard to interest rates survey inquiry revealed that microfinance banks charged higher interest rates compared to SACCOS, NGO or Governmental microfinance (30% for microfinance Banks and 24% for SACCOS). BoT statistics in 2009 indicated that main stream banks on average charged 22%-19%. Holding all other factors constant, some prospective microfinance participants can be deterred by high interest rates charged by microfinance institutions.

4.2.2 Descriptive Results on Factors Affecting Participation decisions

Table 14 presents a two sample T-tests on means differences and other descriptive statistics between the control group sample and the sub-sample of the non-participants (refer methodology chapter) on variables of household asset endowment, non-farm income, and household structure variables.

Table 14: Two samples mean t-test on sub-sample of non-members and control group sample on household characteristics variables.

S/No.	Variable name	Sub-sample- means values (N=76)	Control Sample- mean values (N= 75)	T- values for mean differences
1.	Household head age (in years)	38.13	33.65	2.9078***
2.	Household labour ratio	0.62	0.55	2.0667**
3.	Household size	4.94	5.38	-1.1422
4.	Household house quality (dummy , 1= acceptable house; 0= otherwise)	31%	62%	-4.0136***
5.	Household dependency ratio	0.38	0.46	-2.3253**
6.	Household non productive assets per capital (TAS)	89 183.7	172 310.5	-3.3291***
7.	Household total assets (Livestock, productive and non-productive assets) per capita (TAS)	126 030.6	226 934.6	-3.4839***
8.	Household land size per capita (in acres)	0.767	1.009	-1.3553
9.	Household marital status (dummy, 1= married;0= otherwise)	0.722	0.8571	-1.9160*

Mean differences significant at 1% (***); 5% (**); and 10% (*).

Household asset endowment

As shown in Table 14, the differences on the means on variables of household house quality and total assets were statistically significant at the level of one percent. The mean differences on household land size and household livestock variables between the two samples were not statistically different from zero.

The control group (newly joined members) had on average more households with quality houses than the non-participant sub-sample. Sixty one percent (61%) of the control group households had collateral acceptable house quality compared to only 31% of their counterpart households in the sub-sample of non-participants with similar housing quality. The difference in the means was significant at zero percent level (p= 0.0001). These results suggest that the quality of housing of household affects the decision to participate in MFIs. This is because a house is used as collateral by MFIs with individual lending mechanism. Similarly households with quality houses are easily acceptable by peers in MFIs with group lending methodology. The results suggest that household with collateral acceptable house quality had more probability of joining MFIs than their counterparts without acceptable housing.

The mean for the per capita non-productive assets were TAS 89 184 and TAS 172 311 for sub-sample non- participants and control group sample respectively. The means difference between the two groups was significant at zero percent level (p= 0.001). These results suggest that households with more assets had more probability of joining MFIs than their poorer households' counterparts.

Household structure variables

Table 14 shows that the average age of household head was 38.13 years for non-members sub sample and 33.65 years for control group sample. The differences on the mean for the age of household head variable between the two samples was statistically significant at the level of one percent (p= 0.0043). On average the control group (new MFIs members) contained less aged household heads than the sub-sample of non-members sample. This suggests that households with young household heads have more probability of joining MFIs than household with matured or old household heads. This is due to high economic activeness, more risk taking behaviour and quick adoption of innovation among young households compared to old households who are risk averse, and slow in adopting innovations.

The means difference on dependents ratio and labour force ratio were statistically significant at 5% level (p = 0.0216 and p = 0.0407 respectively). Control group sample had high dependents ratio compared to non-participants sub-sample. On the other hand non-participants had high labour force ratios compared to participants control sample. These results indicate that households with more dependants' ratio have more probability of joining MFIs than households with low dependant ratio. High dependants ration suggest labour shortage in a household, thus household with labour shortage have a high probability of joining MFIs to mitigate labour shortage (both in farm and non-farm activities) through credit funds.

The mean difference on household size variable between non-participants and the control group participants was not statistically different from zero. The difference on marital status of household head between the two groups was significant at a 10%

level of significance. Control group household indicate slightly high proportion of married household compared to non-participants sub-sample. Marital status indicates trustworthiness of a household in a society and thus high acceptability by groups arising from social trustfulness by group peers especially in group based lending MFIs. Therefore married household heads have more probability of joining MFIs than unmarried household heads.

Generally descriptive statistics results show that the two groups of control sample and sub-sample of non-members have significant differences in some demographic and socio-economic variables. These results suggest that the decision to participate in MFIs among farm household is governed by these specific household characteristics variables.

4.2.3 Econometric results and discussions

Table 15 presents the logistic regression results on the factors affecting participation decisions among farm households. The sample used for the analyses was the control group sample and non-participants sub-sample. Both the socio-economic and demographic variables were involved as described in equation (1) in the methodology chapter.

Table 15 shows six variables with significant coefficients. These are the age of household head, household dependents ratio, and marital status of household head, per capita household assets, and education of the household head. The age variable of the household head was negative and statistically significant at 1% ($p= 0.012$). Age in this context reflects the household economic activities, adoption to

innovation and responsiveness to risks associated with credit. The negative sign implies that the probability of participation in MFIs decreases with increase in age and vice versa.

Table 15: Logistic regression estimates of coefficients of determinants of microfinance participation decision

	Dependent variable: Dummy variable 1= Control group (63) and 0= sub sample of non-participants (72): N= 135			
Independent Variable	Coefficient estimates	Odds ratios	Std. Err	Wald (Z)
Household head Marital status (Dummy , married =1, 0= otherwise)	1.373**	3.950	0.611	2.25
Household head age (years)	-0.073***	0.027	0.031	-2.52
Household head Education(1= No formal education, 0= otherwise)	-0.244	0.967	1.236	-0.20
Household head education-3(1= secondary school or above, 0= otherwise)	2.364***	10.642	0.942	2.51
Household dependency ratio	2.476**	11.892	1.374	2.07
Log of land size owned (in acres)	0.507	1.661	0.352	1.48
Household house Quality Dummy (1= acceptable, 0= otherwise)	0.520	1.683	0.496	1.06
Log of per capita household assets (TAS)	0.710***	2.036	0.290	2.49
Const.	-10.057***	-	3.948	2.60

χ^2 (8) = 57.10; Prob > χ^2 = 0.0000; Pseudo R Squared= 0.3061; Log Likelihood = - 64.723; Log likelihood when all coefficients equal zero= -93.275; Significant at 1% (***); 5% (**), and 10% (*).

Thus the negative sign suggest that young household heads (>40 years) had more probability of joining MFIs than matured household aged between 41-50 years or old aged 51-65. This is because as the age of household head increases adoption to innovations declines.

From these results it can also be inferred that as age of household increases beyond some point, risk taking behaviour associated with credit starts declining (risk evasiveness increases with age). Furthermore old age is associated with decrease in economic activeness and therefore credit evasiveness. These results are similar to those observed by Mohamed (2003) in Zanzibar context who also found a negative relationship between age of households and accessibility to credit. In Bangladesh Zaman (1998b) found that membership to BRAC credit program increased with the age of households of but then declined beyond a certain age limit.

The dependents ratio variable was positive and significant at 5% level (p= 0.039). Households with high dependents ratio had a high probability of joining MFIs compared to their counterparts with low dependents ratio (High labour force ratio). This implies that labour constrained households are likely to join MFIs to alleviate labour constraints through borrowed funds. This finding confirms the hypothesis that one pathway through which micro credit might improve the livelihood of beneficiaries is thorough reduction of labour constraints faced by households (both farm and non-farm) and micro-entrepreneurs. These results are in conformity to those by Zaman (1998b) and Akram *et al.* (2008) who found that household with fewer numbers of income earners to households' size are more likely to become members of microcredit program in Bangladesh and Pakistan respectively.

The dummy variable for marital status of household head was positive and statistically significant at 5% level (p = 0.024). The implication is that married household head had a higher likelihood of joining microfinance than single household head (Married household head in this study context were found to be male). A change in marital status from single to married increases the odds of microfinance participation significantly (holding other factors constant). Marital status of household head represent family relationship that would both increase the trustworthiness necessary to be accepted by one's group peers and facilitates obtaining family (clan) support if the borrower have difficulties in his/her loan repayments. These findings are similar to those by Diagner and Zeller (2001) in Malawi context, Mohamed (2003) in Zanzibar, and Zaman (1998b) in Bangladesh who found that male headed households had more odds of joining MFIs than their counterpart female headed households. However, Pitt and Khandker (1998) showed that female have more probability of joining BRAC credit program than male.

Per capita household assets variable had a positive and statistically significant effect on MFIs participation as expected (p = 0.013). The likelihood of microfinance membership increased with increases in total household assets. Household assets are normally used as collateral by individual lending microfinance institutions. Similarly possession of some assets increases trustworthiness and acceptance by one's group peers in group lending microfinance institutions. There is evidence to suggest that households with more assets have a high probability of joining microfinance institutions compared to very poor households. Wright (1999), Johnston and Mordurch (2007), and Diagner and Zeller (2001) similarly showed that insufficient

resources deter poor households from participating in MFIs due to fear of inability to pay debt on time and lack of assets to collateralize loans.

The household housing quality variable has a positive effect on participation decision, although the coefficient was not statistically significant (p= 0.29). Households with acceptable house quality have slightly high probability of participating in MFIs compared to their counterpart households with collateral unacceptable houses. Good housing reflects creditworthiness and the ability of household to collateralize loans.

The education level of household heads was also found to significantly affect participation decision. Three dummy variables for education of the household head were used in the analysis. The primary school dummy variable was used as a reference category in the model. Results showed that the coefficient for secondary school or above education dummy variable was statistically significant at the 1% level (p= 0.012). Implying that households whose heads had secondary school or above education had more probability of joining MFIs compared to their counterparts households with primary school or no formal education. This was generally expected because increase in education of household head increases the confidence of using MFIs services due to reduction in transaction costs of microfinance institutions services (MFIs services paper works, and training requirements). Similar results were obtained by Maliki (1999), and Akram *et al.* (2008) in Pakistan, Zaman (1998b) in Bangladesh, and Mohamed (2003) in Zanzibar.

The variable for land size was not statistically significant (p= 0.139). However other studies such as by Diagner and Zeller (2001), in Malawi, and Duong and Izumid (2002) in Vietnam found that total farming land decisively determines participation decisions in MFIs.

4.3 Farm Household Demand for MFIs Credits

One of the study objectives was to determine the nature and extent of demand and identify factors effecting farm household demand for credit from MFIs and provide policy recommendation accordingly. The hypothesised determinants of demand among farm households were household location characteristics, MFIs characteristics variables and control variables of farm household specific characteristics (demographic and economic). This section presents the descriptive and econometric results and discussion on this objective.

4.3.1 Descriptive analysis

Table 16 presents the descriptive analysis of the credit demand of farm households according to their locations. The Table shows that the overall average credit demand was TAS 584 699. The minimum demand was TAS 30 000 and the maximum was TAS 6 000 000 (six million). Household members in Njombe areas had the highest mean loan demand at TAS 829 387, followed by Madibira households with average loan at TAS 602 758. Kilolo households indicated the lowest loan of all the surveyed areas at TAS 282 812. These results suggest that on average household loan demand amount differ from one location to another. This could be due differences in to the underlying location factors such as infrastructure development, economic endowments and other unobservable factors.

Table 16: Descriptive Statistics of Sampled MFIs Members' Loan Demand by Location

Location	Mean (in TAS)	Standard deviation	Minimum (in TAS)	Maximum (in TAS)
Mufindi	534 298	786 280	30 000	4 500 000
Madibira	602 758	503 710	45 000	2 800 000
Njombe	829 387	1 194 151	40 000	6 000 000
Kilolo	282 812	231 965	50 000	1 100 000
Whole sample	584 699	800 673	30 000	6 000 000

Descriptive analysis also shows that the average demand for credit depends on the type of MFIs for which farm households have membership. As shown in Table 17 on average bank borrowers had the highest average loan demand (TAS 686 388), followed by SACCOS borrowers (TAS 673 330). Farm household who borrowed from government MFIs had the lowest average loan size (TAS 322 727). These results suggest that there are specific MFIs characteristics and/or lending conditions that affect credit demand of farm households. Lending factors such as group lending or individual lending mechanism, collateral requirements and capital capacity can be attributed to the observed results.

Table 17: Descriptive statistics of loan demand of sampled farm households members by type of MFIs membership (N= 203)

Type of MFI	Mean (TAS)	Standard deviation	Minimum (TAS)	Maximum (TAS)
Bank (MuCoBa)	686 388	782 276	30 000	4 500 000
SACCOS	673 330	904 410	40 000	6 000 000
NGO	374 000	286 351	60 000	1 100 000
GOVNMENT	322 727	363 752	50 000	1 500 000
Whole sample	584 699	800 673	30 000	6 000 000

Descriptive analysis further suggests that education of household head affect the amount of credit borrowed by households. On average borrowing of farm households whose heads had secondary school or above education had loan amount of TAS 889 722 (N= 36) while that of households with primary or no formal education was TAS 501 331 (N= 164). The mean differences was statistically significant at the level of 1% (p= 0.0052). This suggests that education of farm households head is an important factor on credit demand decisions among farm households.

Table 18 indicates that longer loan period induces farm households to borrow more. On average households who were allowed to make repayments over a period exceeding six months had the highest average loan size than those who made their repayments within three or six months. The results showed that about 42% of farm household had loan duration of between 10 months to 12 months. Only 7% of borrowers had loan duration of equal or less than three months. These results

suggest that with longer loan repayment time periods, preferably more than nine months farm households borrowers can increase their borrowings significantly afford the required repayments. This is due to the fact that farm households can mitigate loan repayment with cash flows from their investments which generally have low returns in rural areas. Longer time period were more important for households who depend solely on cereal crops such as maize, rice, potatoes which require longer periods of time of at least six months before receiving cash flows. For horticultural crops such as tomatoes, onions, and vegetables at least three months was found appropriate. Qualitative inquiry also revealed that some microfinance institutions had weekly collection in form of deposits or loan repayments. Farm household members generally complained on this practice because household who had no alternative sources of income other than crop income faced difficulties in coping with such cash flow requirement.

Table 18: Descriptive statistics of loan demand of sampled farm household members by loan duration (N= 203)

Loan duration (months)	No.	%.	Mean (TAS)	Standard deviation	Minimum	Maximum
<3	15	7.4	291 333	232 590	40 000	1 000 000
4- 6	81	40	384 383	339 133	30 000	2 000 000
7-9	20	10	716 500	716 146	100 000	2 800 000
10-12	86	42.1	768 755	1 073455	30 000	6 000 000
>12	1	0.5	1900 000	N/A	1 900 000	1 900 000

N/A= Not applicable

Table 19 shows the frequency distribution of loans demanded by all surveyed MFIs. About 73% of the household borrowers had loan size equal or below TAS 500 000. Around 15% of microfinance members had loan size between TAS 500 000 and TAS 1 000 000 while about 12% of household members had loan size above one million. These results suggest that very few farm households can afford to purchase farm machinery while majority of the borrowers had loan sizes just adequate to finance farm variable inputs and other petty non-farm businesses or consumption.

Table 19: Frequency distribution of credit demand of the sampled farm households MFIs members

Loan amount (TAS)	Frequency	%	Cumulative %
1-100 000	33	16	16
100 001-200 000	45	22	38
200 001- 300 000	34	16.7	54.7
300 001- 400 000	28	13.7	68.4
400 001- 500 000	11	5.4	73.8
500 001- 600 000	10	5	78.8
600 001- 700 000	8	3.9	82.7
700 001- 800 000	6	3	85.7
800 001-1 000 000	3	1.5	87.2
1 000 001 +	25	12.8	100
Total	203	100	100

Regard farm household expenditure on procured loans, Table 20 shows that 70% of microfinance participants used part of their loans in agricultural activities to purchase farm inputs such as fertilizers, pesticides, and hiring labourers. Results also showed that 24% of farm household borrowers used their loan for consumption purposes including education of their children (secondary school), health expenses, and other social needs. About 31% used part of their loans for starting or furthering their non-farm businesses. Non-farm businesses included restaurants, local and modern beer bars, small shops, crops trade, used cloth business (Mitumba), and others.

The Analysis further showed that about 8% of the microfinance borrowers used their loans to purchase power tillers (special type of low cost tractors). Results showed that all farm household who used their loan to purchase machinery were located in Madibila ward. Madibila areas are prominently served by Mufindi Community Bank and Madibila SACCOS. The average borrowing for this group of borrowers was above one million. Most of farm household in Madibila area benefit from an agricultural irrigation scheme located in the Usangu basin where farmers use irrigation to cultivate rice for both consumption and commercial purposes.

Table 20: Descriptive statistics of major types of loan uses by sampled farm households MFIs members

Type of loan use	No. of Observation	%. (N= 203)
Businesses (non-farm)	63	31
Farm variable inputs	142	70
Farm machinery	16	8
Consumptions	48	24

4.3.2 Regression analysis results

Table 21 show two OLS regression equations results on the the determinants of credit demand. Initially microfinance type dummy variables and location dummy variables were analysed in one OLS equation. The ration of the number of variable to the sample size (variable: observation ration) was found to be below the ideal ratio of 1: 15. The observation led to a decision to run two OLS equations while altering the explanatory variables. The variable for interest rate charged by microfinance institutions was not included as this was found constant among members of the same microfinance institution, thus there was little variation to cause a significant impact in the model.

Table 21: OLS Coefficients estimates of the determinants of credit demand of sampled farm households members (equation 1)

S/No.	Dependent Variable is Log of household credit amount	N= 203		
	Independent Variables	**Coefficient**	**Std. Err.**	**T- Value**
1.	Education of Household Head D3- Dummy variable =1 for secondary school	0.307	0.307	1.96 (0.051)**
2.	Mufindi location Dummy variable (=1,and 0= otherwise	0.269	0.168	1.60 (0.112)
3.	Madibira location dummy=1, and 0= otherwise	0.585	0.137	4.25(0.000)***
4.	Njombe location Dummy variable =1; and 0= otherwise	0.552	0.179	3.08 (0.002)***
5.	Quality of house of household dummy variable =1 for collateral acceptable house, and 0= otherwise	0.320	0.146	2.19(0.030)**
6.	Duration of loan in Months	0.054	0.016	3.39(0.000)***
7.	Log of household total assets	0.276	0.077	3.56 (0.000)**
8.	Log of household total land cultivated	0.224	0.096	2.33(0.021)**
	Constant.	7.656	0.994	7.70***
	Adjusted R^2			0.4004
	F- Values			13.49 (0.000)

Numbers in brackets are P-values. Significant at 1% (***), 5% (**), and 10% (*) respectively.

Household location dummy variables

Table 21 shows that the location dummy variables were significant determinants of the amount borrowed by the households. The dummy variables for Madibila, and Njombe were statistically significant at 1% level, while the coefficient for Mufindi dummy variable was not statistically significant (reference location was Kilolo). The implication is that the amount borrowed by microfinance members is affected by the location of the household. Microfinance who were located in Madibila, or Njombe borrow more than those located in Kilolo by 58%, and 55% respectively compared to Kilolo microfinance members. Microfinance members located in Madibila exhibited the highest amount borrowed and propensity to borrow, followed by Njombe, and Mufindi. Kilolo indicated the lowest of all the location surveyed. The differences in demand across the surveyed locations can be attributed to differences in entrepreneurship, resources endowment and infrastructure development. In Madibira areas presence of an irrigation scheme and reliable transport infrastructure enhance the production of rice, maize and other crops and hence farm income. This economic advantage induces farm household members to borrow more for agricultural activities or for related farm and non-farm activities (*e.g.* chemicals, farm implement shops, crop produce trade).

In Njombe areas the high production of marketable potatoes as the main cash crop facilitated by good transport network motivate farm household members to borrow more to invest in farming and related farm activities (*e.g.* farm implement shops, crop trade) compared to Kilolo or Mufindi highland areas which are affected by poor infrastructure. The location effect on household demand for credit was also

highlighted by Pitt and Khandker (1998) in Bangladesh who showed that village differences in natural resource endowment influence farm households' credit demand in addition to other factors. Zeller *et al.* (1997) also indicated that the relative differences on poverty level across regions were the cause for variations in borrowing behaviour of households.

Type of MFIs membership

Table 22 presents the results of the analysis of the second OLS equation on the determinants of demand for credit among farm households. Four dummy variables were included to represent the effect specific lending characteristics of the four surveyed types of microfinance institutions. The coefficient for bank membership dummy variable was statistically significant at zero percent level (p= 0.000). This result shows that farm households who borrowed from microfinance banks (*e.g.* MuCoBa) procured/demanded more credit amount than households who were members of government microfinance institutions by almost 59% (Government MFI was used as reference dummy variable in the analysis). Qualitative analysis supported this result by showing that some borrowers of microfinance banks (MuCoBa in particular) borrowed substantial funds to the extent that they were able to purchase modern farm equipments such as power tillers. The observed findings can be attributed to the relative big operating capital capacity of microfinance banks compared to government MFIs and the individual lending methodology used by microfinance banks. The individual lending policy provide opportunity for individual borrowers who have collaterals and who may be relatively non- or less poor to use as security to borrow large loans.

Table 22: OLS Coefficients estimates of the determinants of credit demand of sampled farm households members (equation 2)

	Dependent Variable is Log of household current credit amount : N= 203			
S/No.	Independent Variables	Coefficient	Std. Err	T-Values
1.	Education of Household Head D3 (Dummy variable =1 for secondary school)	0.251	0.153	1.64 (0.102)*
2.	Quality of house of household dummy variable =1 for collateral acceptable house, and 0= otherwise	0.416	0.136	3.06*** (0.003)
3.	Duration of loan in Months	0.032	0.015	2.47 (0.014)***
4.	Log of household total assets	0.317	0.073	4.29(0.000)***
5.	Log of household total land cultivated	0.184	0.095	1.47(0.122)
6.	Household type of MFIs membership Dummy=1 for Bank , 0= otherwise	0.591	0.073	3.85 (0.000)***
7.	Household type MFI membership Dummy=1 for SACCOS , 0= otherwise	0.463	0.155	2.99(0.003)***
8.	Household type of MFIs membership Dummy=1 for NGO , 0= otherwise	0.405	0.180	2.25(0.026)**
	Constant.	7.169	0.969	7.39***

R^2 = 0.4076; Numbers in brackets are P-values; Significant at 1% (***), 5% (**); and 10% (*) respectively.

The coefficient for SACCOS dummy variable was also statistically significant at 1% level (p= 0.003). SACCO's members were found to borrow more by around 46% than the governmental programs members. The coefficient for the members of

microfinance NGO was statistically significant at the level 5% (p= 0.026). Field interviews also indicated that microfinance NGOs and government programmes used mainly the group lending methodology which does not require collateral. Instead group peers pressure is normally used to enforce repayments of loan. Normally the amount issued by group based MFIs are not expect to be large as the case with individual lending mechanism applicable with banks or SACCOS microfinance institutions. This is because the only grantee is the group cohesion and therefore loan security is generally low to warrant large loans from lenders who mostly avoid excessive risks.

In addition field interview indicated that MFIs such as FINCA, SIDO sometimes focus exclusively on desperate poor, especially women who have micro-businesses. The credit demands for such clients are generally and relatively small. The present study results find support from finding by Diagner and Zeller (2001) in Malawi who observed that the average loan sizes issued to farm households significantly varied across micro-credit programmes. Microfinance banks exhibited the largest loan sizes than microfinance NGOs or government supported programmes.

Loan transaction characteristics variables

The duration of time of loan over which repayment are made positively affected demand for credit at a statistical significance of 1% level (p= 0.003) in all two regression equations. This was expected because longer loan periods of time and opportunity for farm household to put the money into profitable operations before receiving the initial cash flows from investments in both farm and non-farm activities. For agricultural activities the minimum duration is three months for

horticultural crops and pulses, and the time increases to six months for cereal crops such as rice, maize and others. Additionally longer loan duration allows farm households to get better prices which needs a couple of months (up to four months) to pick up after harvesting season.

Household endowment variables

Household housing quality, total household asset, and education of household head were statistically significant while the size of land cultivated by the household was marginally significant in all the two OLS equations. The dummy variable for collateral acceptable house has a positive and significant effect on the demand for credit among farm households. Household members with acceptable houses are predicted to borrow up to 41% more than members with unacceptable houses. The variable for the total household assets was statistically significant and positive in both equations at the level of 1% (p= 0.000). Intuitively less (or non-poor) poor households with some assets reflect their high creditworthiness and income generating ability and can be assumed to have additional entrepreneurial ability and risk taking behaviour. The results are consistent with those by Akram *et al.* (2008) who observed that total borrowing per household was positively and significantly dependent upon both initial total assets and transitory liquid assets of members.

The coefficient for household size of land cultivated variable was positive and significant at the level of 5% in the first equation and marginally significant in the second equation (p= 0.112). The results suggest that farm size do not determine demand for credit. Farm households with large farm holdings would have demanded more credit in order to mitigate working capital (labour, and farm variable inputs)

requirements. These results indicate that credit demand of farm households was marginally driven by the size of land cultivated. Results by Akram *et al.* (2008) however contradict these results. They found that land has a positive and significant effect on borrowing in Pakistan context (land is used as collateral in most cases by MFIs in Pakistan). However the present study results find support from Shahidur *et al.* (1998) who found that microcredit issued by microfinance programmes in Bangladesh (Bangladesh Rural Development Board, and Grameen Bank in particular) were mostly used by clients on production and employment in the rural non-farm sector than in the farm sector and thus borrowings had no correlation with farm inputs expenditure.

The dummy variable for education of household head in the category of secondary school or above was statistically significant at the level of 5% and 10% in the first and second equations respectively. Households whose heads had secondary school education or above had more borrowings than households with primary school or no formal education. This was due to complementarities of human capital (skills and knowledge) and physical capital in the production process. Education increases productivity and thus ability to handle relatively large farm and non-farm investments. In addition the bargain power for credit increases with education. Similar results were observed by Cheng (2006), Akram *et al.* (2008), and Mohamed (2003).

Household structure variables

All coefficients for household structure variables were not statistically significantly different from zero. These variables are not included in Table 22, however they

indicated the expected sign (age- negative; marital status –positive; dependency ratio- positive; and household size –positive). These findings are consistent with Zaman (1998b) who found that household' structure variables such as age, and household size, influence participation decisions but not the amount borrowed by households.

4.4 Impact of MFIs services on Crop Income, Savings and Asset Accumulation.

In this section the results and discussion on the impact of access to microfinance services are presented. Both descriptive and econometric results are presented. The results are presented in four major subsections namely, impact on crop income, farm investments, savings and asset accumulation.

4.4.1 The impact of MFIs on crop income

The analysis on the impact of access to MFIs services on farm household crop income was analysed using both descriptive and econometric techniques as stated in the methodology chapter.

4.4.1.1 Descriptive statistics results

The analysis on descriptive statistics was carried out to estimate the differences on the mean crop income between the control group (newly joined members) and the treatment group (old members). The descriptive analyses also involved estimating means differences and pair wise correlations among the factors that determine crop production of farm households. However the descriptive results do not prove causality but rather show which factors are likely to cause variation in crop income among farm households in the two groups.

Means statistics on crop income of farm households

Table 23 shows the mean t-test statistics of annual crop income of surveyed farm households.

Table 23: Descriptive statistics on farm variables inputs between the control and treatment group samples (T-test for sample means)

Variables	Control group N= 72	Treatment group; N= 128	T- test on mean differences	Overall means
Crop income (TAS)	1 749 319	3 236 559	2.321**	2 701 153
Farm variable inputs (TAS)	162 871	228 061	2.9290***	204 593
Land cultivated (in acres)	3.93	6.44	5.4 ***	5.4

Significant at 1% (***); 5% (**), and 10% (*) respectively.

As shown in Table 23 the mean annual crop income for the treatment group (old microfinance members) is TAS 3 236 559 and for the control group (new microfinance members) was TAS 1 749 319. The mean differences on crop income between the treatment group and control sample is statistically significant at the level of 5% ($p = 0.0213$). The older members had on average higher mean crop income than the new members.

Table 23 further indicates that the mean expenditure on farm variable inputs (fertilizers, seeds, pesticides etc) for the treatment group is statistically and significantly ($p= 0.0038$) higher than the control group. The mean for land size cultivated by the treatment group was similarly larger than the control group at a level of 1% significance.

Table 24 shows that the mean statistics on crop income, variable input expenditure and size of land cultivated vary by location of farm household members. As show in Table 24 farm households located in Madibila had the highest mean statistics in all three variables, namely crop income, variable inputs expenditure, and size of land cultivated. Farm household in Njombe location ranked second in terms of crop income and farm variable input expenditures. The Mufindi farm household ranked last in all the locations surveyed in the three variables.

Table 24: Descriptive statistics on farm variables inputs by location of sampled farm household MFIs members

Variables	Mufindi; N= 60	Madibila; N= 59	Njombe; N= 50	Kilolo; N= 31	Over all mean; N=200
Crop income (TAS)	890 933	5 876 407	2 063 400	1 190 210	2 701 153
Farm variable inputs (TAS)	163 581	1 389 280	445 154	311 029	619 410
Land cultivated (in acres)	4.2	7.97	4.69	4.93	5.54

Descriptive statistics also show that the mean crop income for household whose heads have secondary school education or above was TAS 3 316 681 compared to TAS 2 566 037 for primary school or/and no formal education household. The mean difference was however not statistically significant (p=0.385). These statistics suggest that education of household head did not affect crop income of household. Despite the finding in section 4.3 which showed that education of household head significantly affected borrowings, the interactive effect of education and borrowing on crop income is not evident. Suggesting that insignificant portion of MFIs credits

were directed toward farming activities by borrowers. If all borrowing were directed toward crop farming, then household with secondary school education or above could have indicated higher mean crop income than their counterpart with primary or no formal education households through borrowing pathway though this could not necessarily a prove of causality.

Correlation statistics

Table 25 presents the Pearson correlation coefficients among the selected variables of farm household members. The correlation between crop income and borrowing of farm household was 13%. This level of correlation is generally low to suggest a significant effect of borrowings on crop income. The correlation between crop income and length of membership (in MFIs) of farm household was also as low as 14%. The correlation between borrowings and variable inputs expenditure was about 16%. This suggests the effects of borrowings on expenditures such as seeds, manure, chemical fertilizers, pesticides, and labour was very low. The effect of borrowing was slightly high on size of land cultivated by members when the correlation increased to 25%.

Table 25: Pearson correlation matrix of farm variable inputs variables of farm household MFIs members (N=200)

Variables	Farm input	Crop income	Member ship length	Land. Cult	Borrowing
Farm input (TAS)	1.0				
Crop income (TAS)	0.9198***	1.00			
Membership length (months)	0.1307*	0.1427*	1.00		
Borrowing (TAS0	0.1548*	0.1268*	0.2480**	0.2574**	1.00
Land. Cult (acres)	0.7243***	0.6686***	0.2233**	1.00	0.2574**

Significant at 1% (***); 5% (**), and 10% (*) respectively.

Implication from descriptive statistics

Results from descriptive statistics showed that the treatment group sample had statistically and significantly higher average crop income than the control group sample. The correlation analyses showed that increase in amount borrowed (0.13) or membership length (0.14) was positively associated with increase in crop income. However the strengths of the associations were statistically marginal. Econometric analyses are presented in the next section to show whether access to MFIs cause crop income to vary between the control group and treatment group. However the observed differences on crop income between the two groups cannot be directly be attributed to MFIs credits or other services because descriptive statistics did not control for the effects of farm household specific characteristics and location effects.

4.4.1.2 Econometric analyses

The Heckman model results

The Heckman model results for estimating the impact of microfinance membership are presented in Table 26. Table 26 shows that the coefficients of the inverse mills ratio (Mills Lambda) was positive and statistically significant at the level of 1% (p= 0.009).

Table 26: Heckman two steps Coefficients estimates of the impact of microfinance borrowings on household crop income.

Outcome equation: Dependent variable- Log of Crop income

Independent Variables	Coefficients.	Std. Err	Z	P> /Z/
Log of Borrowing (in TAS)	0.0066	0.029	0.23	0.819
Mufindi Location Dummy	-0.021	0.129	-0.16	0.870
Madibira Location Dummy	1.422	0.135	10.49***	0.000
Njombe Location Dummy	0.580	0.134	4.31***	0.000
Household dependency ratio	-0.585	0.350	-1.67*	0.095
Log of size of land cultivated (acres)	0.605	0.083	7.23***	0.000
Log of household fertilizer and other farm expenditure (In TAS)	0.129	0.029	7.56***	0.000
Log of total assets (in TAS)	0.26	0.107	2.48**	0.013
Mills Lambda	0.838	0.321	2.61***	0.009
Constant	12.367	1.774	28.12***	0.000

Significant at 1% (***); 5% (**), and 10% (*) respectively. Number of observations = 419; Censored observation= 219;Uncensored observations= 200; Wald chi2 (10) =399.38 ; Prob > chi2 = 0.000; Mills Lambda Obtained from fist stage probit equation. Kilolo is reference location.

The observed positive sign of the coefficient of the inverse mills ratio (lambda term) suggests that the unobservable factors influencing microfinance membership (self-selection) are positively correlated with the factors affecting crop income. That is factors such as entrepreneurship, ability, and risk taking behaviour of farm household members positively affect both membership and crop income. If these factors were not controlled the effect of borrowing on crop income could have been significantly overstated.

The impact of amount borrowed by farm household on crop income as indicated by the coefficient of log of amount of borrowed variable was positive but statistically insignificant (p= 0.819). Therefore, the Heckman two-steps model results showed no evidence to suggest an impact of MFIs credits on crop income among rural farm households after controlling for self-selection bias in the whole sample (pooled data of members and non-members).

OLS estimation results

The impact of MFIs credit on crop income was also estimated using OLS regression equations. Two OLS regression equations were run. The first regression equation was run on the control group sample (new members) together with treatment sample (i.e. pipeline approach) and the second analysis was done on the whole sample in which case non-members were pooled with microfinance members. The second OLS analysis on pooled data of members and non-members was done just for demonstration to represent (naïve estimation) the type of analyses which ignores selection bias. The two OLS regression equations were run in accordance with the operational model in equation (5).

OLS estimate on treatment vs control samples- pipeline approach

This approach was done to eliminate the problem of selection bias likely to arise when using the whole sample. The length of membership of household to MFIs was used as an instrumental variable instead of amount borrowed (Amount borrowed is an endogenous variable). The instrumental variable (Household length of membership) was designed in two forms namely; a dummy approach and a metric variable approach. A dummy variable was created to separate the treatment group and the control group. The treatment group was composed of old members (membership duration greater than three months) and was assigned a value of one and the control group composed of new microfinance members (membership less than or equal to three months) were assigned a value of zero. A metric form of the membership length variable was the duration in months for which a household have experienced MFIs services. The log for household crop income was regressed against membership length variable (dummy and metric, one at a time) together with the control variables of household demographic, socio-economic, and location variables.

Results of equation 1 in Table 27 shows that the coefficients for the membership length dummy variable was not statistically significantly different from zero (p= 0.410). Meaning that crop incomes did not vary by whether a household belonged to the treatment group or to the control group. In other words the impact of credit as measured by membership duration dummy variable on crop income was not statistically significant. When the dummy variable separating the control group and the treatment group was replaced with a metric variable of microfinance

membership length in months, the impact of MFIs on crop income was positive, though insignificant even at the level of 10% (p= 0.155).

Table 27: OLS coefficient estimates of the impact of access to microfinance on household Crop income (Pipeline and Naive estimations)

Dependent variable: *Log of crop income* **Independent variables**	**Equation 1: N=200 (Treatment = 128, Control = 72)-pipeline**		**Equation 2 : Whole sample N= 419 -Naive**	
	Coef	Std .Err	Coef.	Std. Err
Household membership Dummy variable (1=Microfinance members, 0= Non-members)	—		0.352 (3.81)***	0.092
Treatment or control sample, (Dummy= 1, Treatment; 0= control)	0.083 (0.83)	0.071	-	-
Household length of microfinance membership in months	0.101(1.43)	0.017	-	-
Age of household head in years	-0.007 (-1.41)	0.004	-0.005 (-1.50)	0.003
Household dependency ratio	0.062 (-0.23)	0.269	-0.264 (-1.57)	0.169
Log of household land cultivated	0.560(7.24)***	0.074	0.872 (14.47)***	0.060
Log of total household expenditure in fertilizers and other expense	0.174 (7.24)***	0.025	0.99 (8.66)***	0.011
Household Location Dummy 1 = Mufindi, 0= otherwise	-0.026 (-0.18)	0.146	-0245 (-2.61)***	0.093
Household Location Dummy 1 = Madibira	1.42 (11.10)***	0.127	1.22 (13.41)***	0.091
Household Location Dummy 1 = Njombe	0.607(4.39)***	0.138	0.506 (5.24)***	0.097
Constant	11.82 (29.26)***	0.404	11.464 (59.03)***	0.194
	F(8,191)=81.51		F(9,409)=188.32	
	Prob>F=0.000		Prob>F = 0.000	
Adjusted R^2	0.7344		0.7516	

Significant at 1% (***); 5% (**), and 10% (*). Figures in parentheses are t-values. Kilolo = reference location.

OLS estimation on whole sample (naïve estimation)

OLS results on the whole sample analysis of equation 2 in Table 27 shows that the coefficient for microfinance membership status dummy variable (a variable separating members and non-members) was statistically significant at the level of less than 1% (p=0.000). This meant that crop income of farm household increases with member to MFIs. Signifying that MFIs credit had a significant impact on crop income among members. This result however demonstrates analysis that ignores selection bias. When the unobservable difference between microfinance members and non-members such as entrepreneurship, risk taking behaviour and other giving rise to self-selection into microfinance program are ignored the results are normally either overstated or understated. Therefore not controlling for the selection bias on unobservable factors between members and non members, the effect of MFIs credit or other services could have been overstated.

Multivariate regression results under both the Heckman model (Table 26) and OLS model (Table 27, equation.1) also showed that there were other factors that significantly influenced farm household crop incomes. These factors are: location characteristics, size of land cultivated by a household, and amount of expenditure farm variable inputs.

Results indicated that household located in Madibira area and Njombe area exhibited the highest level of crop income compared to household located in Mufindi or Kilolo districts (reference category) at levels of significance of 1% (p= 0.000). The possible reasons for the observed location (districts) differences in crop income among surveyed households could be differences in climatic conditions,

type of crops grown, crop prices, agricultural technology adoption, and infrastructure development. In Madibira areas there is an irrigation scheme in the Usangu basin which enhances the production of crops such as rice, maize and beans. Similarly in Njombe areas the abundant production of marketable round potatoes, maize and beans coupled with good transportation networks can be attributed to the observed high crop income of farm households located in these areas (See chapter three). The low crop income in Mufindi and Kilolo locations can be attributed to poor transportation net works such as roads which affect prices of agricultural inputs and crop output especially in wet seasons, hence poor markets of crop products and therefore low incomes.

Results also showed that the variables for total amount of expenditure on agricultural inputs (*e.g.* chemical fertilizer, labour, seeds, pesticides) and size of land cultivated by households significantly affect crop income. The amount of expenditure on agricultural inputs and the size of land cultivated by households were both positively and significantly correlated with crop income in all analyses (Heckman and OLS). Household with more expenditure on agricultural inputs or cultivated large sizes of land realized more crop incomes. These results were expected because these two variables are major determinants of the agriculture production function.

The study findings on the relevant determinants of crop income are in conformity with the findings by Rahman and Ahmed (2010) who also found that household size, and total land size owned had positive and significant influence on household crop income.

Implication from descriptive and econometric results on crop income

Both descriptive and econometric results show that access to microfinance credit had positive but statically insignificant effect on crop income and thus contrarily to the hypothesis of the study. The expectation was to find that those who had access to funds (micro-credit) could use credits to reduce agricultural input constraints or facilitate acquisition of farm machinery and thereby other things being equal enhance crop income. Three reasons can be suggested to be the cause for the observed lack of significant impact of MFIs services on crop income. First is small/inadequacy of loans issued/ borrowed by farm households; second is insignificant amount of credit spent on farm activities (more credit directed to non-farm activities), and third is the nature of the rural economy (prices, market access, storage etc).

Result from qualitative analysis indicated that almost 70% of farm household members had loans less than TAS 500 000. This amount was small to enable farm household purchase farm machinery such as tractors or power tillers which are expected to bring greater changes on agricultural output. Results also showed that only 8% of farm household members used credit to acquire farm machinery (mostly power tillers). These results suggest that cultivation of land for agriculture activities among farm households still depends on hand hoes. The finding showed that the possible pathway though which credit can make a dent is through farm variable inputs expenditure such as seeds, fertilizers, pesticides and others.

Farm household demand for credit showed that farm credit was significantly correlated with education of household head (secondary school or above) however

the correlation between education of farm household head and crop income was not significant. This suggests that credit demanded did not necessarily translate into change in crop income which implies that amount borrowed was not only spent in farm inputs but also invested in other non-farm investments or household consumption.

Results further indicated that the correlation between farm variable input expenditure and amount borrowed and/or length of membership in MFIs was marginal suggesting that expenditure in agricultural inputs and implements was not the most preferred area of investing MFIs credit among farm households. Qualitative inquiry showed that non-farm activities and consumption needs compete with agriculture needs on borrowed funds and thereby significantly reducing its effect on crop income. As Reardon *et al.* (1994) and Barret *et al.* (2001) pointed out, non-farm and farm enterprises choices are made jointly and compete for household's labour, and capital resources. The number of farm activities engaged in by households, and the scale of each activity, depend on the relative returns of farm and non-farm activities. Consequently in most rural areas access to credit may not necessarily enhance farm income as one would expect.

The finding that locations of farm household affects both credit demand and household crop income shades light to suggest that the effect of MFIs services on farm household were hampered by location characteristics of farm household in rural areas. There is evidence to suggest that even when farm household invested their credit funds in farm activities, location specific characteristics such as poor agricultural infrastructure development (*e.g.* irrigation), type of crop grown, soil

fertility, and land availability, transportation, market access and storage facilities affect crop income and hence MFIs impact. There is also evidence to support the argument by Buckley (1997), Conning (1999), Fischer (2010) and Stewart *et al.* (2010) that the environment in rural areas of developing countries are so frail such that the volatility of returns in agricultural activities inhibits pay-offs from micro-credits.

The findings of this study are also supported by those by Coleman (1999) in Thailand who found that loans taken by households were too small to be invested productively and thus did not make a difference. Similarly in Malawi Diagner and Zeller (2001) indicated that MFIs credits increased fertilizer application among members but the effects on crop incomes were negative due to droughts and other adviser characteristics of the rural farm economy. In India Binswanger and Khandker (1992) found that the effect of expanded rural finance have been much smaller in farm sector than in non-farm sector. Capital investment was found to be more important in substituting for agricultural labour than in increasing crop output. In Bangladesh the study by Khandker (1998b), and Pitt and Khandker (1998) also indicated that MFIs do not support farm household crop income growth. Their results showed that increased income among MFIs program villages were largely due to non-farm income. Similarly Zeller *et al.* (2001) showed that access to credit among farm households can provide good return only when complementary inputs such as seeds or irrigation water, or market access are present.

4.4.2 Impact of MFIs on agricultural investments

In this study agricultural investment was defined as any expenditure related to

agricultural activities undertaken by farm households (Reardon *et al.*, 1994). The major agricultural or farm expenditures included expenditure on variable inputs (expenditure in fertilizers, chemicals, pesticides, modern seeds, and labour) and long term expenditure such as expenditure on tractors, power tillers, animal tractions and others. It was hypothesized that farm household participation in microfinance institutions services especially credit would increase their ability to purchase farm inputs and technology adoption. Farm household microfinance members were expected to exhibit high propensity to use modern farm technologies such as approved crop seeds, chemical fertilizers, pesticides, and tractors than non-members, or newly joined members. Econometric techniques were used to estimate the effect of access to MFIs on application of farm variable inputs. The analysis however did not cover the effect of MFIs on farm machinery expenditure due to limited number of observation on farm machinery expenditure among farm households.

Descriptive statistics results on farm variable inputs expenditure

T-test statistics was used to assess the mean differences in farm variable inputs expenditure amount among the survey samples. Descriptive statistics indicated that the whole sample average annual farm variable input expenditure was TAS 411 838. The annual average farm variable inputs expenditure for microfinance members was TAS 618 410 compared to the annual average for non-members of TAS 223 188. The difference in the annual average expenditure was statistically significant at the level of zero percent ($p = 0.000$). Descriptive statistics further indicated that the differences between the control group sample average (TAS 372 469) and that of the treatment sample (TAS 710 122) was significant at the level of 5% ($p = 0.037$).

Location wise Madibira households had the highest mean of farm variable input expenditure (TAS 1 389 280) followed by Njombe households (TAS 445 154) while Mufindi farm households ranking last (TAS 163 581), after Kilolo households (TAS 311 029). Results also showed that the correlation between amount borrowed and variable input expenditure was positive but as low as 0.16. Similarly the correlation between farm household lengths of membership and farm variable input expenditure was positive but also as low as 0.14.

Generally descriptive results indicated that there was evidence to suggest that old microfinance members (treatment group) had significantly more farm inputs expenditure than new microfinance members (control group) at a level of 5%. However these descriptive results do not prove that these means differences were attributable to MFIs credit due to the possibility of the effects of other socio-economic factors and farm household location differences. Consequently econometric analysis was important to establish the strength of the causal relationships.

Econometric results on household farm investments- Heckman and OLS

The dependent variable in the models was the natural log of total annual expenditure in farm variable inputs. The total annual farm inputs expenditure was obtained by taking households expenditure on chemical fertilizers, pesticides, seeds, and labour of farm activities. The impact of MFIs credits was measured by significance of the coefficient of the log of household borrowings (in the Heckman model) and the length of household membership time in months (in the OLS model). The analysis also included the specific household socio-economic and demographics variables as

control variables. The forced entry procedure regression was used and insignificant control variables were removed from the analysis until refined model fit was obtained.

Table 28 presents the results of the two-step Heckman model on the estimation of the variables affecting farm variable inputs expenditures in agricultural activities. The dependent variable in the outcome equation is the log of total household farm expenditures in agricultural inputs. The selection equation was based on the probit microfinance participation equation (dummy variable; members vs non-members)

Results indicate that the coefficient for mills lambda is statistically significant at 1% (p=0.000). Implying that farm household who participate in microfinance institutions had high expenditures on variable agricultural inputs compared to non-microfinance members. This difference was however, due to observable and unobservable household characteristics (self selection) between members and non-members.

The impact of household microfinance membership (Log of household borrowings) on agricultural inputs was statistically not significant (p = 0.946). This implied that under Heckman procedure there was no evidence to suggest that credits from microfinance institutions had increased investments in agricultural variable inputs among farm household microfinance members.

Table 28: Heckman two steps coefficient estimates on the impact of microfinance borrowings on household farm variable inputs expenditure

Dependent variable: *Log of Total annual farm variable input expenditure (TAS).* N= 419; Members = 200, Non-members = 219				
Independent Variables	**Coefficients.**	**Std. Err**	**Z**	**P> /Z/**
Log of Borrowing (TAS)	0.005	0.086	0.07	0.946
Kilolo Location Dummy	0.129	0.379	0.34	0.733
Madibira Location Dummy	0.815	0.329	2.47***	0.013
Njombe Location Dummy	0.686	0.335	2.05**	0.041
Household head age in years	-0.008	0.017	-0.39	0.695
Household dependency ratio	3.00	0.895	3.35***	0.010
Log of size of land cultivated (acres)	0.945	0.243	3.88***	0.000
Household Education Dummy, 1= primary education, 0= otherwise	2.833	1.642	1.73*	0.084
Household head Education Dummy, 1= secondary education or above, 0= otherwise	2.99	1.757	1.71*	0.088
Mills Lambda	2.462	0.528	4.66***	0.000
Constant	16.853	2.525	6.67***	0.000

Significant at 1% (***); 5% (**), and 10% (*). Number of observations = 419; Censored observation= 219; Uncensored observations= 200; Wald chi2 (10) =45.86 ;Prob > chi2 = 0.000; Mills Lambda obtained from probit selection equation. Probit equation presented in Appendix 5

The OLS regression analysis on MFIs members (as categorized into the control sample and treatment sample) are as presented in Table 29. As shown in Table 29 the impact of MFIs services as measured by membership time length variable was

not statistically significant even at the level of 10% (p = 0.931).

Table 29: OLS coefficients estimates on the impact of access to microfinance on agricultural variable inputs (MFIs members only)

Dependent variable= Log of land cultivated **Independent variables**	**Treatment sample, N= 128, control sample, N= 72)Total N= 200**	**Std. Err**
Household time length of microfinance membership (in months)	0.004 (0.09)	0.004
Age of household head in years	-0.01(-0.71)	0.014
Dependent ratio	1.67 (2.31)**	0.720
Education of household head dummy (1= No formal education)	-0.03(-0.02)	0.340
Education of Household head Dummy (3= secondary school or above, 0= otherwise)	0.706 (2.21)**	0.334
Log of household land cultivated	1.514(7.38)***	0.205
Household Location1 Dummy 1 = Kilolo, 0= otherwise	0.518 (1.33)	0.389
Household Location2 Dummy 1 = Madibira, 0= otherwise	1.098 (3.22)***	0.340
Household Location3 Dummy 1 = Njombe, 0= otherwise	1.11 (3.34)***	0.334
Constant	10.492(15.79)***	0.664
	F(9,190)=11.50	
	Prob > F = 0.000	
Adjusted R^2	0.3219	

Significant at 1% (***); 5% (**), and 10% (*)... Figures in parentheses are t-values.

These results suggest that there was no significant difference on variable inputs expenditure among microfinance members (control group vs treatment group). MFIs services had a positive but insignificant effect on farm variable inputs expenditure among farm households.

Conclusively both the Heckman procedure and OLS regressions results showed that MFIs membership had a positive effect on farm variable input expenditure of household however the effect was statistically not significant.

The study findings are contrary to a study by Olagunja, (2007) in Osun–State Nigeria who found that farmers who used credit exhibited increased use of farm resources compared to farmers without credits. In Malawi the study by Diagner and Zeller (2001) noted a significant difference on input application between microfinance program members and non-program members. Members were given in-kind loan (fertilizers and pesticides) and thus exhibited higher fertilizer application compared to non-members, however the impacts on crop income were diminished by other factors such as lack of rainfall (droughts), low crop prices and others.

The Heckman model and the OLS model identified several other determinants of total farm variable inputs expenditures. Tables 28 and 29 indicate the importance of location fixed effect on farm variable input expenditures. Madibila and Njombe locations had the highest positive and statistically significant farmvariable input expenditure compared to Mufindi which was used as a reference location in the analyis. Farm household in Kilolo and Mufindi districts had relatively similar

expenditures on agricultural inputs. The results suggest that household location specific characteristics such as land fertility, land scarcity (population density), technology adoption behaviour, and transportation and availability of fertilizers are attributable to the noted differences across locations. In Njombe location the population density was high to the extent that farm households have small landholding and hence necessitating an efficient utilization of land through fertilizer application. In addition the production of marketable round potatoes which require abundant use of fertilizers can be attributed to this observation. In Madibira areas the competitive scarce land for rice production under irrigation in low lands dictate the heavy use of fertilizers to maximize output. In Kilolo and Mufindi mountainous landscape and the poorly developed transport infrastructure hampers transportation of agricultural inputs and thus application of the same.

4.4.3 Impact of MFIs on farm households savings

This section presents the results on the impact of MFIs services on saving behaviour of farm household members. The hypothesis was that access to MFIs services motivates farm household to make more financial savings to mitigate their future capital needs and credit worthiness. Both descriptive and econometric analyses are presented. The sample used in the analyses was the farm household members only (control and treatment groups) because the savings of non-members were not observable and thus constrained to zero. Therefore to eliminate contamination of analyses non-members were not involved in the analyses.

Descriptive analysis on farm household financial savings

The mean saving of farm household MFIs members was TAS 490 130 and the overall standard deviation was 1 495 463. The mean savings of the treatment group was TAS 559 882 while that of the control group was TAS 366 125. The mean difference was statistically significant at the level of 5% (p= 0.0385) between the two groups. Table 30 shows that farm household members located in Madibira area had the highest level of savings (TAS 891 661), followed by Njombe households (TAS 543 900). Household located in Mufindi (TAS 168 683) areas indicating the lowest amount of savings after Kilolo households (TAS 261 354). These results suggest that location characteristics were likely to affect savings of farm households significantly.

Table 30: Descriptive statistics of sampled households MFIs members' outstanding financial savings (in TAS)

Location	Mean	Standard deviation	Minimum	Maximum
Mufindi	168 683	261 046	0	1 230 000
Madibira	891 661	2 500 681	15 000	16 000 000
Njombe	543 900	736 280	0	3 200 000
Kilolo	261 354	1 069 036	0	6 000 000
Whole sample (N= 200)	490 130	1 495 463	0	16 000 000

Table 31 shows that the mean savings of farm households differ by type of MFIs for which farm household had membership. On average SACCOS members had the highest average saving balances than all farm households with savings in other MFIs. These results suggest that MFIs specific characteristics such as compulsory savings, interest rates on savings and other affect savings of farm households.

Table 31: Descriptive statistics of outstanding financial savings of sampled farm household by type of MFIs membership (in TAS)

Type of MFI	Mean	Standard deviation	Minimum	Maximum
Bank (MuCoBa)	255 512	402 768	0	2 420 000
SACCOS	694 725	1 787 500	20 000	16 000 000
NGO	62 000	86 419	0	125 000
Government	358 667	1 295 907	0	6 000 000
Whole sample (N= 200)	490 130	1 495 463	0	16 000 000

The savings of farm households were in general very widely spread. While the highest amount of saving was TAS sixteen million (TAS 16 000 000) the lowest amount of savings observed savings is zero. The standard deviation was as wide as TAS 1 495 463. These results suggest for the presence of huge diversity of saving levels of MFIs members in the survey areas. Table 32 shows the frequency distribution of outstanding amount of savings. The Table shows that around 46% of farm households had savings less than or equal to TAS 100 000 and only 9% of farm households members had savings above one million.

Table 32: Frequency distribution of outstanding financial savings of sampled households' microfinance members

Amount outstanding (in TAS)	Frequency	%	Cumulative %
1-100 000	92	46	46
100 001-200 000	45	22.5	68.5
200 001- 300 000	20	10	78.5
300 001- 400 000	8	4	82.5
400 001- 500 000	7	3.5	86
500 001- 600 000	2	1	87
600 001- 700 000	1	0.5	87.5
700 001- 800 000	3	1.5	89
800 001-1 000 000	4	2	91
1 000 001 +	18	9	100
Total	**200**	**100**	**100**

Implication from descriptive analysis of household financial savings

Descriptive analyses indicated that on average old MFIs members had more savings than new members. The observed variations of savings were partly due to households' locations and/or type of MFIs membership. In order to establish causal relationships between savings, location characteristics, MFIs characteristics, duration of membership and other control variables, econometric analysis was necessary. In the next section the estimates of the relationship of these variables are presented.

Econometric analysis results on financial savings of farm households

Estimation of the impact of microfinance participation on farm household savings in MFIs was carried out using the samples of treatment and control groups. Tobit regression was used instead of OLS because some household members had saving amount of zero. Tobit regression was more appropriate because it is able to handle censored observations in the dependent variable more appropriately than OLS. The dependent variable in the analyses was the log of household cumulative financial savings in MFIs. The explanatory variables of interest that measured the impact of MFIs on savings behaviour in all analyses was the microfinance membership time length variable (in months). Household demographic variables, economic variables, microfinance type dummy variables and location dummy variables were included in the analysis as control variables.

Table 33 shows that the coefficient for the microfinance membership time length variable was statistically significant at the level of 5% ($p = 0.043$). Implying that savings of farm households increases with duration of membership in MFIs and therefore evidence to suggest that MFIs positively affect the financial savings of household members.

Table 33 also reveals three other factors determining financial savings behaviour of farm households. These are household location, type of MFIs for which a household is a member, and total household assets. Household located in Madibira, Njombe, and Mufindi had more financial savings than those in Kilolo which was categorized as a reference location in the analysis. Njombe and Madibila areas had relatively good communication networks which lower transaction cost. Money can be easily

deposited and withdrawn at low travel costs. Conversely households located in areas with poor communication (*e.g.* Kilolo) had low motivation of saving in MFIs due to high transaction costs associated with withdrawals and depositing.

Results also show that the types of MFIs for which a household have membership affected the amount of household financial savings. SACCOS members had statistically significant more savings than any other MFIs members ($p = 0.034$).

Table 33: Tobit coefficient estimates of the impact of microfinance institutions on household savings in financial assets

Dependent variable = *Log of savings*	**Treatment and control sample, N = 200**	
Independent variables	**Coef.**	**Std. Err**
Household length of microfinance membership in months	0.017 (2.03)**	0.08
Age of household head in years	-0.028 (-1.12)	0.024
Household Location Dummy 1 = Mufindi, 0= otherwise	4.081 (3.72)***	1.097
Household Location Dummy 1 = Madibira, 0= otherwise	4.635 (4.09)***	1.132
Household Location Dummy 1 = Njombe, 0= otherwise	4.620 (4.31)***	1.073
Log of household total assets	0.395(1.69)*	0.234
Household dependants ratio	0.314 (0.25)	1.241
Microfinance institution type: 1 for Banks- and =0 for otherwise	0.693 (0.91)	0.762
Microfinance institution type: 1 for SACCOS- and =0 for otherwise	1.530 (2.14)**	0.714
Microfinance institution type: 1 for GOV and =0 for otherwise	0.848(0.84)	1.006
Pseudo R^2	0.0799	
	LR ch2 (12) = 84.47	
	Prob > ch2 = 0.000	

Significant at 1% (***), 5% (**), and 10% (*). Figures in ( ), are t-values; log likelihood = -486.26482; Kilolo was reference location; NGO-MFIs reference category.

The results that SACCOS membership is positively correlated with savings in financial assets among farm households can be attributed to the fact that SACCOS

are generally member based and their capital largely depend on members savings where as MFIs such as SIDO (governmental supported) or MuCoBa (banks) have a diversified source of operating capital, thus farm household saving is not generally taken to be a major source of operating capital. Results also indicated that total household assets affected the savings of farm households at a significance of 10% level (p= 0.093). Holding other factors constant, household with more assets were expected to have more savings than otherwise. Empirical evidence by Johnston and Morduch (2007) in Indonesia support this result. They revealed that the propensity to have savings account rises with income levels. However they further indicated that those who saved but did not borrow were likely to be poorer than those who borrowed, in their opinion it was on the saving side BRI (Bank Rakyat Indonesia) achieved its greatest outreach.

While the present study results show significant effects of access to microfinance on saving of farm households, the results by Coleman (1999) found contradicting results. He found no evidence to suggest an effect of microfinance membership on savings in the Thailand context. However empirical studies by Hashemi *et al.* (1996), Montegomery *et al.* (1996), and Morduch (1998) in Bangladesh context support the present study results. They similarly found that micro-credit programs stimulate savings behaviour thus strengthened crisis-coping mechanism of members especially among women.

In the Philippines, Ashriff *et al.* (2006c) showed that innovations in savings product of MFIs improved saving behaviour of poor households. MFIs clients who accepted a new commitment savings product increased their savings balances significantly

than those clients who were in a traditional saving account. Results implied that with innovations in savings products, MFIs can mop up large volumes of savings from poor households than expected. In similar avenues Morduch (2009) suggest that despite the known factors influencing savings of the poor such as transaction costs, liquidity, and interest rates, products innovations that commit savers to re-building their accounts after major withdraws would be welfare improving.

Yet in recent studies by Dupas and Robinson (2008) in Kenya, and Stewart *et al.* (2010) in selected countries of Sub-Sahara Africa (Tanzania excluded) evidence indicated that MFIs have positive impact on the levels of poor people's savings. Micro saving was found to be a better model than credit both theoretically and empirically because it does not require an increase in income to pay high interest rates and so implication of failure is not so high.

As Johnston and Morduch (2007) reported, poor households have been assumed to use informal means to save and that these mechanisms can work quite well. However, this study shows that poor households require a safe and convenient place to keep their money and a structure with which to discipline the accumulation of lots of small sums and their transformation into large sum. With appropriate saving products, households can build up liquidity to use as collateral, smooth seasonal consumption needs, self-insure against shocks, and self-finance investments.

4.4.4 Impact of MFIs on vulnerability through physical asset accumulation of farm households

It was hypothesised that one of the impact of MFIs is building up of household physical assets base (both productive and non-productive) which in turn can reduce vulnerability of households though two main channels. One is, some assets can be sold to meet daily and emergency consumption needs, and secondly, assets building can improve creditworthiness of household members, thereby increasing the ability to cope with crisis. Theoretically MFIs can affect asset building through households investing credit funds in farm or non-farm business assets or using returns from such investments. Similarly physical assets building can arise due to direct purchase of non-productive asset using micro-credits. In this section the analysis focused on the extent to which micro-credit has stimulated asset –creation among farm household members.

Descriptive analysis on Physical asset accumulation of farm households

Results indicated that all farm households surveyed had physical assets, in the form of livestock, furniture, bicycles, farm cart, houses, radio, sewing machines, power tillers, tractors, farm equipments, and others. Descriptive statistics showed that the average value of physical assets for the treatment group (old microfinance members) was TAS 1 631 861 while the average for the control group (new microfinance members) was TAS 1 144 738. The mean difference in the two groups is significant at the level of 5% ($t = 2.0062$, $p = 0.0462$). Whilst this difference was statistically significant it however cannot be used to directly attribute MFIs services causality due to presence of other factors that can influence the mean differences between the

control group and the treatment group. The study used econometric analyses to determine the marginal impact of MFIs on asset accumulation.

Econometric analysis on Physical asset accumulation of farm households

The impact of microfinance participation on physical assets was analysed using the member samples only (control and treatment groups). OLS regression was used to estimate the impact. The dependent variable in the analysis was the log of household value of total physical assets. The explanatory variable of interest that measures the impact of MFIs services was the microfinance membership time length variable. The household demographic, and location variables were included in the analysis as control variables.

Table 34 shows that the membership time length variable is positive and statistically significant at the level of 10% (p= 0.07). This result indicates that there is evidence to suggest that MFIs had improved asset building among members; however the impact is statistically marginal. This result reinforces the assertion that providing credit and other services could lead to a process of asset creation and a reduction in vulnerability of households. However, this result does not necessarily mean that the asset building process is through the farm income pathway, but could be via the non-farm income or the direct purchase of both productive and non-productive household assets using the micro-credit. The present study results are similar to those observed by Zaman (2001), Montegometry *et al.* (1996), and Morduch (1998) in Bangladesh who found that micro-credit assist household in asset building and in strengthening their crisis coping mechanism. Similarly Morris and Barne (2005) in Uganda found a causal relationship between micro-credit use and non-farm

household asset building both productive and non-productive household assets such as sewing machines, furniture, appliances, and others.

Table 34: OLS coefficient estimates of the impact of microfinance membership on household assets accumulation

Dependent variable = *Log of total household assets (TAS)*	**Treatment= 128; Control= 72: N= 200**	
Independent variables	**Coef**	**Std. Err**
Household length of microfinance membership in months	0.004 (1.83)*	0.002
Age of household head in years	-0.0065 (0.89)	0.007
Log of household land cultivated (in acres)	0.481 (4.04)**	0.119
Household Location Dummy 1 = Kilolo, 0= otherwise	0.473 (2.13)**	0.222
Household Location Dummy 1 = Madibira; 0= otherwise	0.373 (2.08)**	0.179
Household Location Dummy 1 = Njombe; 0= otherwise	0.535 (2.68)***	0.182
Household head marital status Dummy; 1= married, 0= otherwise	0.109 (0.53)	0.204
Education of Household head Dummy (1= secondary school or above, 0 = otherwise)	0.535 (3.43)***	0.156
Constant	12.13 (33.17)***	0.365
Adjusted R^2	0.2455	
	F (8,191)=8.68	
	Prob >F = 0.000	

Significant at 1% (***); 5% (**), and 10% (*). Figures in ( ) are t-values. Mufindi = reference

Table 34 also indicates that asset accumulation depends on location of households, education of household head and the size of land cultivated by a household. Household located in Madibira, Njombe and Kilolo were statistically significant. Mufindi location was used as reference location. Location characteristics such as infrastructure development and economic activities (type of crops grown, livestock, and others) can be attributed to the observed asset accumulation differences.

The coefficient for education dummy variable for secondary school or above education was statistically significant at 1% (p= 0.000) compared to the dummy variable for primary school education which was used as reference category. The results suggest that education of household head affects household assets accumulation. This could be due to the fact that education is associated with skills, knowledge and other complementarities necessarily in dealing and handling socio-economic activities. Other things being equal, household with secondary school or above education can effectively and relatively handle more productive assets such as sewing machine, shops, restaurants and others to alleviate poverty than their counterpart with primary or no formal education household heads. Similarly education stimulates the desire for using and owning modern household assets such as furniture, TV, radio, motor cycles and others.

On the whole the present study results show that MFIs services have significant effect on household asset build among farm households in the surveyed areas. However results further provide evidence that other factors significantly affect asset building of farm households. The influence of household location characteristics and education of households are evidently significant. Since education was correlated

with MFIs services use, failure to control the effect of education on asset accumulation, the interaction effect between education and credit use could have inflated the marginal effect of MFIs services (credit) on asset accumulation of farm households.

4.5 Summary of results and discussions

This section provides a summary of the major findings of the study. The major findings are presented in accordance with the study objectives.

4.5.1 Farm household decisions to participate in MFIs

The objective of the analysis was to identify factors that affect the decision to participate in microfinance institutions among rural farm households. The analysis attempted to answer the question who participates and why? The analysis was governed by the hypothesis that there exist specific household demographic and socio-economic factors that affect decisions to participate in microfinance institutions in the survey area. Two approaches were used to make this investigation, namely the qualitative inquiry and quantitative approaches. The study found evidence to suggest that participation in microfinance programme among farm household is not a random phenomena, but as other studies show is affected by specific farm household characteristics.

Qualitative results show that some farm household do not participate in MFIs because of satisfactory personal capital and therefore do not need additional capital. Results also show that the small amounts of loan issued by microfinance do not attract some farm household to participate in microfinance institutions. Lack of

collateral and initial compulsory deposit due to poverty levels is also a major constraint hindering participation in MFIs services. Results also show that dependence on rain fed agriculture activities and lack of diversification in non-farm economic activities reduce the confidence of farm households joining MFIs and ultimately use credit. High interest rate is yet another barrier to participation especially among microfinance banks and NGOs.

Descriptive and logistic regression results indicate that participation in MFIS among farm household is highly determined by household assets endowment variables and household structure variables. Farm household structure variables such as dependant ratio and age of household head significantly affect participation in microfinance institutions. Farm household asset endowments variables such as productive and non-productive assets, education of household head, possession of collateral acceptable housing and non-farm income are significant determinants in making decisions to participate in MFIs.

4.5.2 Determinants of demand for MFIs credit of farm households

The objective of the analysis was to assess the nature of MFIs credit demand and identify factors that determine the variation in the amount of credit borrowed by farm household members. The analysis attempted to answer the question why do some farm household borrow more while others borrow less? The demand side factors and supply side factors were involved in the analyses.

Results show that up to 70% of rural farm households members surveyed borrowed on average less than TAS 500 000. Very few (8%) farm households' members'

surveyed borrowed substantial amount to purchase long term farm equipments, such as power tillers, tractors, ploughs, or animal ox-cats. Demand for credit is derived by need to finance non-farm businesses (shops, alcohol, restaurants, etc), agriculture needs, (farm variable inputs such as fertilizers, pesticides, hiring of land, and labourers), and consumption needs (children education expenses, health and ceremonies). Findings shows that household location characteristics, possession of collateral (*e.g.* tree farm, furniture), duration of loan, length of membership, education of household head, total household assets, and type of microfinance for which a household is a member are significant factors determining farm household demand for credit.

4.5.3 The impact of microfinance services on household crop income and farm investment

The objective of the analyses was to determine the extent to which access to microfinance institutions affect rural farm households' crop income and farm variable inputs expenditure. Using both the Heckman two-stage regressions and OLS regressions the study has found that access to MFIs has a positive but in significant impact on both crop income, and farm variable input expenditures. The results show that crop income and farm variable input expenditures among farm households are mainly determined by location of farm households and household land cultivated. However, the lack of significant impact of MFIs services on crop income do not necessarily mean that MFIs have no impact in the rural economy of the surveyed areas; the impact could be through other pathways such as nonfarm income (e.g. petty rural non-farm businesses), consumption smoothing (education of

children, nutrition, clothing, and health) or women empowerment.

4.5.4 The impact of MFIs membership on savings of farm households

The objective of the analysis was to determine the extent to which MFIs affect farm household savings in the form of financial assets. The impact of MFIs on savings was analysed using both descriptive and econometric analyses.

Results show that household access to MFIs has a positive and significant impact on financial savings of farm household. Previous empirical literature suggest that underdeveloped rural financial markets in developing countries retard economic growth and development. The assumption has been, rural poor are too poor to save. This assumption limits the extension of saving services to rural areas. However, this present study shows that rural farm households are able to save in financial assets. This signifies the importance of appropriate saving facilities to rural farm households in Tanzania.

The study also shows that savings are determined by the type of MFIs, for which a household is a member, location characteristics of the household and household total assets. Farm households who are SACCOS members are found to have more savings than other farm household with membership elsewhere. Both MFIs characteristics variables and location characteristics reflect the importance of transaction costs associated with savings in MFIs.

4.5.5 The impact of MFIs membership on asset accumulation of farm households

The objective of the analysis with respect to this objective was to determine the

extent to which MFIs services affect farm households' asset accumulation in the form of productive and non-productive assets. The impact was analysed using both descriptive and econometric analyses.

Results show that MFIs services have a positive and statically significant effect on asset building of farm household members in the survey areas. Despite the fact that this study has found no impact of MFIs on crop income pathway, there is evidence to suggest that MFIs services have enhanced asset accumulation of farm household members through either the direct use of micro-credit on both productive and non-productive assets and/or through the return from non-farm investments.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The theoretical and conceptual frameworks used in this study are not new to literature but the methodological approach and its application in the agricultural sector in Tanzania are generally new. Therefore by looking at the different theoretical concepts used to analyse the study objectives the study has attempted to fill this empirical vacuum at least for Iringa region in Tanzania.

This study shows how location and socio-economic specific characteristics of farm households influence participation decisions. More importantly is the finding that participation decisions among farm households are more influenced by lack of diversification of income sources in non-farm income activities, volatility of crop income, and household labour constraints.

The study identifies the nature and determinants of credit demand of farm households. Farm household demand for credit is generally low to the extent that it is only sufficient to meet farm variable inputs, consumptions needs, and petty non-farm businesses operating capital needs but not sufficient to purchase farm machinery. The study also provides insights on how education, location specific characteristics and MFIs specific characteristics affect credit demand.

Using rigorous analytical approach, which control selection bias and endogeneity of the amount borrowed this study shows that the hypothesis that MFIs alleviate capital

constraints in the farming activities pathway and ultimately crop income is not evident. MFIs have not improved farm household crop income in the study area of Iringa region of Tanzania. However, the study does not necessarily prove that MFIs services have no impact on other outcome variables such as non-farm income, vulnerability, consumption (*e.g.* health, and education), and women empowerment.

This study empirically shows that MFIs services in the rural areas of Tanzania have significantly managed to mobilize savings of farm household, increased their credit worthiness, and enhanced their risk coping capacity. The study shows that rural farm household do save, and have the potential for savings. The study also shows that farm household savings are more linked to farm household specific rural location conditions and MFIs membership. Findings provide evidence to suggest that if appropriate policies and saving product innovations are implemented by MFIs, more savings can be mobilized for efficient resource allocation in the country.

The empirical evidence of this study provide support to previous empirical studies' assertion that micro-credit reduces vulnerability of poor household through asset creation resulting from direct use of credits and/or returns on non-farm loan financed investments in rural areas.

5.2 Recommendations for Policy

A number of policy implications flow from the findings of this study. The findings from the study objectives indicate interrelated policy actions on areas of infrastructure development, stabilization of agricultural produce prices, investment in social services, formation of specialized agricultural microfinance banks,

insurance services, training and revision of MFIs operational policies. This section describes how the policy action can enhance the impact of MFIs services on farm household economic outcome variables such as crop income.

5.2.1 Implication for infrastructure development

Total dependency on rain fed agriculture and poor access to inputs and output markets among farm households point out to the importance of infrastructure development in rural areas of Tanzania. Unreliable rainfall and poor infrastructure in rural areas make agriculture unreliable and unpredictable business among farmers in Tanzania. Access to markets (for inputs and output) and infrastructure development is attributable to the exhibited findings on microfinance participation decisions, demand for credit, and MFIs services impact on crop income among farm households. Policy interventions should be investment in infrastructure such as irrigation schemes, roads, crop storage facilities, and electricity in rural areas.

Developments of roads in rural area would improve transportation of inputs to rural areas and transportation of agricultural output to urban centres for markets. Availability of electricity will stimulate processing of agricultural produce in the rural areas and thus reduce losses due to poor storage facilities of perishable agricultural products and thus improve agricultural products prices.

Generally microfinance institutions endeavours need to be complemented with government investment in physical infrastructure (roads, electricity, storage facilities etc). They are no substitute for it. The re-orientations of construction of roads, crop ware houses and other transport facilities to rural areas may well go further than any

other investment toward reducing poverty. This will enhance participation of farm households in MFIs, increase credit demand, increase savings of farm households (through reduction in transaction costs), and ultimately improve the impact of MFIs on income of rural farm households and other externalities.

5.2.2 Implication for investments in social services

Despite the fact that micro-credit is taken to be poor's development tool, provision of social services such as free education, water, and health facilities can complement microfinance institutions endeavours. The study recommends investment in social services in order to address leakages of microfinance credits to household consumption purposes (*e.g.* education, food, water, clothes and health). This is due to the fact that in rural areas of Tanzania public social services are poorest thus compelling farm household to use MFIs loans to meet social needs instead of investing in productive economic activities.

5.2.3 Implication for stabilization of agricultural products prices.

Findings show that fluctuations of agricultural product prices and lack of alternative source of income other than crop income hinder participation in MFIs among farm households. Poor and unreliable agricultural produce prices and lack of markets are causes for limited participation in MFIs and/or loan repayments problems among farm households. During harvesting seasons agricultural products fall in prices. The overall seasonal price fluctuation of agricultural product in the survey region erodes the profitability of agricultural activities.

Another important qualitative finding from this study is that the system known as

crop voucher system introduced by the government has not produced adequate marketing relief. The system involves farmers to trade their produce to their agricultural co-operative societies on credit terms and be issued a voucher. In turn the co-operatives sell to merchants at some future dates when prices are high and then relinquish the proceeds to farmers. Sometimes the arrangement does not result into high prices. This is due to poor transportation in the villages and lack of bulk buyers. Ultimately the system locks farmers' capital and affects their ability to meet loan repayment schedules on time (interest on loans also piles up). This in turn threatens their creditworthiness.

In addition the policy that restricts exports of some agricultural products has adverse effects to some farm households. Despite the good intension of the policy on one hand, on the other hand it affects farm household crop income. Farmers are forced to sell domestically even when the prices are low compared to international markets, thus realizing losses or low crop income than otherwise.

Therefore establishing reliable local or regional agricultural marketing boards to scrutinize and comprehensively address marketing problems of agricultural products is an important policy response. The government should design policies that aim at stabilizing agricultural produce prises nationally and regionally. Such policies may include farmers' compensation schemes, enhancement of crop boards, and international agricultural product markets arrangements.

5.2.4 Implication for training of farm households

The process of participation, demand and impact of MFIs is partly associated with

household asset endowment and entrepreneurship spirit. Government policy interventions should include rural entrepreneurship development and training of farm households. Findings from the present study show that training given by microfinance institutions are those related with record keeping of credit and business transactions. None of the surveyed microfinance institutions have training programs to improve the skills of beneficiaries in terms of new technologies and new skills related to agricultural activities. Extension services by government agricultural officers are similarly unavailable or limited in supply. Rural farm households continue to use traditional farming facilities, and technologies. Policy response should be training and improvement in agricultural skills and technologies adopted by farm household members. Farmers need to be exposed to new technologies and technical know-how whenever exposed to credit facilities.

5.2.5 Implication for agricultural insurance services

There is need to introduce crop insurance as an important financial product among microfinance institutions or among insurance companies in Tanzania. Crops insurance is important for encouraging farmers to adopt new technologies and to minimize risks associated with farming activities in rural areas of Tanzania. This in turn will stimulate household participation in MFIs.

5.2.6 Implication for formation of specialized agricultural microfinance banks

The critical challenge ahead of most MFIs (especially SACCOS) is inadequate capital base to facilitate large and flexible loans. Government policy interventions may include provision of concession loans to microfinance institutions and encouraging the private sector to support microfinance institutions in various aspects

including staff training, members training, office infrastructure support and others are necessary. Policy intervention should also address capacity building of microfinance institutions to enable them issue large and flexible loans sizes adequate to finance modern agricultural equipments that can bring agricultural revolution rather than the micro-loans issued currently due to capital limitation of most microfinance institutions.

Establishment of large government supervised agricultural credit banks is an appropriate policy option to address the unique needs of the agricultural sector. The advancement of timely loans accompanied with impartation of technical know-how in agriculture is important attributes of a government credit program. Provision of special agricultural loans by specialized microfinance banks to rural entrepreneurs and rich farm household (who may cultivate large farms) in rural areas may enhance employment of desperate poor farm households in rural areas who may gradually become creditworthy in MFIs and thus benefit from financial services.

5.2.7 Implication for MFIs operations and policies

Lending policies and financial instruments of MFIs need to be compatible with poverty levels of farm households as well as the uniqueness of the agricultural sector. It can be recommended that flexible lending conditions should be established in order to encourage more and rapid acceptance of the MFIs services by rural farm households. Loan repayments (grace period) has to be staggered or rescheduled when unexpected circumstances happen which significantly reduce agricultural production (floods, severe rainfall shortage, and other disasters) this will motive participation and reduce defaults rates. The requirement to start repayments

immediately or few months after borrowing deters farmers as the incubation period for farming activities is generally not less than six months. Similarly compulsory savings and initial deposit has to be minimal and borrowing should not necessarily be linked to amount saved.

MFIs should increase the size of loan in order to attract rich rural entrepreneurs. This approach may result into a win-win situation. Large loan sizes reduces the overall administrative cost on the part of microfinance institutions and in turn large loan amount can be used by rich rural entrepreneurs and commercial farmers to substantially expand their farming business (economies of large scale in farming activities). Large farms will create employments to the poorest farm households who do not borrow due to poverty level, thus gradually making them creditworthy.

Findings show that farm households save and enjoy MFIs saving farcicalities. In this respect the poorest who cannot borrow should be encouraged to save and thus contribute to resource mobilization and thereby enhance the capital base of MFIs and make them sustainable. Policy perspective should be to reduce transaction costs associated with financial savings in rural areas. MFIs need to relocate themselves as close as possible to the people in rural areas. Adoption of savings incentives strategies such as increasing interest rate on savings and deposits can stimulate saving behaviour of farm households. Furthermore innovations in savings products appropriate for the rural farm household is important for exploiting the potential savings of farm households in rural areas.

5.3 Future Research Areas

Future researches may use panel data or randomized controlled trials (RCTs) in order to see the extent to which the results would change given the methodological problems facing impact studies. To improve external validity, future studies may involve a representative sample of farm household from all regions of Tanzania.

The exhibited alternative uses of credit procured funds among farm household needs; namely farm inputs, non-farm needs, and consumption needs shades lights to suppose and suggest that future researches should analyse the impact of MFIs on other economic and social variables such as non-farm income (rural petty businesses), education, health, nutrition, housing conditions and women empowerment in Tanzania.

Given the fact that microfinance participants do not exist in isolation, there are indirect benefits/effects (spill over effect) to the community in which MFIs members live. Future research may investigate the indirect impact of microfinance at village level, regional level or national level on economic, social, cultural, and political variables in order to track impact on wider perspective such as employment, inflation, and exchange of goods and services.

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APPENDICES

APPENDIX 1: SURVEY INTERVIEW GUIDE

SECTION Z: GENERAL INFORMATION

Name of village..... District.....Distance from district (KM).....Name of interviewer:.....

Date of interview.....

Name of Respondent:.....

SECTION A: RESPONDENTS' DEMOGRAPHIC AND SOCIAL CHARACTERISTICS

A1: Respondent's status in family

1 . Head of Household

2. Member of House hold [ ]

A2: Sex

1. Male
2. Female [ ]

A3: Marital Status

1. Married
2. Unmarried
3. Divorced
4. Widowed [ ]

A4 : Age in years.....

A5: What is the highest level of education of the Household head?

1. No formal education
2. Primary school
3. Secondary School
4. Post secondary non University;
5. University. [ ]

A6: For each of the category below indicate the number of people in your household and whether they provided labour in the previous farming season

Age group of household	Number	Provided/ not provided
Below 17 years		
18 – 60 years		
Over 60 years		
Total		

A7: Do your household members provide enough labour for your crop production activities?

1. Yes
2. No [ ]

SECTION B: ECONOMIC CHARACTERISTICS OF RESPONDENTS.

B1: Please give information on your household's House (tick appropriate box)

Type of asset	Part	Component	Tick	Value estimated
1. Main House	Roof	Grass/ Coconut leaves thatched		
		Corrugated iron		
	Floor	Compacted soil		
		Cement		
	Wall	Burnt bricks		
		Mud bricks		
		Cement brick		
		Mud and Timber		
		Cement Plastered		
2. Other houses				
Total				

B2: Please give information on your household other assets.

Type of asset	No	Price	Value in Tshs
1. Radio			
2. Bicycle			
3. Furniture - Stool - Arm Chairs - Table - Wardrobes - Sofa set			
4.			
5.			

B3: Please indicate how many of each of the following farm assets do your household has?

Asset	Number	Current value
Tractor		
Ox- plough		
Ox- cut		
Pairs of oxen		
Hand-Hoe		
Improved dairy cows		
Goats		
Local non- oxen cattle		
Pigs		
Chicken		
Sheep		
Other Farm machinery		

SECTION C: FARM CHARACTERISTICS OF RESPONDENTS.

C 1: What is the main occupation of the head of household? (Rank them)

1. Crop farming [ ]
2. Livestock farming [ ]
3. Mixed farming [ ]
4. Wage employment (Mention)..... [ ]
5. Petty business [ ]
6. Others (Specify)..... ..... [ ]

C2: For how many years have you been involved in crop farming?

1. Less than 5 years
2. More 5 years but less than 10 years
3. More than 10 years but less than 15 years [ ]
4. More than 15 years

C 3: Do you have enough land for your current household use?

1. Yes
2. No [ ]

C 4: What is the size of land owned by your household?

1. Less than 1 Hectare.
2. More than 1 hectare but less than 2 hectares
3. Between more than 2 hectare but less than 5 hectares [ ]
4. More than 5 hectare but less than 10 hectares
5. More than 10 hectares

C 5: What is the size of the land you currently use in your household?

1. Less than 1 Hectare.
2. More than 1 hectare but less than 2 hectares
3. Between more than 2 hectare but less than 5 hectares [ ]
4. More than 5 hectare but less than 10 hectares
5. More than 10 hectares

C 6: Do you hire labourers in your crop/livestock farming activities?

1. Yes [ ] GO TO C9
2. No. [ ] GO TO C8

C7: If answer is NO in C7 above what is the major reason for not hiring labourers?

1. Household labour is enough
2. No money to pay labourer [ ]
3. Labourers are not available
4. Others (Specify).....

C8: If answer in C7 is YES where do you get the money to pay labourers (More answers allowed)?

1. Savings from previous season farm income [ ]
2. Borrowings from Friends and relatives [ ]
3. Borrowings from MFI or banks [ ]
4. Income from my other Sources /employment [ ]
5. Others (Specify)..... [ ]

C 9: What was the production of food and cash crops in the following years in your household?

	Crop type	Area- Acres	Production (kg) 2009			Total value (Tshs)
			Amount in kg/bags	Price per unit		
1.						
2.						
3.						
4.						
5.						

C 10: What were the total expenses related to production of food and cash crops in the year, 2009.

	Number of units (Bags/kg) per acre	Price per unit	Total Cost, (In Tshs)
Fertilizers			
Pesticides			
Hired labour			
Seeds			
Hired Tractors			
Hired Ploughs			
Other expenses.....			

SECTION D: FOOD SECURITY OF RESPONDENTS

D 1: What is the main staple food in your household?

1. Maize
2. Rice
3. Cassava
4. Bananas
5. Potatoes (Yams)
6. Others (Specify)..... [ ]

D2: How many times did you eat per day in 2009?

1. Sometimes none per day
2. Once per day
3. Two times per day
4. Three times per day [ ]
5. Four times per day
6. Others (Specify) .....

D3: In year 2009 did you get good harvest?

1. Yes
2. No
3. Average [ ]

D4: In year 2009 did you experience food Shortage?

1. Yes [ ] GO TO D5
2. No [ ]

D5: If the answer is yes in D4, which food items were in short supplies?

Type of Food	Months (List)	Total duration
1.		
2.		
3.		
4.		
5.		

SECTION E: LOAN TRANSACTION INFORMATION OF RESPONDENTS

E 1: Do you participate in any MFIs schemes?

1. Yes [ ] GO TO E3
2. No [ ] GO TO E2

E 2: If answer is No in E1 above what are reasons for not participating (More than one answer allowed)

1. I did not need credit [ ]
2. I dislike any borrowings [ ]
3. Loans are too expensive [ ]
4. I felt that lenders would refuse because of My 1. Age ( ) 2. Health Problems ( ) 3. Poverty level ( )
5. My application was rejected [ ]
6. Others (Specify)..... [ ]

E3: If your answer is yes in E1, which of the following MFIs do you participate (Tick appropriate box- more than one answer is allowed)

Scheme	Tick	Loan Amount applied in 2009	Loan Amount offered (Credit limit in 2009)	Loan amount received/borrowed in 2009	Interest rate charged	Purpose of loan 1= Capital asset,2= Seasonal inputs, 3= consumption(Health, education)
PRIDE						
FINCA						
SIDO						
MUFINDI COMMUNITY BNK						
PRESIDENTIAL TRUST FUND						
SACCOS						
Others:						

E4: What is the lending methodology of the MFIs you're participating?

1. Group lending
2. Individual lending
3. Both group and individual
4. Others (Specify)..... [ ]

E5: Is there any collateral required by the MFIs you are participating?

1. Yes
2. No [ ]

E6: If answer is Yes in E5 what is the most preferred collateral:

1. House
2. Movable assets (cars , machinery, bicycles)
3. Animals
4. Crops [ ]
5. Land
6. Others (specify).....

E7: How did you spend the loan received in 2009?

	Expenditure item	Amount spent
1.	Buying seeds	
2.	Hiring labourer (e.g. planting, tilling land weeding ,etc)	
3.	Buying fertilizers	
4.	Buying pesticides	
5.	Buying ox- ploughs	
6.	Buying tractors	
7.	Hiring tractors	
8.	Hiring ox-ploughs	
9.	Paying school fees/uniforms etc	
10.	Buy land for agriculture/ farm	

11.	Buy food	
12.		
13.		

E8: Did you receive prior training from the MFIs before given the loan?

1. Yes [ ] GO TO E6
2. No [ ] GO TO E7

E 9: If answer in E5 is YES what type of training did you receive (More answers allowed)?

1. Agricultural [ ]
2. Trade [ ]
3. Record keeping [ ]
4. Others (Specify)..... [ ]

E10: How long does it take between loan application and receipt of loan?

1. Less than 30 days
2. Between 31 days and 60 days
3. Between 61 days and 90 days.
4. 91 days to 120 days
5. More than 120 days.
6. Others (Specify)..... [ ]

E11: Did you make initial cash deposit before being issued the loan?

1. Yes [ ] GO TO E9
2. No [ ] GO TO E10

E12: If answer is YES in E8 above where did you get the initial cash deposit?

1. From my own other sources [ ]
2. Borrowed from friends and relatives [ ]
3. Sold some of my own assets [ ]
4. Others (SPECIFY)..... [ ]

E13: Are you satisfied with the amount of loan given to you by your MFIs:

1. YES [ ]
2. NO [ ]

E14: If answer in E11 is NO how do you meet the unmet requirements?

1. Friends and relatives [ ]
2. Formal banks [ ]
3. I just use the one I'm given [ ]
4. Other informal money lenders [ ]

5. Others (specify)..... [ ]

E15: What are you view with regard to interest rates charged by the MFIs you are participating

1. Very high [ ]
2. High [ ]
3. Normal [ ]
4. Low [ ]

E16: Did you experience non- repayments or delays in any of the past three years:

1. Yes [ ]
2. No [ ]

E 17: If answer is YES in E11 above, what in your opinion was the reason for non-repayment or delays?

1. Crop failure [ ]
2. Poor market (low prices and demand) for agricultural output [ ]
3. Emergencies (diseases, social problems) [ ]
4. I just decided not to repay on time [ ]
5. Others specify..... [ ]

E 18: How many fellow clients have ever failed to repay their loans in the MFIs you are in:

1. None [ ]
2. Very few [ ]
3. Few [ ]
4. Many [ ]

E19: What measures has the MFIs you are in taken against defaulters:

1. Sue them in court [ ]
2. Pursue social sanction in the village elders [ ]
3. Dispose collateral (e.g. family assets) [ ]
4. Others (specify) [ ]

E20: Did you receive any agricultural subsidy in 2009?

1. Yes [ ]
2. No [ ]

E21: If answer is NO in E11 above why did you not get subsidy?

1. I was not aware
2. I did not qualify for subsidy [ ]
3. I did not need subsidy
4. Others (Specify).....

E 22: If answer is YES in E11 above, what type and amount of subsidy did you receive in 2009?

Type of subsidy	Amount (Tshs/ kg)	From (Provider e.g. Government, Church..)	
Cash			
Fertilizers			
Pesticides			
Tractor			
Ox- plough			
Hand –hoe			
Total			

E 23: As a result of receiving and using funds from MFIs credit, in any of the following items indicate (Tick) whether it has increased, decreased, or no change:

	Item	Increased	Decreased	No change
1.	Cultivated land			
2.	Number of livestock			
3.	Production			
3.	Income			
4.				
5.				
6.				

SECTION F: SAVINGS INFORMATION OF RESPONDENTS

F1: Did you make any savings in year 2009?

1. Yes [ ] Go TO F2
2. No [ ] GO TO F3

F2: How do you use/spend your savings (More than one answers allowed)?

1. Use to pay education expenses for my household members [ ]
2. Use to pay for agricultural expenses [ ]
3. Use as initial deposit during loan application in financial institutions. [ ]
4. Use during emergency e.g. sickness [ ]
5. Others (Specify)..... [ ]

F3: If your answer is No in F1 above, what do you consider to be the main reason for not saving (More than one answers allowed)?

1. I did not have enough money to save [ ]
2. I save my money at home [ ]
3. I make my savings in goods/ASSETS (e.g. crops, etc) [ ]
4. MFIs do give low interest on savings [ ]
5. MFIs are too far from here [ ]
6. Other reasons (Specify)..... [ ]

F4: If answer in F1 is YES where and how much did you save in 2009?

Scheme	Tick	Amount saved in 2009	Interest amount received on savings in 2009)	Interest rate offered on Savings
PRIDE				
FINCA				
SIDO				
MUFINDI COMMUNITY BNK				
MWANGA COMMUNITY BANK				
PTF				
SACCOS				
Others: (e.g. Home)				

SECTION G: OPINION SECTION. Please give your opinion in each of the following question.

G1: What do you consider to be the major constraints to your agricultural activities (Rank them)?

1. Lack of access to credit [ ]
2. Lack of access to extension officers [ ]
3. Lack of arable/cultivatable land [ ]
4. Lack of labourers [ ]
5. Lack of agricultural inputs (Fertilizers, pesticides, etc) [ ]
6. Low prices of agricultural output [ ]
7. Poor infrastructure (roads etc) [ ]
8. Others (Specify)..... [ ]

G2: What do you consider to be the major problems of using MFIs Credits?

1. .....
   .....
   .....
2. .....
   .....

.....
.....

G3: Will you continue using MFIs credits in the future?

1) YES
2) NO

G4: If YES why do you want to continue using MFIs credits?

.....
.....
.....
.....
.....

G5: If answer is NO in G3 why are not intending to continue with MFIs credit?

.....
.....
.....
.....

G6: What have been the major benefit for you participation in the MFIs programme you are in

1) .....
   .....

.....
.....

2) .....
.....
.....
.....
.....

3) .....
.....
.....

G6: In your opinion what should the government do to enhance you agricultural productivity

1) .....
.....
.....

2) .....
.....
.....

3) .....
.....
.....

END OF QUESTIONNAIRE

THANK YOU VERY MUCH FOR YOUR COOPERATION

APPENDIX 2: DESCRIPTIONS OF VARIABLES USED IN THE STUDY

S/no	Abbreviation	Variable Description
	Hhmfparts	Household MFIs participation status, 1= member; 0= non-member
	Rage	Household head age in years
	Hhsize	Household size; number of household members
	Hhlfrat	Household labour force ratio; number of household members with age between 18 to 64 years
	Hhcropinc	Household amount of annual crop income in TAS
	Hhborrow	Household amount of cumulative borrowings in TAS
	TFEXP	Household total variable farm input expenditure amount in TAS
	Hhdeprat	Household dependency ratio; household members below 18 or above 64 years
	hhedu3	Secondary school or above education level of household head
	hhedu2	Primary school education level of household head

	Hhlocation2	Location dummy variable; 1= Madibira; 0= otherwise
	Hhlocation3	Location dummy variable; 1= Njombe; 0= otherwise
	Hhlocation4	Location dummy variable; 1= Kilolo; 0= otherwise
	MFEXPMONTHS	Household MFIs membership length in months
	LANDCULT	Household size of land cultivated; in acres
	Hhlodu	Household loan duration in months
	Hhsavings	Household amount of cumulative savings with MFIs in TAS

APPENDIX 3: MFIs PARTICIPTION DECISIONS DESCRIPTIVE STATISICS AND REGRESSION RESULTS (STATA)

```
. ttest rage, by(hhmfparts)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	37.77733	.6177641	9.708925	36.56055	38.99411
1	210	37.5619	.6165799	8.935092	36.34639	38.77742
combined	457	37.67834	.4374571	9.351765	36.81865	38.53802
diff		.2154232	.878702		-1.511394	1.942241

diff = mean(0) - mean(1) t = 0.2452
Ho: diff = 0 degrees of freedom = 455

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.5968 Pr(|T| > |t|) = 0.8064 Pr(T > t) = 0.4032

```
. ttest hhsize, by(hhmfparts)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	4.850202	.1384944	2.17661	4.577416	5.122988
1	210	5.585714	.1302815	1.887959	5.32888	5.842549
combined	457	5.188184	.0972731	2.079461	4.997025	5.379343
diff		-.7355119	.1923349		-1.113487	-.357537

diff = mean(0) - mean(1) t = -3.8241
Ho: diff = 0 degrees of freedom = 455

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0001 Pr(|T| > |t|) = 0.0001 Pr(T > t) = 0.9999

. ttest hhlfrat, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	.5845862	.0129514	.2035475	.5590763	.610096
1	210	.5273924	.0125298	.1815747	.5026913	.5520935
combined	457	.5583046	.0091518	.1956436	.5403196	.5762895
diff		.0571938	.0181875		.0214518	.0929357

diff = mean(0) - mean(1) t = 3.1447
Ho: diff = 0 degrees of freedom = 455

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9991 Pr(|T| > |t|) = 0.0018 Pr(T > t) = 0.0009

. ttest hhdeprat, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	.4140981	.012895	.2026615	.3886993	.4394968
1	210	.4728117	.012615	.1828087	.4479428	.4976807
combined	457	.4410781	.0091585	.1957861	.42308	.4590761
diff		-.0587136	.0181904		-.0944613	-.022966

diff = mean(0) - mean(1) t = -3.2277
Ho: diff = 0 degrees of freedom = 455

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0007 Pr(|T| > |t|) = 0.0013 Pr(T > t) = 0.9993

```
. ttest hhhedu3, by(hhmfparts)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	.0607287	.0152274	.239317	.0307361	.0907214
1	210	.1809524	.0266295	.3858986	.1284555	.2334493
combined	457	.1159737	.0149944	.3205443	.086507	.1454405
diff		-.1202236	.0295887		-.178371	-.0620762

```
    diff = mean(0) - mean(1)                                  t =  -4.0632
Ho: diff = 0                     degrees of freedom =      455

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0001          Pr(T > t) = 1.0000

. ttest hhedu2, by(hhmfparts)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	.8866397	.0202133	.3176765	.8468265	.9264528
1	210	.7952381	.0279126	.4044918	.7402118	.8502644
combined	457	.8446389	.0169638	.3626455	.8113019	.877976
diff		.0914016	.0338063		.0249657	.1578375

```
    diff = mean(0) - mean(1)                                  t =   2.7037
Ho: diff = 0                     degrees of freedom =      455

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9964         Pr(|T| > |t|) = 0.0071          Pr(T > t) = 0.0036
```

. ttest hhhedu1, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	.0526316	.0142369	.2237503	.0245898	.0806733
1	210	.0238095	.0105456	.1528196	.0030202	.0445988
combined	457	.0393873	.009109	.1947278	.0214865	.0572881
diff		.0288221	.0182481		-.0070389	.064683

diff = mean(0) - mean(1) t = 1.5795
Ho: diff = 0 degrees of freedom = 455

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9425 Pr(|T| > |t|) = 0.1149 Pr(T > t) = 0.0575

. ttest ressex, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	.534413	.0318032	.4998272	.4717716	.5970543
1	210	.5380952	.0344852	.4997379	.4701118	.6060786
combined	457	.536105	.0233535	.4992412	.4902112	.5819989
diff		-.0036823	.046912		-.0958734	.0885088

diff = mean(0) - mean(1) t = -0.0785
Ho: diff = 0 degrees of freedom = 455

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.4687 Pr(|T| > |t|) = 0.9375 Pr(T > t) = 0.5313

. ttest rmasta, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	247	.7408907	.0279352	.4390354	.6858681	.7959133
1	210	.8333333	.0257787	.3735685	.7825138	.8841529
combined	457	.7833698	.0192913	.4123999	.745459	.8212806
diff		-.0924426	.038509		-.1681202	-.0167651

diff = mean(0) - mean(1) t = -2.4005
Ho: diff = 0 degrees of freedom = 455

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0084 Pr(|T| > |t|) = 0.0168 Pr(T > t) = 0.9916

Pair wise Pearson correlation of all variables used in the study

```
. pwcorr rmasta rage hhsize hhtassetval hhnpasset hhlivstock hhnoncroinc hhlsiz
> e hhdepratio hhlforat hhhedu3 hhedu2 hhhedu1 hhhedu1 hhhouseq
```

	rmasta	rage	hhsize	hhtass~l	hhnpas~t	hhlivs~k	hhnonc~c
rmasta	1.0000						
rage	0.1187	1.0000					
hhsize	0.1902	0.3581	1.0000				
hhtassetval	0.0996	-0.0699	0.2251	1.0000			
hhnpasset	0.0662	-0.0591	0.2255	0.9436	1.0000		
hhlivstock	0.1203	-0.0505	0.0684	0.4610	0.1411	1.0000	
hhnoncroinc	0.1063	-0.2035	0.0792	0.3965	0.4066	0.0958	1.0000
hhlsize	0.0661	0.1098	0.2530	0.1253	0.0848	0.1473	0.2150
hhdepratio	0.1194	0.0068	0.5001	0.1097	0.1320	-0.0256	0.0987
hhlforat	-0.1130	-0.0070	-0.5006	-0.1124	-0.1349	0.0255	-0.1112
hhhedu3	-0.1132	-0.1854	-0.0362	0.3145	0.3481	0.0071	0.2181
hhedu2	0.1814	0.0528	0.0399	-0.2285	-0.2690	0.0379	-0.1420
hhhedu1	-0.1498	0.2078	-0.0145	-0.0949	-0.0752	-0.0821	-0.0963
hhhedu1	-0.1498	0.2078	-0.0145	-0.0949	-0.0752	-0.0821	-0.0963
hhhouseq	-0.0403	-0.0461	0.0682	0.4361	0.4017	0.2274	0.3735

	hhlsize	hhdepr~o	hhlforat	hhhedu3	hhedu2	hhhedu1	hhhedu1
hhlsize	1.0000						
hhdepratio	0.0369	1.0000					
hhlforat	-0.0465	-0.9857	1.0000				
hhhedu3	0.0038	0.0324	-0.0357	1.0000			
hhedu2	0.0061	-0.0109	0.0152	-0.8435	1.0000		
hhhedu1	-0.0176	-0.0332	0.0307	-0.0846	-0.4638	1.0000	
hhhedu1	-0.0176	-0.0332	0.0307	-0.0846	-0.4638	1.0000	1.0000
hhhouseq	0.1655	0.1212	-0.1091	0.2631	-0.2469	0.0241	0.0241

	hhhouseq
hhhouseq	1.0000

```
. ttest NONCRPC, by(hhmfparts)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	181892	40690.02	345266.2	100758.4	263025.5
1	63	293660.6	44818.46	355735.5	204069.8	383251.4
combined	135	234050.7	30410.43	353337.2	173904.1	294197.2
diff		-111768.7	60412.76		-231262.8	7725.429

```
    diff = mean(0) - mean(1)                                      t =  -1.8501
Ho: diff = 0                     degrees of freedom =      133

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0333         Pr(|T| > |t|) = 0.0665          Pr(T > t) = 0.9667
```

```
. ttest rage, by(hhmfparts)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	38.125	1.236656	10.49337	35.65918	40.59082
1	63	33.65079	.840951	6.674841	31.96976	35.33183
combined	135	36.03704	.788699	9.163855	34.47713	37.59695
diff		4.474206	1.538691		1.430736	7.517677

```
    diff = mean(0) - mean(1)                                      t =   2.9078
Ho: diff = 0                     degrees of freedom =      133

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9979         Pr(|T| > |t|) = 0.0043          Pr(T > t) = 0.0021
```

. ttest hhlforat, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	.6207055	.0271044	.2299889	.5666608	.6747503
1	63	.5451814	.0237981	.1888915	.4976097	.5927531
combined	135	.5854609	.0184522	.2143952	.5489657	.6219562
diff		.0755241	.0365433		.0032428	.1478054

diff = mean(0) - mean(1) t = 2.0667
Ho: diff = 0 degrees of freedom = 133

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9796 Pr(|T| > |t|) = 0.0407 Pr(T > t) = 0.0204

. ttest hhsize, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	4.944444	.2912985	2.47175	4.363612	5.525277
1	63	5.380952	.2367087	1.878817	4.907778	5.854126
combined	135	5.148148	.1908691	2.217699	4.770642	5.525654
diff		-.4365079	.3821551		-1.192396	.3193801

diff = mean(0) - mean(1) t = -1.1422
Ho: diff = 0 degrees of freedom = 133

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.1277 Pr(|T| > |t|) = 0.2554 Pr(T > t) = 0.8723

. ttest LIVESTOCKPC, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	36846.91	7704.239	65372.64	21485.09	52208.72
1	63	54624.11	10394.49	82503.74	33845.81	75402.41
combined	135	45142.94	6378.813	74115.11	32526.76	57759.12
diff		-17777.2	12741.14		-42978.69	7424.279

diff = mean(0) - mean(1) t = -1.3953
Ho: diff = 0 degrees of freedom = 133

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0826 Pr(|T| > |t|) = 0.1653 Pr(T > t) = 0.9174

```
. ttest hhhouseq, by(hhmfparts)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	.2916667	.0539427	.4577194	.1841079	.3992255
1	63	.6190476	.0616739	.4895215	.4957632	.742332
combined	135	.4444444	.042926	.4987547	.3595444	.5293445
diff		-.327381	.0815676		-.4887185	-.1660434

```
    diff = mean(0) - mean(1)                                  t =  -4.0136
Ho: diff = 0                     degrees of freedom =      133

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0001          Pr(T > t) = 1.0000
```

```
. ttest hhdepratio, by(hhmfparts)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	.3775584	.0271639	.230493	.3233952	.4317216
1	63	.4611678	.0226607	.179864	.4158696	.506466
combined	135	.4165761	.0182312	.2118269	.3805181	.4526342
diff		-.0836094	.0359571		-.1547313	-.0124876

```
    diff = mean(0) - mean(1)                                  t =  -2.3253
Ho: diff = 0                     degrees of freedom =      133

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0108         Pr(|T| > |t|) = 0.0216          Pr(T > t) = 0.9892
```

```
. ttest NONPROPC, by(hhmfparts)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	89183.66	13688.25	116148.6	61890.07	116477.3
1	63	172310.5	21635.95	171730	129060.9	215560.2
combined	135	127976.2	12917.35	150086	102427.9	153524.5
diff		-83126.85	24969.91		-132516.4	-33737.34

```
    diff = mean(0) - mean(1)                                  t =  -3.3291
Ho: diff = 0                     degrees of freedom =      133

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0006         Pr(|T| > |t|) = 0.0011          Pr(T > t) = 0.9994
```

. ttest TOTASETPC, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	126030.6	17364.08	147339.1	91407.58	160653.6
1	63	226934.6	23771.85	188683.2	179415.4	274453.9
combined	135	173119.1	15037.66	174721.8	143377.3	202861
diff		-100904	28962.74		-158191.2	-43616.87

diff = mean(0) - mean(1) t = -3.4839
Ho: diff = 0 degrees of freedom = 133

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0003 Pr(|T| > |t|) = 0.0007 Pr(T > t) = 0.9997

. ttest LANDPC, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	.7666718	.0784013	.6652571	.610344	.9229995
1	63	1.009713	.1695567	1.345815	.6707737	1.348652
combined	135	.8800909	.0897458	1.042752	.7025893	1.057592
diff		-.243041	.1793328		-.5977543	.1116723

diff = mean(0) - mean(1) t = -1.3553
Ho: diff = 0 degrees of freedom = 133

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0888 Pr(|T| > |t|) = 0.1776 Pr(T > t) = 0.9112

. ttest rmasta, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	.7222222	.0531563	.4510464	.6162315	.8282129
1	63	.8571429	.0444408	.3527378	.768307	.9459787
combined	135	.7851852	.0354785	.4122234	.7150148	.8553556
diff		-.1349206	.0704169		-.2742026	.0043613

diff = mean(0) - mean(1) t = -1.9160
Ho: diff = 0 degrees of freedom = 133

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0288 Pr(|T| > |t|) = 0.0575 Pr(T > t) = 0.9712

Logistic Regression Estimates: Odds

```
Logistic regression                                     Number of obs   =        135
                                                        LR chi2(8)      =      57.10
                                                        Prob > chi2     =     0.0000
Log likelihood = -64.724612                             Pseudo R2       =     0.3061
```

hhmfparts	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
rmasta	3.950601	2.411478	2.25	0.024	1.194216	13.06903
rage	.9289134	.027148	-2.52	0.012	.8771996	.9836758
hhhedu1	.7831102	.9676885	-0.20	0.843	.0695014	8.823723
hhhedu3	10.6421	10.02614	2.51	0.012	1.679165	67.44686
hhhouseq	1.683147	.8275205	1.06	0.290	.6421381	4.411801
hhdepratio	11.89282	14.24218	2.07	0.039	1.137453	124.3474
LOGTOTASSET	2.035852	.581859	2.49	0.013	1.1627	3.564715
LNHHLSIZE	1.661655	.5696544	1.48	0.139	.8486503	3.253514

```
. logit hhmfparts  hhhouseq LOGTOTASETPC LOGNONCRPC hhdepratio  hhhedu3 hhhedu1
>  hhsize rmasta rage hhsubsidy LANDPC

Iteration 0:   log likelihood = -93.274647
Iteration 1:   log likelihood = -55.741432
Iteration 2:   log likelihood = -54.856986
Iteration 3:   log likelihood = -54.848688
Iteration 4:   log likelihood = -54.848685

Logistic regression                                     Number of obs   =        135
                                                        LR chi2(11)     =      76.85
                                                        Prob > chi2     =     0.0000
Log likelihood = -54.848685                             Pseudo R2       =     0.4120
```

hhmfparts	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
hhhouseq	1.015778	.566837	1.79	0.073	-.0952023	2.126758
LOGTOTASETPC	1.266533	.3778616	3.35	0.001	.5259376	2.007128
LOGNONCRPC	-.3132712	.0831475	-3.77	0.000	-.4762373	-.150305
hhdepratio	3.896473	1.667009	2.34	0.019	.6291941	7.163751
hhhedu3	2.519699	.9694378	2.60	0.009	.6196359	4.419762
hhhedu1	.2983544	1.296099	0.23	0.818	-2.241952	2.838661
hhsize	.1623769	.1535837	1.06	0.290	-.1386416	.4633955
rmasta	2.742925	.8151625	3.36	0.001	1.145235	4.340614
rage	-.1264858	.0403004	-3.14	0.002	-.2054732	-.0474984
hhsubsidy	.0625178	.5257507	0.12	0.905	-.9679346	1.09297
LANDPC	.2361873	.3224447	0.73	0.464	-.3957928	.8681674
_cons	-12.90998	4.640146	-2.78	0.005	-22.0045	-3.815464

```
. estat gof

Logistic model for hhmfparts, goodness-of-fit test

       number of observations =       135
number of covariate patterns =       135
            Pearson chi2(123) =    100.37
                  Prob > chi2 =    0.9331
```

```
. logistic hhmfparts rmasta rage hhhedu1 hhhedu3 hhsize hhhouseq hhdepratio LOGTOTASSET
```

Logistic regression

Number of obs	= 135
LR chi2(9)	= 57.10
Prob > chi2	= 0.0000
Pseudo R2	= 0.3061

Log likelihood = -64.723147

hhmfparts	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
rmasta	1.375438	.6112107	2.25	0.024	.1774873	2.573389
rage	-.0730504	.0318425	-2.29	0.022	-.1354605	-.0106403
hhhedu1	-.2473041	1.236629	-0.20	0.841	-2.671053	2.176445
hhhedu3	2.363763	.9422588	2.51	0.012	.5169698	4.210556
hhsize	-.0077479	.1433289	-0.05	0.957	-.2886673	.2731716
hhhouseq	.5167978	.4968532	1.04	0.298	-.4570165	1.490612
hhdepratio	2.51236	1.374659	1.83	0.068	-.1819207	5.206642
LOGTOTASSET	.7137301	.2904849	2.46	0.014	.1443902	1.28307
LNHHLSIZE	.512302	.3529368	1.45	0.147	-.1794414	1.204045
_cons	-10.09859	3.948301	-2.56	0.011	-17.83712	-2.360063

APPENDIX 4: DEMAND FOR MFIs CREDIT - DESCRIPTIVE STATISTICS AND REGRESSION RESULTS (STATA)

```
. pwcorr hhtfexp hhcropinc hhmfexp hhborro hhdeprat hhlcult, sig star(5)
```

	hhtfexp	hhcrop~c	hhmfexp	hhborro	hhdeprat	hhlcult
hhtfexp	1.0000					
hhcropinc	0.9198*	1.0000				
	0.0000					
hhmfexp	0.1307	0.1427*	1.0000			
	0.0651	0.0438				
hhborro	0.1548*	0.1268	0.2480*	1.0000		
	0.0287	0.0735	0.0004			
hhdeprat	0.1045	0.1139	0.0995	0.1679*	1.0000	
	0.1408	0.1083	0.1610	0.0175		
hhlcult	0.7243*	0.6866*	0.2233*	0.2574*	0.1187	1.0000
	0.0000	0.0000	0.0015	0.0002	0.0942	

REGRESSION- DEMAND EQUATION 1

Linear regression

Number of obs	= 203
F(11, 191)	= 13.49
Prob > F	= 0.0000
R-squared	= 0.4004
Root MSE	= .8199

logborro	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
hhlocation1	.2696326	.1689596	1.60	0.112	-.0636337	.6028989
hhloaction2	.5853026	.1375804	4.25	0.000	.3139304	.8566747
hhlocation3	.5520058	.179338	3.08	0.002	.1982685	.9057432
rage	-.0006543	.0067771	-0.10	0.923	-.0140219	.0127133
hhhedu1	.547655	.5431283	1.01	0.315	-.523645	1.618955
hhhedu3	.3071912	.1566913	1.96	0.051	-.0018764	.6162588
hhhouseq	.3204007	.1460878	2.19	0.030	.0322481	.6085534
hhdeprat	-.0015537	.3217076	-0.00	0.996	-.6361097	.6330023
logtotasset	.2761385	.0775241	3.56	0.000	.1232252	.4290519
LOGLANDCULT	.2242991	.0962409	2.33	0.021	.0344675	.4141306
hhlodu	.0544662	.0160447	3.39	0.001	.0228186	.0861138
_cons	7.656898	.9941731	7.70	0.000	5.69593	9.617867

REGRESSION- DEMAND EQUATION 2

Linear regression

Number of obs	= 203
F(11, 191)	= 15.19
Prob > F	= 0.0000
R-squared	= 0.4076
Root MSE	= .81494

logborro	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
hhmfbank	.5916208	.1538107	3.85	0.000	.2882351	.8950065
hhsaccos	.463055	.1550159	2.99	0.003	.157292	.768818
hhmfngo	.4057654	.1802363	2.25	0.026	.0502561	.7612747
rage	-.0009345	.0067026	-0.14	0.889	-.0141552	.0122861
hhhedu1	.5525905	.5082793	1.09	0.278	-.449971	1.555152
hhhedu3	.251929	.1532811	1.64	0.102	-.050412	.5542701
hhhouseq	.416159	.1361571	3.06	0.003	.1475943	.6847237
hhdeprat	.0949616	.337976	0.28	0.779	-.5716832	.7616063
logtotasset	.3173053	.073972	4.29	0.000	.1713983	.4632123
LOGLANDCULT	.1479634	.0951528	1.56	0.122	-.039722	.3356487
hhlodu	.0376666	.0152278	2.47	0.014	.0076303	.0677029
_cons	7.169501	.9698775	7.39	0.000	5.256454	9.082547

. vif

Variable	VIF	1/VIF
hhloaction2	2.72	0.368296
hhlocation3	2.37	0.422540
hhlocation1	2.32	0.431628
logtotasset	1.93	0.519002
hhlobus	1.73	0.578985
hhhouseq	1.71	0.583425
hhloagr1	1.61	0.620267
LOGLANDCULT	1.49	0.671661
hhsize	1.41	0.707255
hhsubsidy	1.38	0.724180
hhdeprat	1.34	0.744311
rmasta	1.21	0.829222
hhlodu	1.20	0.831703
hhhedu3	1.19	0.839448
hhhedu1	1.19	0.842777
MFEXPMONTHS	1.15	0.870387
Mean VIF	1.62	

. hettest

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of logborro

         chi2(1)      =     0.05
         Prob > chi2  =   0.8163
```

. vif

Variable	VIF	1/VIF
hhsaccos	2.44	0.409388
hhmfbank	2.16	0.463440
logtotasset	1.67	0.598599
hhloagr1	1.62	0.617751
hhlobus	1.62	0.618663
hhmfngo	1.56	0.639460
hhsize	1.56	0.640658
logsaving	1.54	0.647394
LOGLANDCULT	1.50	0.667419
hhdeprat	1.30	0.769315
hhlodu	1.27	0.789442
rage	1.26	0.791147
hhhedu1	1.22	0.820296
MFEXPMONTHS	1.20	0.835967
rmasta	1.19	0.842145
hhcoreq	1.18	0.846031
hhhedu3	1.18	0.848445
hhsubsidy	1.17	0.852390
Mean VIF	1.48	

APPENDIX 5: MFIs IMPACT ANALYSIS; DESCRIPTIVE STATISCS AND REGESSION RESULTS (STATA)

```
. ttest hhcropinc, by(hhmfparts)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	219	1136826	107951.5	1597537	924063.3	1349588
1	200	2701153	310846.5	4396034	2088177	3314128
combined	419	1883521	163079.2	3338147	1562964	2204078
diff		-1564327	317782.5		-2188982	-939671.7

```
    diff = mean(0) - mean(1)                                  t =  -4.9226
Ho: diff = 0                     degrees of freedom =      417

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

```
. tabulate hhlocation1, summarize(hhcropinc)
```

hhlocation1	Summary of hhcropinc Mean	Std. Dev.	Freq.
0	2446309.7	3865379.9	289
1	632398.46	680795.48	130
Total	1883521	3338147.3	419

```
. tabulate  hhloaction2, summarize(hhcropinc)
```

hhloaction2	Summary of hhcropinc Mean	Std. Dev.	Freq.
0	1033578.4	1057234.9	310
1	4300789	5653279.8	109
Total	1883521	3338147.3	419

```
. tabulate   hhlocation3, summarize(hhcropinc)
```

hhlocation3	Summary of hhcropinc Mean	Std. Dev.	Freq.
0	1976991.3	3799751.4	310
1	1617688.1	1312623.4	109
Total	1883521	3338147.3	419

```
. tabulate   hhlocation4, summarize(hhcropinc)
```

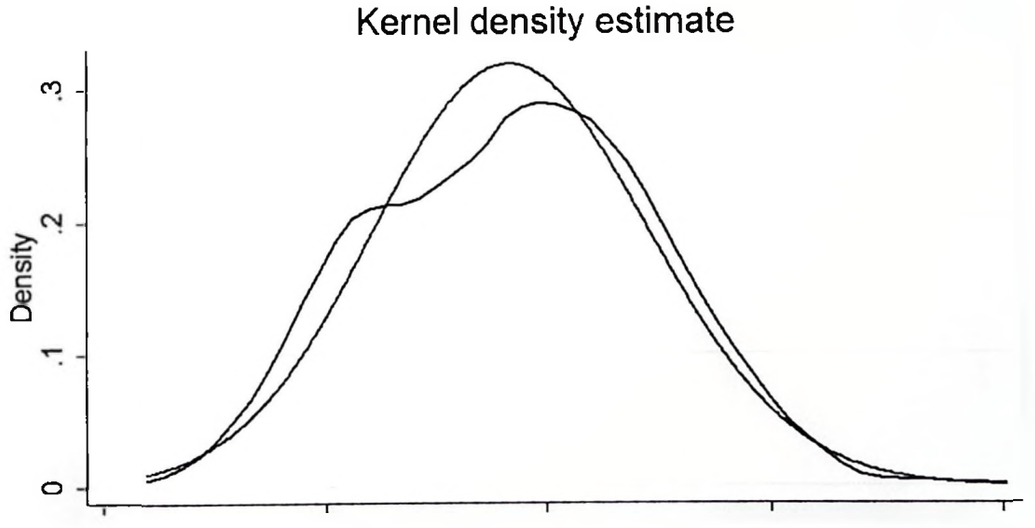
hhlocation4	Summary of hhcropinc Mean	Std. Dev.	Freq.
0	2090016.7	3613441.9	348
1	871401.41	751502.72	71
Total	1883521	3338147.3	419

```
. ttest hhcropinc, by(hhmedur)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	1749319	347933.8	2952316	1055559	2443080
1	128	3236559	438442.9	4960415	2368959	4104158
combined	200	2701153	310846.5	4396034	2088177	3314128
diff		-1487239	640569.1		-2750453	-224025.7

```
    diff = mean(0) - mean(1)                                  t =  -2.3217
Ho: diff = 0                     degrees of freedom =      198

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0106         Pr(|T| > |t|) = 0.0213          Pr(T > t) = 0.9894
```

Normality test- log- Crop income: Visual plots



Outliers and leverage tests- Studentized and Cooks Distance

```
. display (2*13+2) /209
.13397129

. list code lev if lev > .13
```

	code	lev
19.	22	.2393135
35.	39	.2609017
41.	47	.3401237
43.	50	.1508601
51.	59	.248585
54.	62	.1985853
58.	66	.1855489
96.	110	.1973465
L02.	116	.1973201
L61.	181	.2531975
L91.	212	.2083435

```
. predict D, cooksd

. list D code if D>4/209
```

	D	code
33.	.0232354	37
35.	.0583031	39
41.	.1437966	47
49.	.0335732	57
58.	.0826555	66
L67.	.0237547	188
L76.	.0372354	197
L89.	.0212842	210
L91.	.0525401	212

```
. predict D, cooksd
. list D code if D>4/230
```

	D	code
22.	.024945	255
34.	.0179862	270
35.	.0344923	271
44.	.0189346	282
46.	.0178255	285
53.	.0400758	294
59.	.0212462	302
67.	.0187149	312
78.	.0234173	328
82.	.031165	333
125.	.0194889	384
146.	.0187204	407
164.	.0181606	432
205.	.019297	495
223.	.0251799	532

Heckman procedures- impact on crop income

Heckman selection model -- two-step estimates (regression model with sample selection)

Number of obs	= 419
Censored obs	= 219
Uncensored obs	= 200
Wald chi2(8)	= 353.97
Prob > chi2	= 0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LOGCROPINC~E						
hhdeprat	-.5855753	.3502887	-1.67	0.095	-1.272129	.1009781
LOGTECHADOPT	.1294572	.0171275	7.56	0.000	.095888	.1630264
LOGBORRO	.0066408	.0290958	0.23	0.819	-.0636676	.050386
LOGLANCULT	.6056364	.0837362	7.23	0.000	.4415165	.7697563
LOGTOTASSET	-.2676949	.1079965	-2.48	0.013	-.4793641	-.0560258
hhlocation1	-.0213375	.1299237	-0.16	0.870	-.2759832	.2333083
hhloaction2	1.422265	.1355965	10.49	0.000	1.156501	1.68803
hhlocation3	.5806572	.1346217	4.31	0.000	.3168036	.8445108
_cons	15.78022	1.774584	8.89	0.000	12.3021	19.25834
hhmfparts						
rage	.0006755	.0077165	0.09	0.930	-.0144487	.0157996
hhhedu1	-.3681626	.5765103	-0.64	0.523	-1.498102	.7617768
hhhedu3	.5057284	.2293319	2.21	0.027	.0562462	.9552106
hhdeprat	.8961304	.3686786	2.43	0.015	.1735337	1.618727
LOGTOTASSET	.3803917	.0794421	4.79	0.000	.224688	.5360954
LOGLSIZE	.2203576	.087595	2.52	0.012	.0486746	.3920407
hhhouseq	.292253	.1586452	1.84	0.065	-.0186859	.6031918
_cons	-5.797868	1.068282	-5.43	0.000	-7.891662	-3.704073
mills						
lambda	.8383211	.3213063	2.61	0.009	-1.46807	.2085724

Correlation Matrix of crop income and borrowing variables.

```
. pwcorr hhtfexp hhcropinc hhmfexp hhborro hhdeprat hhlcult, sig star(5)
```

	hhtfexp	hhcrop~c	hhmfexp	hhborro	hhdeprat	hhlcult
hhtfexp	1.0000					
hhcropinc	0.9198*	1.0000				
	0.0000					
hhmfexp	0.1307	0.1427*	1.0000			
	0.0651	0.0438				
hhborro	0.1548*	0.1268	0.2480*	1.0000		
	0.0287	0.0735	0.0004			
hhdeprat	0.1045	0.1139	0.0995	0.1679*	1.0000	
	0.1408	0.1083	0.1610	0.0175		
hhlcult	0.7243*	0.6866*	0.2233*	0.2574*	0.1187	1.0000
	0.0000	0.0000	0.0015	0.0002	0.0942	

Correlation Matrix of variables included in the crop income regressions.

	LOGCRO~E	hhmfpa~s	rage	hhsubs~y	hhloca~1	hhloac~2	hhloca~3	hhhedu1	hhhedu3	hhdeprat	LOGTFEXP
LOGCROPINC~E	1.0000										
hhmfparts	0.3797	1.0000									
rage	-0.0839	-0.0333	1.0000								
hhsubsidy	0.3083	0.1661	-0.0295	1.0000							
hhlocation1	-0.4270	-0.0212	0.0759	-0.1208	1.0000						
hhloaction2	0.4493	0.0759	-0.0744	-0.1734	-0.3977	1.0000					
hhlocation3	0.1132	-0.0221	-0.0845	0.4470	-0.3977	-0.3516	1.0000				
hhhedu1	-0.1466	-0.0873	0.2006	-0.1338	0.0333	-0.0773	-0.0773	1.0000			
hhhedu3	0.1556	0.2054	-0.0733	0.0134	-0.0095	0.0650	-0.0211	-0.0463	1.0000		
hhdeprat	0.0707	0.1602	0.0373	-0.0227	-0.0057	0.0297	0.0224	-0.0236	0.0736	1.0000	
LOGTFEXP	0.6874	0.3637	-0.0684	0.3919	-0.2497	0.0927	0.2114	-0.1235	0.1795	0.0140	1.0000
MFEXPMONTHS	0.3431	0.7370	0.0602	0.1801	-0.0454	0.1350	-0.0175	-0.0592	0.1503	0.1614	0.2987
LOGLANCULT	0.6852	0.3203	0.0714	0.1838	-0.1401	0.2093	-0.0892	-0.0275	0.1033	0.1317	0.5049

```
. regress LOGBORRO MFEXPMONTHS
```

Source	SS	df	MS
Model	9749.30593	1	9749.30593
Residual	7393.15166	417	17.7293805
Total	17142.4576	418	41.0106641

Number of obs	= 419
F(1, 417)	= 549.90
Prob > F	= 0.0000
R-squared	= 0.5687
Adj R-squared	= 0.5677
Root MSE	= 4.2106

LOGBORRO	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
MFEXPMONTHS	.1759947	.0075052	23.45	0.000	.161242	.1907473
_cons	2.620712	.2515982	10.42	0.000	2.126153	3.115271

Linear regression

Number of obs	= 200
F(8, 191)	= 81.51
Prob > F	= 0.0000
R-squared	= 0.7344
Root MSE	= .58799

LOGCROPINC~E	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.0070124	.0049845	-1.41	0.161	-.0168441	.0028193
hhlocation1	-.0261636	.1468932	-0.18	0.859	-.3159048	.2635777
hhloaction2	1.420518	.1279206	11.10	0.000	1.1682	1.672837
hhlocation3	.6078919	.1384653	4.39	0.000	.3347744	.8810094
hhdeprat	-.0625654	.2693491	-0.23	0.817	-.5938464	.4687155
LOGTECHADOPT	.1303488	.0252785	5.16	0.000	.080488	.1802096
LOGMFEXPMO~S	.1017155	.0712391	1.43	0.155	-.242232	.038801
LOGLANCULT	.6782532	.0746497	9.09	0.000	.5310096	.8254969
_cons	11.82971	.4043443	29.26	0.000	11.03216	12.62726

Linear regression

Number of obs	= 419
F(9, 409)	= 188.32
Prob > F	= 0.0000
R-squared	= 0.7516
Root MSE	= .63029

LOGCROPINC~E	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
hhmfparts	.3521193	.0923099	3.81	0.000	.1706582	.5335805
rage	-.0054593	.0036315	-1.50	0.134	-.0125981	.0016794
hhlocation1	-.2450742	.0939413	-2.61	0.009	-.4297422	-.0604062
hhloaction2	1.228077	.0916006	13.41	0.000	1.04801	1.408144
hhlocation3	.5065692	.0966693	5.24	0.000	.3165386	.6965998
hhdeprat	-.2646791	.1691153	-1.57	0.118	-.5971227	.0677644
LOGTECHADOPT	.0993049	.0114691	8.66	0.000	.0767592	.1218507
LOGLANCULT	.8726183	.0602946	14.47	0.000	.7540923	.9911444
MFEXPMONTHS	.0022438	.0017392	1.29	0.198	-.0056627	.0011751
_cons	11.46472	.194233	59.03	0.000	11.0829	11.84654

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of LOGCROPINCOME

chi2(1) = 13.53
Prob > chi2 = 0.0002

. estat ovtest

Ramsey RESET test using powers of the fitted values of LOGCROPINCOME
Ho: model has no omitted variables
F(3, 405) = 4.08
Prob > F = 0.0071

Instrumental variables (2SLS) regression

Number of obs	= 419
Wald chi2(13)	= 1446.64
Prob > chi2	= 0.0000
R-squared	= 0.7762
Root MSE	= .59101

LOGCROPINC~E	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LOGBORRO	.0093984	.0072769	1.29	0.197	-.0048641	.023661
rage	-.0048137	.0035041	-1.37	0.170	-.0116816	.0020541
hhsubsidy	.189744	.0707342	2.68	0.007	.0511076	.3283804
hhlocation1	-.2208499	.0899065	-2.46	0.014	-.3970635	-.0446364
hhloaction2	.9851202	.09356	10.53	0.000	.801746	1.168494
hhlocation3	.3623838	.1012557	3.58	0.000	.1639263	.5608414
rmasta	.0657989	.0771129	0.85	0.394	-.0853397	.2169375
hhhedu1	-.3045814	.2348392	-1.30	0.195	-.7648578	.155695
hhhedu3	.0691786	.0955757	0.72	0.469	-.1181463	.2565035
hhsize	-.0036293	.020133	-0.18	0.857	-.0430892	.0358306
hhdeprat	-.0548707	.1762515	-0.31	0.756	-.4003172	.2905759
LOGTFEXP	.1229978	.0112886	10.90	0.000	.1008726	.1451231
LOGLANCULT	.7965074	.0592371	13.45	0.000	.680405	.9126099
_cons	11.09029	.1862918	59.53	0.000	10.72517	11.45542

Instrumented: LOGBORRO
Instruments: rage hhsubsidy hhlocation1 hhloaction2 hhlocation3 rmasta hhhedu1 hhhedu3 hhsize hhdeprat LOGTFEXP LOGLANCULT MFEXPMONTHS

```
. ivregress 2sls LOGCROPINCOME rage hhsubsidy hhlocation1 hhloaction2 hhlocation3 rmasta
> P LOGLANCULT (LOGBORRO = MFEXPMONTHS)
```

Instrumental variables (2SLS) regression

Number of obs	= 200
Wald chi2(12)	= 536.81
Prob > chi2	= 0.0000
R-squared	= 0.7186
Root MSE	= .59152

LOGCROPINC~E	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LOGBORRO	-.1436215	.1449352	-0.99	0.322	-.4276891	.1404462
rage	-.0060282	.0052414	-1.15	0.250	-.0163012	.0042449
hhsubsidy	.2079857	.0960585	2.17	0.030	.0197145	.3962568
hhlocation1	.0064421	.1426289	0.05	0.964	-.2731055	.2859896
hhloaction2	1.16366	.1426333	8.16	0.000	.8841042	1.443216
hhlocation3	.4906989	.1555083	3.16	0.002	.1859082	.7954895
rmasta	.0788712	.1271962	0.62	0.535	-.1704287	.3281711
hhhedu1	.0067651	.6225704	0.01	0.991	-1.213451	1.226981
hhhedu3	.0348539	.1149864	0.30	0.762	-.1905153	.2602231
hhdeprat	.2081585	.2791628	0.75	0.456	-.3389904	.7553075
LOGTFEXP	.1874877	.0273268	6.86	0.000	.1339282	.2410471
LOGLANCULT	.5956562	.0993953	5.99	0.000	.4008449	.7904675
_cons	12.28803	1.525936	8.05	0.000	9.297247	15.27881

Instrumented: LOGBORRO
Instruments: rage hhsubsidy hhlocation1 hhloaction2 hhlocation3 rmasta hhhedu1 hhhedu3 hhdeprat LOGTFEXP LOGLANCULT MFEXPMONTHS

HOUSEHOLD AGRICULTURAL INPUTS- ANALYSIS

. ttest hhtfexp, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	219	223188.6	28394.76	420204	167225.2	279152
1	200	618410	89230.07	1261904	442452.2	794367.8
combined	419	411838.4	46068.73	943003.3	321283.2	502393.7
diff		-395221.4	90291.87		-572705.4	-217737.5

diff = mean(0) - mean(1) t = -4.3772
Ho: diff = 0 degrees of freedom = 417

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.0000

ttest hhtfexp, by(hhlocation1)

wo-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	289	551117.3	64921.68	1103669	423336.2	678898.4
1	130	102210.8	12993.28	148146.1	76503.25	127918.3
ombined	419	411838.4	46068.73	943003.3	321283.2	502393.7
diff		448906.5	97252.05		257741.2	640071.9

diff = mean(0) - mean(1) t = 4.6159
o: diff = 0 degrees of freedom = 417

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

ttest hhtfexp, by(hhloaction2)

wo-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	310	203318.7	16278.94	286620.3	171287.1	235350.3
1	109	1004876	158170.4	1651347	691355	1318397
ombined	419	411838.4	46068.73	943003.3	321283.2	502393.7
diff		-801557.4	97532.35		-993273.8	-609841.1

diff = mean(0) - mean(1) t = -8.2184
o: diff = 0 degrees of freedom = 417

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.0000

. ttest hhtfexp, by(hhlocation3)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	310	435819	60894.29	1072155	315999.1	555638.9
1	109	343636.7	36662.42	382767	270965.4	416308
combined	419	411838.4	46068.73	943003.3	321283.2	502393.7
diff		92182.34	105037.8		-114287.2	298651.9

diff = mean(0) - mean(1) t = 0.8776
Ho: diff = 0 degrees of freedom = 417

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.8097 Pr(|T| > |t|) = 0.3807 Pr(T > t) = 0.1903

. ttest hhtfexp, by(hhlocation4)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	348	460561.2	54876.12	1023701	352629.5	568492.9
1	71	173028.2	25335.39	213479.8	122498.3	223558
combined	419	411838.4	46068.73	943003.3	321283.2	502393.7
diff		287533	122139.1		47448.03	527618

diff = mean(0) - mean(1) t = 2.3541
Ho: diff = 0 degrees of freedom = 417

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9905 Pr(|T| > |t|) = 0.0190 Pr(T > t) = 0.0095

. ttest hhtfexp, by(hhmedur)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	370104.2	77838.79	660484	214898	525310.3
1	128	758082	131002.2	1482121	498852.3	1017312
combined	200	618410	89230.07	1261904	442452.2	794367.8
diff		-387977.9	184313.9		-751448.1	-24507.66

diff = mean(0) - mean(1) t = -2.1050
Ho: diff = 0 degrees of freedom = 198

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0183 Pr(|T| > |t|) = 0.0366 Pr(T > t) = 0.9817

Heckman estimation- agricultural Input

Heckman selection model -- two-step estimates (regression model with sample selection)

Number of obs	= 419
Censored obs	= 219
Uncensored obs	= 200
Wald chi2(9)	= 47.00
Prob > chi2	= 0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LOGTFEXP						
rage	-.0129549	.0171622	-0.75	0.450	-.0465923	.0206824
hhloaction2	.8153425	.3298164	2.47	0.013	.1689143	1.461771
hhlocation3	.6866782	.3353581	2.05	0.041	.0293885	1.343968
hhlocation4	.1295103	.3798811	0.34	0.733	-.6150429	.8740635
hhedu2	2.833998	1.642684	1.73	0.084	-6.053599	.3856032
hhhedu3	2.997242	1.757061	1.71	0.088	-6.441018	.4465333
hhdeprat	3.000917	.8959415	3.35	0.001	-4.75693	-1.244904
LOGLANCULT	.9466429	.243989	3.88	0.000	.4684332	1.424853
LOGBORRO	.0058019	.0861666	0.07	0.946	-.1630815	.1746854
_cons	16.85316	2.52516	6.67	0.000	11.90394	21.80238
hhmfparts						
rage	.0005075	.0077564	0.07	0.948	-.0146948	.0157098
rmasta	.0403161	.1760338	0.23	0.819	-.3047038	.3853359
hhedu2	.3580185	.5768637	0.62	0.535	-.7726135	1.48865
hhhedu3	.8643525	.6189544	1.40	0.163	-.3487757	2.077481
hhhouseq	.2903086	.1589221	1.83	0.068	-.0211731	.6017902
hhdeprat	.8886215	.370187	2.40	0.016	.1630683	1.614175
LOGTOTASSET	.3791145	.0796723	4.76	0.000	.2229597	.5352694
LOGLSIZE	.2178976	.0882261	2.47	0.014	.0449776	.3908176
_cons	-6.158883	1.178182	-5.23	0.000	-8.468078	-3.849688
mills						
lambda	2.462341	.5289008	4.66	0.000	-3.498967	1.425714

OLS Estimation- Farm investments in variable inputs

Source	SS	df	MS
Model	2015.28672	10	201.528672
Residual	3046.81688	408	7.46768843
Total	5062.1036	418	12.1102957

Number of obs	= 419
F(10, 408)	= 26.99
Prob > F	= 0.0000
R-squared	= 0.3981
Adj R-squared	= 0.3834
Root MSE	= 2.7327

LOGTFEXP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
hhmfparts	1.631181	.4061603	4.02	0.000	.8327533	2.429609
MFEXPMONTHS	.0041976	.007431	0.56	0.572	-.0188055	.0104103
rage	-.015646	.015177	-1.03	0.303	-.045481	.0141889
hhlocation4	.5711668	.4081672	1.40	0.162	-.2312063	1.37354
hhloaction2	.7698166	.3669099	2.10	0.037	.0485468	1.491086
hhlocation3	2.398076	.3575604	6.71	0.000	1.695185	3.100966
hhhedu3	1.026699	.4345611	2.36	0.019	.1724412	1.880958
hhhedu1	-1.623135	1.076951	-1.51	0.133	-3.7402	.4939296
hhdeprat	-1.663062	.7209183	-2.31	0.022	-3.08024	-.2458846
LOGLANCULT	2.449167	.2310589	10.60	0.000	1.994952	2.903382
_cons	7.576129	.7149135	10.60	0.000	6.170756	8.981503

Source	SS	df	MS
Model	311.306217	9	34.5895796
Residual	560.910108	190	2.95215847
Total	872.216325	199	4.38299661

Number of obs	= 200
F(9, 190)	= 11.72
Prob > F	= 0.0000
R-squared	= 0.3569
Adj R-squared	= 0.3265
Root MSE	= 1.7182

LOGTFEXP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.0115166	.0142031	-0.81	0.418	-.0395326	.0164994
hhlocation4	.5406473	.3880394	1.39	0.165	-.2247714	1.306066
hhloaction2	1.093065	.3387214	3.23	0.001	.4249279	1.761203
hhlocation3	1.113248	.3336318	3.34	0.001	.4551498	1.771346
hhhedu3	.7151569	.3189391	2.24	0.026	.0860405	1.344273
hhhedu1	-.0889312	1.772049	-0.05	0.960	-3.584348	3.406486
hhdeprat	1.732753	.7196872	2.41	0.017	-3.152356	.31315
LOGLANCULT	1.467635	.2049404	7.16	0.000	1.063384	1.871886
LOGBORRO	.0879929	.0775152	1.14	0.258	-.064908	.2408939
_cons	9.512289	1.086036	8.76	0.000	7.370053	11.65453

Source	SS	df	MS
Model	307.524087	9	34.169343
Residual	564.692238	190	2.97206441
Total	872.216325	199	4.38299661

Number of obs	= 200
F(9, 190)	= 11.50
Prob > F	= 0.0000
R-squared	= 0.3526
Adj R-squared	= 0.3219
Root MSE	= 1.724

LOGTFEXP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.0102115	.0144506	-0.71	0.481	-.0387157	.0182927
hhlocation4	.5180605	.3899768	1.33	0.186	-.2511798	1.287301
hhloaction2	1.098005	.3407224	3.22	0.001	.4259209	1.77009
hhlocation3	1.118813	.334726	3.34	0.001	.4585564	1.779069
hhhedu3	.7065019	.319957	2.21	0.028	.0753776	1.337626
hhhedu1	-.0399851	1.777511	-0.02	0.982	-3.546175	3.466205
hhdeprat	1.666637	.720296	2.31	0.022	-3.087441	.2458333
LOGLANCULT	1.514107	.2051402	7.38	0.000	1.109462	1.918752
MFEXPMONTHS	.0004133	.004798	0.09	0.931	-.0098774	.0090508
_cons	10.49244	.66467	15.79	0.000	9.181357	11.80352

Linear regression

Number of obs	= 419
F(12, 406)	= 21.77
Prob > F	= 0.0000
R-squared	= 0.4146
Root MSE	= 2.7016

LOGTFEXP	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.0273892	.0165435	-1.66	0.099	-.0599109	.0051324
hhsubsidy	1.538446	.2520525	6.10	0.000	1.042955	2.033937
hhlocation1	-.865254	.3982975	-2.17	0.030	-1.648237	-.0822711
hhloaction2	.067797	.5082721	0.13	0.894	-.9313765	1.066971
hhlocation3	.8180363	.3487446	2.35	0.019	.1324656	1.503607
rmasta	.4798647	.4225612	1.14	0.257	-.3508164	1.310546
hhhedu1	-1.227351	1.268711	-0.97	0.334	-3.721414	1.266713
hhhedu3	1.299685	.2590929	5.02	0.000	.7903537	1.809016
hhsize	.0541689	.0848581	0.64	0.524	-.1126473	.2209851
hhdeprat	-1.448113	.8465897	-1.71	0.088	-3.11236	.2161336
MFEXPMONTHS	.0128461	.0041996	3.06	0.002	.0045905	.0211018
LOGLANCULT	2.16815	.2894905	7.49	0.000	1.599062	2.737237
_cons	8.185166	.7947222	10.30	0.000	6.622882	9.74745

Source	SS	df	MS
Model	324.133671	12	27.0111392
Residual	548.082654	187	2.93092328
Total	872.216325	199	4.38299661

Number of obs	= 200
F(12, 187)	= 9.22
Prob > F	= 0.0000
R-squared	= 0.3716
Adj R-squared	= 0.3313
Root MSE	= 1.712

LOGTFEXP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.004799	.0151633	-0.32	0.752	-.0347121	.0251141
hhsubsidy	.394105	.2780453	1.42	0.158	-.1544036	.9426137
hhlocation1	-.48887	.3926024	-1.25	0.215	-1.263369	.2856289
hhloaction2	.5334915	.4104689	1.30	0.195	-.2762532	1.343236
hhlocation3	.4834911	.4326883	1.12	0.265	-.3700864	1.337069
rmasta	-.5179566	.3601026	-1.44	0.152	-1.228342	.192429
hhhedu1	-.3251269	1.795327	-0.18	0.856	-3.866824	3.21657
hhhedu3	.6171519	.3216181	1.92	0.057	-.0173141	1.251618
hhsize	-.1088286	.0822175	-1.32	0.187	-.2710217	.0533644
MFEXPMONTHS	.0011082	.0047914	0.23	0.817	-.0105603	.0083438
LOGLANCULT	1.594431	.2168666	7.35	0.000	1.166612	2.022251
hhdeprat	-1.145631	.788317	-1.45	0.148	-2.700768	.4095063
_cons	11.33758	.7274621	15.59	0.000	9.902488	12.77266

Linear regression

Number of obs	= 200
F(11, 187)	= .
Prob > F	= .
R-squared	= 0.3716
Root MSE	= 1.712

LOGTFEXP	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.004799	.0168296	-0.29	0.776	-.0379992	.0284012
hhsubsidy	.394105	.2623174	1.50	0.135	-.1233767	.9115868
hhlocation1	-.48887	.3658573	-1.34	0.183	-1.210608	.2328681
hhloaction2	.5334915	.4315759	1.24	0.218	-.3178918	1.384875
hhlocation3	.4834911	.298582	1.62	0.107	-.1055308	1.072513
rmasta	-.5179566	.267013	-1.94	0.054	-1.044701	.0087882
hhhedu1	-.3251269	.3495983	-0.93	0.354	-1.01479	.3645365
hhhedu3	.6171519	.178522	3.46	0.001	.2649761	.9693278
hhsize	-.1088286	.0824247	-1.32	0.188	-.2714305	.0537732
MFEXPMONTHS	.0011082	.0027162	0.41	0.684	-.0064665	.0042501
LOGLANCULT	1.594431	.3530369	4.52	0.000	.8979846	2.290878
hhdeprat	-1.145631	.6950709	-1.65	0.101	-2.516819	.2255569
_cons	11.33758	.6291501	18.02	0.000	10.09643	12.57872

APPENDIX 6: DESCRIPTIVE STATISTICS AND REGRESSION RESULTS ON MFIs IMPACT ON HOUSEHOLD SAVINGS AND ASSET ACCUMULATION (STATA)

. summarize hhsaving

Variable	Obs	Mean	Std. Dev.	Min	Max
hhsaving	200	490130	1495463	0	1.60e+07

. ttest hhtassetval, by(hhmfparts)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	219	530363	46935.79	694586.2	437857	622869
1	200	1456497	117431	1660725	1224928	1688065
combined	419	972431.5	65162.51	1333843	844344.5	1100519
diff		-926133.5	122488.9		-1166906	-685360.8

diff = mean(0) - mean(1) t = -7.5610
Ho: diff = 0 degrees of freedom = 417

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.0000

. ttest hhtassetval, by(hhmedur)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	72	1144738	136017.3	1154145	873526.7	1415948
1	128	1631861	165142.4	1868373	1305074	1958648
combined	200	1456497	117431	1660725	1224928	1688065
diff		-487123.4	242809.5		-965948.1	-8298.776

diff = mean(0) - mean(1) t = -2.0062
Ho: diff = 0 degrees of freedom = 198

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0231 Pr(|T| > |t|) = 0.0462 Pr(T > t) = 0.9769

Tobit regression

Number of obs	=	200
LR chi2(12)	=	84.47
Prob > chi2	=	0.0000
Pseudo R2	=	0.0799

Log likelihood = -486.26482

LOGSAVING	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.0280908	.0249892	-1.12	0.262	-.077386	.0212045
hhlocation1	4.081256	1.097316	3.72	0.000	1.916622	6.245889
hhloaction2	4.63501	1.132763	4.09	0.000	2.400451	6.869568
hhlocation3	4.620056	1.073119	4.31	0.000	2.503155	6.736958
hhhedu1	2.58891	3.10685	0.83	0.406	-3.539857	8.717676
hhhedu3	.029447	.5677353	0.05	0.959	-1.090503	1.149397
hhdeprat	.3145501	1.241219	0.25	0.800	-2.133957	2.763057
LOGTOTASSET	.3951758	.2342932	1.69	0.093	-.0670056	.8573572
MFEXPMONTHS	.0170166	.0083689	2.03	0.043	.0005075	.0335257
hhmfbank	.6925776	.7623397	0.91	0.365	-.8112615	2.196417
hhsaccos	1.530421	.7149721	2.14	0.034	.1200223	2.94082
hhgovmf	.8484135	1.006685	0.84	0.400	-1.137437	2.834264
_cons	1.139393	3.297704	0.35	0.730	-5.365865	7.644651
/sigma	2.962049	.1586839			2.649019	3.275079

Obs. summary: 15 left-censored observations at LOGSAVING<=0
185 uncensored observations
0 right-censored observations

Linear regression

Number of obs	= 200
F(11, 188)	= 5.82
Prob > F	= 0.0000
R-squared	= 0.3479
Root MSE	= 2.8385

LOGSAVING	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.0241123	.0191904	-1.26	0.211	-.0619686	.0137439
hhlocation1	3.89792	1.524863	2.56	0.011	.8898793	6.905962
hhloaction2	4.319445	1.533047	2.82	0.005	1.295261	7.343629
hhlocation3	4.389524	1.602175	2.74	0.007	1.228973	7.550075
hhmfbank	.5882731	.7004205	0.84	0.402	-.7934202	1.969966
hhsaccos	1.379322	.8359901	1.65	0.101	-.2698043	3.028449
hhgovmf	.8479588	1.672491	0.51	0.613	-2.451301	4.147219
LOGTOTASSET	.3130503	.2293291	1.37	0.174	-.1393387	.7654393
MFEXPMONTHS	.015356	.0075385	2.04	0.043	.0004851	.0302268
LOGLANCULT	.2860994	.3258043	0.88	0.381	-.3566026	.9288015
hhdeprat	.0623252	1.031446	0.06	0.952	-1.972371	2.097021
_cons	2.269409	3.354115	0.68	0.499	-4.347129	8.885947

. **hettest**

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of LOGSAVING

chi2(1) = 159.62
Prob > chi2 = 0.0000

. **ovtest**

Ramsey RESET test using powers of the fitted values of LOGSAVING
Ho: model has no omitted variables
F(3, 185) = 2.02
Prob > F = 0.1132

Asset accumulation analysis

Linear regression

Number of obs	= 200
F(8, 191)	= 7.15
Prob > F	= 0.0000
R-squared	= 0.2455
Root MSE	= .90029

LOGTOTASSET	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
rage	-.0065678	.0073452	-0.89	0.372	-.0210559	.0079204
hhlocation4	.4736017	.2226518	2.13	0.035	.0344295	.9127739
hhloaction2	.3732179	.1792504	2.08	0.039	.0196533	.7267826
rmasta	.1090949	.2046297	0.53	0.595	-.2945294	.5127192
MFEXPMONTHS	.004241	.0023236	1.83	0.070	-.0003421	.0088241
LOGLANCULT	.4813283	.1192834	4.04	0.000	.2460463	.7166102
hhlocation3	.4891956	.1826651	2.68	0.008	.1288956	.8494956
hhhedu3	.5358946	.1567827	3.42	0.001	.2266468	.8451425
_cons	12.13703	.3658624	33.17	0.000	11.41538	12.85868

Source	SS	df	MS
Model	256.325254	12	21.3604378
Residual	310.310962	406	.764312714
Total	566.636216	418	1.35558903

Number of obs	= 419
F(12, 406)	= 27.95
Prob > F	= 0.0000
R-squared	= 0.4524
Adj R-squared	= 0.4362
Root MSE	= .87425

LOGTOTASSET	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
hhmfparts	.5001666	.1313842	3.81	0.000	.2418884	.7584447
rage	-.0164222	.0052151	-3.15	0.002	-.0266742	-.0061702
hhlocation1	-.4107368	.1323593	-3.10	0.002	-.6709318	-.1505418
hhloaction2	.06283	.1393615	0.45	0.652	-.2111302	.3367903
hhlocation3	.2304964	.1378442	1.67	0.095	-.040481	.5014738
rmasta	.1406058	.1135595	1.24	0.216	-.0826322	.3638438
hhhedu1	-.5212752	.3450281	-1.51	0.132	-1.19954	.1569893
hhhedu3	.4985975	.1402318	3.56	0.000	.2229265	.7742685
hhsize	.0295173	.0266105	1.11	0.268	-.0227942	.0818288
LOGLANCULT	.5757148	.0793224	7.26	0.000	.4197809	.7316487
LOGNONCROI~M	.0425654	.010116	4.21	0.000	.0226792	.0624516
MFEXPMONTHS	.0035048	.0023792	1.47	0.141	-.0011722	.0081818
_cons	11.58228	.2728961	42.44	0.000	11.04582	12.11875

. **hettest**

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of LOGTOTASSET

chi2(1) = 4.65
Prob > chi2 = 0.0311

. **ovtest**

Ramsey RESET test using powers of the fitted values of LOGTOTASSET
Ho: model has no omitted variables
F(3, 403) = 3.92
Prob > F = 0.0089

Linear regression

Number of obs	= 419
F(12, 406)	= 31.71
Prob > F	= 0.0000
R-squared	= 0.4524
Root MSE	= .87425

LOGTOTASSET	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
hhmfparts	.5001666	.1327475	3.77	0.000	.2392083	.7611248
rage	-.0164222	.0051464	-3.19	0.002	-.0265391	-.0063054
hhlocation1	-.4107368	.1492949	-2.75	0.006	-.7042243	-.1172494
hhloaction2	.06283	.1486397	0.42	0.673	-.2293695	.3550295
hhlocation3	.2304964	.1456043	1.58	0.114	-.0557359	.5167288
rmasta	.1406058	.1188932	1.18	0.238	-.0931174	.374329
hhhedu1	-.5212752	.4030821	-1.29	0.197	-1.313664	.2711132
hhhedu3	.4985975	.1224879	4.07	0.000	.2578078	.7393872
hhsize	.0295173	.027122	1.09	0.277	-.0237998	.0828344
LOGLANCULT	.5757148	.0868827	6.63	0.000	.4049188	.7465109
LOGNONCROI~M	.0425654	.0090356	4.71	0.000	.0248031	.0603277
MFEXPMONTHS	.0035048	.0022384	1.57	0.118	-.0008955	.0079051
_cons	11.58228	.2661638	43.52	0.000	11.05905	12.10551

APPENDIX 7: BACKGROUND NFORMATION OF MFIs SURVEYED

A7.1 Mufindi Community Bank

Historical background

The historical background of Mufindi Community Bank Ltd (MuCoBa) starts in 1984 when some residents of Mufindi district established a local NGO called Mufindi Education Trust (MET) with the aim of promoting secondary schools in the district in order to fight against illiteracy. In 1996 MET established a revolving fund that was known as Income Fund Ltd under the support of a Belgian NGO called by then ACT (Now TRIAS).The primary objective was to provide credit facilities to its workers. The fund proved to be very useful especially to the medium and low income earners and therefore its services were extended to others. The Fund was very useful to such people because at that time there was only one bank in the district and besides its presence, the conditions to acquire both deposits and credit facilities were not suited to the low and medium sized income earners.

Due to good experience of this fund, it was observed that having an institution that would provide microfinance services to all residents in the district would be of paramount importance and hence, the idea of forming MuCoBa. In December 1998 Mufindi Community Bank was established under the Companies Ordinance (Cap 212) and ultimately given a licence to operate banking activities by Bank of Tanzania on 1 , June 1999.

Objectives, Vision and Mission

The objective of establishing Mufindi Community Bank was to provide financial

services to the low and medium-sized income earners in Mufindi district especially in rural areas. The mission of the Bank is to provide quality and appropriate financial services that help in creating employment to the community and wealth to shareholders and clients. It seeks to grow and expand within Mufindi district and beyond. The vision is to become a leading community bank in Tanzania creating benefits to all stakeholders competitively.

Products and services

Mufindi Community Bank provides two main kinds of services namely; Deposits and Loans. Other services include money transfers, insurance and training to group members. The customer base of the bank has increased impressively over time since its establishment. Records indicates that the number of depositors increased from 3 934 in 2004 to 9 800 in 2009, an increase of around 290%. Borrowers increased from 1 245 in 2004 to 5 215 in 2009, an increase of almost 450%. Major customers of the bank are the SACCOS, individual business borrowers, group borrowers, private and government employees, and institutions.

Loan delivery Mechanism to individual and groups

Loan issued by Mufindi Community Bank to individuals are aimed at supporting their viable economic activities. The main criterion to qualify for these loans is the existence of a business and at least one year experience on the borrower with that business. Another important criterion was the collateral for the loan. Collateral accepted include but not limited to houses, plots of land with some developments, motor vehicles, machinery, cash deposits with MuCoBa and share certificates of

MuCoBa. The duration of the loan lasts for 18 months with a grace period of one month.

Group loans are offered to individual members in a group in order to support their small economic activities including agriculture. These loans are designed to clients who need relatively smaller loan sizes due to the nature of their businesses and who in one way or the other cannot get reliable collateral under conditions of individual loans. Another reason for the use of this methodology is for the bank to provide these services more efficiently due to the size of transactions. Normally clients select themselves in subgroups between five and seven members and form a group in order to facilitate administration.

Loans are issued in accordance with their respective savings at the ratio of 1:3 (Save one borrow three). The savings of groups saves part of collateral in addition to peer pressure. A group has to receive training with regular saving before it qualifies to get a loan. The duration of loans are generally 12 months and the grace period is fixed depending on the nature of the business although in most cases is one month and up six months for agricultural loans (All information available in MuCoBa Annual Report, 2008).

A7.2 Promotion of Rural Initiative and Development Enterprise (PRIDE-Tanzania)

History and background information

PRIDE- Tanzania was incorporated in May, 1993 under the Companies Ordinance (Cap 212) as a company limited by guarantee without share ownership. The

management and technical support of PRIDE Tanzania comes from PRIDE Africa, based in Nairobi, Kenya.

Objectives and mission

The major objective of PRIDE –Tanzania is to provide financial services to both women and men who are poor but economically active with businesses. The mission of PRIDE (T) is to create a sustainable financial and information services network for small and micro-enterprise in order to promote their business growth, enhance their income and create employment in Tanzania.

Services offered, Loan delivery Mechanism and coverage

PRIDE (T) offers small loans to micro and small enterprises. It also provides services such as voluntary and compulsory savings, and insurance. The loan delivery mechanism practiced is the group lending in which case groups are made up of five members who normally self- select. Loan collateral is in the form of solidarity group guarantee. Members meet each week for making savings, loan repayments and other services.

The client base of PRIDE (T) has increased to cover almost all regions of Tanzania with four main regional centres in Arusha in the Northern part, Mwanza in the lake regions, Dodoma in the West and Central part of the country and Dar es Salaam for the East regions. Membership has been increasing overtime with 99 % of all clients being urban residents and only one percent of the clients being from rural areas. The number of active borrowers has increased by 34% from 54 272 in 2004 to 72 635 by the end of 2009 of which 65% were women.

A7.3 Foundation for International Community Assistance (FINCA)- Tanzania

Historical background

FINCA (T) is a Non-Governmental Organization and was incorporated as company limited by guarantee. It was established in 1998. FINCA (T) is an affiliate of FINCA International and receives technical and other assistance from time to time. FINCA is currently relying on its own source with minimal support externally.

Mission and Vision

The mission of FINCA (T) is to provide access to micro credits and savings to economically disadvantaged groups especially women and support asset accumulation. In a long term the vision of the institution is to develop a sustainable and professional financial institution that supports economic and human development of Tanzanian families trapped in poverty.

Services offered, delivery mechanism and clients

FINCA (T) provides both financial and non financial services. The major focus is on credits and savings. Credits are generally coupled with training on business management. Savings are of two types; voluntary savings and compulsory savings. FINCA, just like PRIDE has replicated the Grameen bank model of group lending methodology. Clients are required to form groups of fives through self-selection and self-guarantee. Loans are then issued to individuals after going through training in business management.

The main beneficiaries of FINCA are economically active poor women who have a

business in operation. Target clients are those in rural areas with low targets for clients in urban centres. The number of active borrowers increased in the country by 15% from 35 732 in 2004 to 41 253 in 2009 of which 85% were women.

A7.4 Savings and Credit Cooperative Societies (SACCOS)

Background information

The Savings and Credit Co-operative Societies operate under the Co-operative Society Act, 1991. The responsibility for supervision of SACCOS is placed in the hands of the Ministry of Agriculture and Cooperatives of Tanzania. SACCOS operate under the following guidelines:

As savings-based institutions, regulation and supervision is necessary once the institutions reach more than a small group of members. To ensure objectivity and compliance to financial standards , SACCOS are supervised by the Bank of Tanzania. As savings-based institutions, it is important to ensure that lines of credit for loan able funds do not undermine incentives to promote savings. Pricing policies should promote savings and allow sufficient interest rate spread for profitable operations of the SACCOS. Services offered delivery mechanism and clients. SACCOS generally offer similar financial services. Major financial services offered include; savings account, credits, and fixed deposits. Loans are offered to individuals or to groups who are members only. Credits offered by SACCOS are broken down into education credits, agricultural credits, business credit and long term or development credits. Collateral generally takes the form of group collateral, land/ farm, houses, and other household assets.

The major source of funds for the SACCOS surveyed was found to be members savings, interest income, borrowings from Commercial banks (CRDB, NMB,NBC, etc) Microfinance institutions NGOs (PRIDE, FINCA etc) and donations from donors including district councils, financial institutions, government and others.

Membership to SACCOS is open to all persons. Men and women have equal opportunity of joining SACCOS. Potential members are required to buy membership shares of any amount before allowed to join. Compulsory saving is also required which allows a member to borrow on the basis of save one borrow three (1:3).

The number of members among the SACCOS surveyed varies significantly. As at the time of survey (March, 2010), Madibira SACCOS had 1 967 active members, Tujikomboe SACCOS with 1 090 members, Ng'anda SACCOS with 908 members and Mlevele SACCOS with 354 members.

END.