AN ANALYSIS OF MICROFINANCE SERVICES AND THEIR EFFECTS ON SMALLHOLDER FARMERS' INCOMES IN NYAMAGABE DISTRICT, RWANDA

BY

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DECLARATION

This Thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

All praises to the Almighty Lord, the Most Gracious, for giving me the strength and determination to complete this study.

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ABBREVIATIONS AND ACRONYMS

ATT: Average Treatment Effect on the Treated

ATE: Average Treatment Effect

ATU: Average Treatment Effect on the Untreated

CAADP: Comprehensive Africa Agriculture Development Program

CSS: Credit and Savings Society

EDPRS: Economic Development and Poverty Reduction Strategies

GoR: Government of Rwanda

MFIs: Microfinance Institutions

MDGs: Millennium Development Goals

MINALOC: Ministry of Local Government, Rwanda

MINECOFIN: Ministry of Finance and Economic Planning, Rwanda

NBR: National Bank of Rwanda

NISR: National Institute of Statistics, Rwanda

RWF: Rwandan Francs

PSM: Propensity Score Matching

SACCOs: Savings and Credit Cooperative Societies

USD: United States Dollars

ABSTRACT

Microfinance in Rwanda is considered as one of the most important and effective mechanisms in the implementation of the government program to reduce poverty and to increase economic growth. However, little is known about the effects of microfinance on smallholder farmers' income in Nyamagabe District of Rwanda. This study sought to examine the contribution of microfinance services to the income of smallholder farmers in Nyamagabe District. Descriptive Analysis, Logit Model and Propensity Score Matching were used to analyze the data. Logit model was used to assess the factors influencing smallholder farmers' participation in microfinance services while Propensity Score Matching was used to assess the effect of microfinance services on smallholder farmers' income.

Primary data were collected from 240 respondents randomly selected in the 3 sectors of Nyamagabe District using structured questionnaires. The results from Logit Model indicated that Age of a household head, Education, Total annual assets, Savings access, and Off-farm income significantly influenced the smallholder farmers' decision to participate in microfinance services. Results from Propensity Score Matching Model using Kernel Based Matching, showed that the households who had participated in microfinance services had increased their total annual income by 265,674 Rwandan francs (equivalent to 443 USD) more than non-participants. From Nearest Neighbor Matching Method results, the households who had participated in microfinance services had increased their total annual income by 228,246 Rwandan francs (equivalent to 380 USD) more than non-participants.

The study recommends that smallholder farmers should be encouraged by the Private and Public Institutions to participate in microfinance services because these services have the potential to increase their income and agricultural productivity. The use of SACCOs and microfinance services need to be promoted by the Government in order to provide an instrument for mobilizing savings and extending credit.

CHAPTER ONE

INTRODUCTION

1.1. Background Information

The Millennium Development Goals (MDGs) and the Comprehensive Africa Agriculture Development Program (CAADP) agenda all recognize poverty as a challenge which every nation must address (Bingen, 2002). Indeed various nations have adopted several strategies collectively and individually in this respect. The Consultative Group to Assist the Poor (CGAP) estimates that of the nearly three billion poor/ low income people who could benefit from formal financial services, only 500 million have access (Sununtar and Parpiev, 2008).

Microfinance sector in Rwanda is considered as one of the most important and effective mechanisms in the implementation of the government program to reduce poverty. The sector is expected to reduce the number of people below the poverty line from 60 percent in 2000 to 30 percent in 2015 (MINECOFIN, 2007). Microfinance is based on a financial innovation in rural and poor communities to offset the lack of access and inadequate provision of savings, credit and insurance facilities. The development of the microfinance sector is based on the concept that people possess the capacity to implement income generating activities, such as in agriculture, livestock and micro and small enterprises (Habyarimana, 2005).

In its Vision 2020, the Government of Rwanda emphasizes the role that the microfinance sector plays in the attainment of the goals of transforming Rwanda from a low income to a medium income country with dynamic, diversified, integrated and competitive economy.

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The major policies and strategies of Microfinance Institutions (MFIs) in Rwanda are to develop financial infrastructure, support pro-poor innovation, build viable institutions and support social intermediation (Maes, 2007). However, MFIs tend to support informal activities which have a low market demand and the aggregate anti-poverty effect of microfinance in a slow growth economy is hardly felt (Khandker, 2003).

MFIs initiatives in Rwanda have increased in recent times, primarily as a response to the weak involvement of the traditional banks in small and micro enterprises. Commercial banks are well established in the country, while MFIs are still inexperienced. They are characterized by weak management information systems, and limited consideration of best practices. In 2005 they contributed up to 76 percent of credit to the economy, and up to 75 percent of savings were mobilized (MINECOFIN, 2007). According to the sector assessment done in 2005, close to 100 million US dollars was mobilized in the sector and 85 million US dollars was extended to over 600,000 MFIs' clients as credit (Habyarimana, 2005).

The Government strategy is to mobilize domestic savings and build an inclusive financial system in Rwanda, yet only 21 percent of adults have access to formal financial services and 52 percent of Rwandans are financially excluded (NBR, 2010). Therefore, National Bank of Rwanda decided in December 2008 to establish at least one Savings and Credit Cooperatives Society (SACCO) per sector with the main objective to allow unbanked but bankable people get access to financial services at low transaction costs (NBR, 2008). In order to facilitate MFIs management, the government decided to finance the project of computerizing some MFIs, particularly those which are located in rural areas.

The government of Rwanda aims to create an enabling environment for sustainable MFIs so that they will be capable of fully playing their role as partners in delivering development objectives.

Microfinance would help to generate employment and to diversify sources of income and productivity, thereby contributing to the improvement of Rwanda's economy in a sustainable manner (MINECOFIN, 2008). This is to be achieved through financial and non financial services extended to the economically active rural and urban small enterprises sectors.

The Government is aware that poverty reduction may not be achieved without access to financial services by the poor (Meyer, 2002). Once smallholder farmers obtain credit from MFIs, they will be able not only to enhance their income and consumption levels, but also improve their productivity through improved access to microcredit (Bamwesigye, 2005).

MFIs and their clients have much to gain from quality and long-term banking relationship. The lender benefits from lower monitoring costs, increased revenue, and improved lending decisions, given that risk decreases as more information about the smallholder farmers is revealed. Benefits to the client include a continued and often expanded access to credit, a cost reduction in capital as terms and conditions improve over the long run, and an opportunity to establish a valuable reputation as a reliable borrower (Smith, 2001).

1.2. Problem Statement

The microfinance industry has evolved over the years to support those who have for a long time been excluded by traditional commercial banks. The industry in Rwanda has in the recent times received much attention from the development agents, such as practitioners, donors and policy makers, for its ability to lend successfully to poor people (Niyonsenga *et al*.2007). Despite the increasingly important roles assigned to microfinance in poverty reduction, little is documented about its contribution to income of the beneficiaries in Rwanda in general and in the smallholder farming sector in particular.

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Microfinance institutions have evolved, but farmers' involvement with them and their contribution to farmers' income are not adequately known.

Nyamagabe District, situated in the southwestern part of Rwanda, is considered one of the poorest in the country. It has a population of 600,000 persons, 90 percent of who depend on agriculture directly or indirectly for their livelihoods, and most are basically smallholder farmers who often lack self-financing for their activities (www.minaloc.gov.rw).

Nyamagabe District, depending basically on agriculture would require strategies that break the vicious circle of poverty through provision of credit facilities. It would be important to monitor and appraise government and community efforts in poverty reduction and /or income generation, especially among the poor, and Nyamagabe programme provides a case study.

1. 3. Purpose and Objectives of the study

Purpose

- The purpose of this study was to examine the contribution of microfinance services to the income of smallholder farmers in Nyamagabe District, Rwanda.

Specific objectives were:

(i) To analyze smallholder farmers' participation and assess the factors influencing this participation in microfinance services in Nyamagabe District.

(ii) To assess the effect of microfinance services on smallholder farmers' income in Nyamagabe district.

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1.4. Hypothesis Tested

The study was guided by two hypotheses, based on the objectives:

(i) Socio-economic factors, mainly Age, Gender, Education, Marital status, Distance from homestead, Total Annual Assets, Home Savings, Perception of credit eligibility and Off-farm income, do not affect the smallholder farmers' participation in microfinance services.

(ii) Microfinance services do not have any significant effect on smallholder farmers' income.

1.5. Justification of the Study

Low agricultural productivity and low incomes have been endemic in Nyamagabe District. Lack of self-financing and lack of access to capital have been considered as the major contributors to this scenario. According to the Ministry of Finance and Economic Planning in Rwanda (MINECOFIN, 2002), microfinance participation by smallholder farmers has potential benefit at both the macro and the micro levels. Exploitation of this potential in Nyamagabe, however, is still not well understood nor documented.

In the past, not much scientific research has been done to assess the effect of microfinance services on smallholder farmers' income and no scientific research has been carried out to depict both qualitative and quantitative contribution of microfinance on poverty reduction especially in this particular area of Rwanda which has been considered as the poorest part of the country.

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Besides contributing to an understanding of how participation in microfinance services would change the smallholder farmers' lives, this study will help policy makers to identify an appropriate financial system. This would enhance smallholder farmers' accessibility to financial services, including credit, savings and insurance, which could potentially increase their income and their agricultural production.

1.6. Outline of the Study

The thesis is organized into 5 Chapters. Chapter one has covered the introduction part, detailing problem statement, study objectives, study hypotheses and justification of the study. Chapter two reviews the literature which is relevant to the study topic. Chapter three discusses the methodology used, including the conceptual framework, study areas, data collection procedures, research design and data needs and sources. Chapter four analyzes the data and discusses the empirical results. Finally, chapter five summarizes the major research findings, gives the conclusion and draws policy implications.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

Since the 1970s, microfinance has come to be seen as an important development and poverty reduction tool for men, as well as women (Olu, 2009). Microfinance includes a set of financial tools which aim to provide banking services for the unbanked, specifically the provision of small cash loans (micro-credit), facilities to save (micro-savings), and insurance policies (micro-insurance) and money transfers. These instruments are seen as reducing and mitigating risks and vulnerabilities experienced by poor people (Hulme, 1999).

Simanowitz (2003) argues that microfinance is a key tool to achieve the Millennium Development Goals (MDGs). Microfinance institutions (MFIs), such as financial cooperatives, financial non-governmental organizations and rural banks, among others, can provide poor people with small amounts of credit at reasonable interest rates. A loan as little as US$ 50 can give poor people a chance to set up their own small businesses, and possibly create more jobs. It can also help secure a family's food supply, buy medicine and pay for children's education (Murray and Boros, 2002).

Although credit is an important part of microfinance, it is just one of the diverse financial services that poor people need to improve their lives. Poor people also need savings services, basic insurance options and affordable remittance systems to best manage their assets and generate income. Microfinance is regarded as one of the successful poverty reduction policies

and has also been seen as a proposal to provide financial services to the low income population and as a strategy for empowering smallholder farmers (Nidia *et al.;* 2001).

2. 2. Overview of Microfinance Sector in Rwanda

The microfinance sector in Rwanda contributes significantly to the provision of basic financial services. About 80 percent of the households holding an account in a financial institution are serviced by the People's Bank network, a microfinance organization (Rusagara, 2008). However, the reach of other MFIs remains limited, and most of them are fully stretched in the use of their resources. To access additional resources, MFIs could seek refinancing from the banking sector, which is likely to prove a more sustainable source of funding than donors (Habyarimana, 2005).

Apart from the Peoples' Bank, the majority of MFIs in Rwanda seem to lack capacity in several areas that are important to manage a financial institution profitably. Capacity building is needed in management, accounting, internal controls, development of new products, and setting up of Management Information Systems (MIS), which only very few institutions in Rwanda are able to provide (MINECOFIN, 2007).

The activities of microfinance in Rwanda have been in existence for a long time with the system of self-help groups, called *IBIMINA* in *Kinyarwanda*, the local language. Microfinance started formally with the introduction of the first People's Bank in 1975 at NKAMBA, the sector of Muhanga District in Rwanda. After the 1994 conflict, the NGOs and donors intervened with credit during the emergency period to assist the Rwanda population. Some were distributing loans often without distinguishing them from grants or gifts, and this created confusion amongst the population. This developed a culture of non-

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repayment, especially at People's Bank, which contributed to the non-performing loan rate of 45 percent (Bamwesigye, 2008). As the Government activities moved into a development phase, several NGOs transformed into MFIs. However, a certain number were not respecting the sector's best practices.

By June 1999, the Law Number 08/99 of June 1999 gave authority to the Central Bank to supervise banks and other financial institutions, including microfinance institutions (MFIs). In 2002 and 2003, the National Bank of Rwanda introduced two regulations: the first was governing microfinance activities in general, while the second was specific to the activities of SACCOs (Minecofin, 2007).

After 2003, there was a proliferation of MFIs operating without professionalism.

They opened counters throughout the country while using the deposits collected for their expenses instead of the preliminary paid up capital. By the end of 2005, one important MFI was not able to repay deposits. Subsequently, eight other MFIs were closed by the Central Bank in June 2006. The decision to liquidate them was made based on their bad corporate governance and their inability to repay depositors who needed to withdraw the money (NBR, 2007). In order to encourage the microfinance sector, the Government took the decision to reimburse 50 percent of deposits in MFIs, which represented 1.5 billion Rwandan francs (Rwf) as the deposits were estimated at 3.034 billion Rwandan francs. The balance of deposits would be covered by the reimbursement from loans granted to the closed MFIs. Although the district authorities were sensitized on the need to cooperate with the liquidators to recover the loans granted by the closed MFIs as well as by the intervention of the General Prosecutor, the recovery rate is still very low (Rusagara, 2008).

In September 2006, the Government adopted the National Microfinance Policy with a recommendation to the National Bank of Rwanda to put in place a legal and regulatory

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framework for the microfinance sector, with the ultimate objective of contributing to social and economic development in both rural and urban areas. The National Policy recognizes the microfinance sector as a key instrument for poverty reduction through the strengthening of the private sector, diversifying investment, generating employment and diversifying rural sources of income (Murgatroyd et al, 2007).

2.3. Effects of Microfinance Services

Debates around the effectiveness of microfinance services in alleviating poverty are compounded by theoretical and methodological issues on how to assess this effectiveness. Many countries in Africa, Asia, and Latin America have included microfinance services as policy variables to eradicate poverty (Hossain and Rahman, 2001). It is widely believed that microfinance services will increase incomes and expand financial markets by providing credit, among other services, to small scale entrepreneurs. The contribution of microfinance services on income goes beyond simply providing financial services for businesses, investing in health and education, managing household emergencies, and proving for other cash needs encountered (Morduch, 1998).

Robinson (2001) in a study of 16 different MFIs from all over the world showed that having access to microfinance services has led to an enhancement in the quality of life of clients, an increase in their self-confidence and diversification of their livelihood security strategies, thereby increasing their income. The results revealed that the microfinance services have a positive impact on livelihoods, social status, treatment in the home and community, living conditions and consumption standards, thereby reflecting significant increases in ownership of livelihood assets, such as livestock, equipment and land. The results also showed that trading activities financed by MFIs can help to establish new marketing links and increase the

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income of traders, and this can lead to reduced migration due to increased employment opportunities and increased income.

Hulme (1999) notes that credit give poor people a means of investing and breaking out of the "vicious circle" of poverty. He notes that credit has the potential of improving users' income and savings, enhancing investment and reinforcing high incomes.

This argument is highly supported by the findings of Kashuliza *et* al. (1998) in the Southern highlands areas of Tanzania who observed that incomes of the credit users are significantly higher than the incomes of non-credit users. Wright (1999) focused solely on increased income as a measure of the impact of microfinance services on poverty. He argues that by increasing the income of the poor, MFIs are not necessarily reducing poverty. It depends on what the poor do with this extra money. The focus needs to be on helping the poor to sustain a specified level of well-being by offering them a variety of financial services tailored to their needs so that their net wealth and income security can be improved.

2.4. Savings Mobilization

During the 1990s, savings had risen to top of the microfinance community's agenda. Previously, MFIs regarded savings as being a less important service than credit. Typically, collateral systems or compulsory savings were implemented, meaning that savings were extracted from clients in order to provide security for MFIs. Therefore, in recent studies, the savings possibility is called 'the forgotten half of microfinance (Bamwesinge, 2008). The experience has shown, however, that there is high demand for saving facilities, often even higher than that for the credit.

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Savings can play a highly crucial role in poor household survival strategies. Particularly, for the poorest of the poor, safe saving deposits can be a great help than even microcredit because profitable use of the loans requires potentials and working capabilities which the poorest people cannot guarantee in many cases. Unsure and irregular income plus high and unexpected expenses from time to time build a very unstable financial foundation and can threaten the existence of vulnerable households (Finney and Kempson, 2009).

Robinson (2001) argues that saving serves four main purposes for the poor. Firstly, savings as insurance against emergency situation like old age, loss of income and unexpected investment opportunities. Secondly, savings as stock to equalize irregular incomes for example for the farmers whose incomes fluctuate with seasonal cycles. Thirdly, savings for social and religious obligations like weddings and village functions. Fourthly, savings for future long- term investment. This is an indication that the poor need and use saving services.

A study conducted in Mexico in 1999 (Fernando,1999) used the 1992 and 1994 Mexican National Surveys of Income and Expenditures as a natural experiment and an exogenous expansion of a savings institute targeted to low-income individuals to identify the effects of increasing financial access on the saving rate of households. The findings show that increasing financial access on low-income people results in saving rates that are statistically significant and of an important magnitude. The expansion of a Mexican savings institute increased the average saving rate of affected households by 3 to 5 percentage points and the expansion, in general, had no effect on high income households. From Fernando (1999), it can be concluded that low-income people save a considerable fraction of their income when they have access to financial instruments. Therefore, this study suggests that microfinance services also can have a wider effect at the regional level, such as creation of jobs at the

regional level, strengthening of the microenterprises sector and strengthening of the financial sector as a whole.

2.5. Rural Finance and Agricultural Credit Experiences

Many empirical studies on rural finance and agricultural credit have tended to concentrate on the factors associated with the requirement and importance of credit in agriculture.

In Rwanda, according to Niyonsenga, et al. (2007), rural financial systems and agriculture credit development are expected to raise the share of agriculture in total credit from 3 percent to 15 percent.

Through the intensification and development of sustainable production systems, the supreme objective is to achieve an average annual growth rate of 7 percent for the sector as a whole by 2011. For the food-crop and export sectors, the corresponding objectives are 6 percent and 8 percent annual growth rates respectively.

Recently, in Rwanda, and especially in Nyamagabe District, microfinance has gained much popularity as a development strategy to combat poverty. The financial sector strategy in Rwanda focuses on four areas that are intended to develop the financial system: Banking and access to credit, long term finance and capital markets, contractual savings regulation, and payment systems. One approach is to promote comprehensive rural finance system in which there is space for self–help groups with community, farmer's organization, microfinance institutions and commercial banks playing different and complementary roles in developing the provision of a range of strong financial support services at every level of government and in providing skilled technical assistance.

In Rwanda, financing of agricultural activities often requires credit because many of the operators do not always have their own resources to develop their activities. Hence, to invest

in production, processing, conservation, storage, transport or other related activities, establishment of a credit system suitable to the producers will contribute to the development of agricultural sector (Niyonsenga *et* al.2007).

Rwanda has systematically practiced a supply-led approach to increase agricultural credit. The objectives have been to replace moneylenders, relieve farmers of indebtedness and to achieve higher levels of agricultural credit, investment and agricultural output.

According to Meyer (2002), agriculture is the area of production with low accumulation capacity, which means that the possibility of self-financing is very small markets fluctuation in the rural economy, particularly in agriculture, introduces significant lender risk. This is primarily due to the allocation of part of accumulation generated in agriculture for the development of other activities, as well as the lower labor productivity, thus leading to lower rate of surplus value.

Hossain (1988) stated that using the modern agricultural farming technology is highly capital intensive due to use of modern agricultural inputs such as high-yielding varieties seeds, synthetic fertilizers, pesticides, modern irrigation facilities and farm implements. Therefore, credit may be needed to facilitate adoption of such technologies.

Temu at al., (2001); Karshenas (2001); Mpunga (2004) independently have found that the developing countries are moving from a predominantly rural agricultural economy to an agricultural system that demands skilled manpower on farms, good quality seeds, credit facilities, supervision and production levels on professional front. With the new scientific and technological developments, agriculture production with respect to total yield per acre could be improved. However, financial constraints prevent farmers adopting new technology.

In Bangladesh, Alam (1992) carried out a study to measure the productivity growth of the Grameen Bank members. His findings suggest that the small and marginal farmers as a result of participating in the Grameen Bank programs have been able to allocate a higher percentage of their land for the cultivation of high-yielding varieties and have improved their agricultural productivity. That study showed that the users of microfinance services were able to bring 81.5 percent of their cultivable land under high yielding varieties compared to 76 percent of the non-users. The study thus concluded that by joining the Grameen Bank credit programs, the income and agricultural productivity in terms of per acre yield have increased immensely.

Mohan (2004) examined the overall growth of agriculture and the role of institutional credit in India, and noted that the overall supply of credit to agriculture as a percentage of total disbursal of credit was going down. However, he argued that this should not be a cause for worry as the share of formal credit as a part of the agricultural GDP was growing. This established that even though credit was increasing, it did not really make an impact on value of output figures, and this point out the limitations of credit. Mohan (2004) also suggested that agricultural credit could be further enhanced by much greater financial inclusion by involving of region-specific market participants, and of private sector suppliers in all these activities, and credit suppliers ranging from public sector banks, co-operative banks, the new private sector banks and micro-credit suppliers, especially self-help groups.

Golait (2007) attempted to analyze issues in agricultural credit in India. The analysis revealed that the credit delivery to the agriculture sector continues to be inadequate. It appeared that the banking system in India was still hesitant on various grounds to provide credit to small and marginal farmers. It was suggested that concerted efforts were required to augment the flow of credit to agriculture, alongside exploring new innovations in product design and methods of delivery, through better use of technology and related processes.

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Golait (2007) also stated that the diversity in cropping patterns, land holding sizes, productivity and regional variations make it difficult to establish the effect of credit on agriculture or rural sector as a whole, even if one had data. Finally, he argued that an increase in supply of credit was not going to address the problem of productivity, unless it was accompanied by investments in other support services. Therefore, channeling of credit through processors, input dealers and NGOs, among others, that were vertically integrated with the farmers, including through contract farming, by providing them critical inputs or processing facilities for their produce, could increase the credit flow to agriculture significant. The study concluded that the direct agriculture credit amount had a positive and statistically significant impact on agriculture output and its effect is immediate.

2.6. Review of the Models Applied in Past Studies

Several approaches have been used to study participation in the microfinance services and their effects on the poverty reduction. Some analysis has been used to study participation, Logit model has been applied to study binary outcomes, and Propensity Score Matching has been used to address the selectivity bias and to evaluate the effect of microfinance services.

Aigbokhan et al., (2011) used cross-sectional data from Edo and Delta States of Nigeria from sample size of 500 and employed the logistic model to estimate relationship between microfinance, household demographic variables and household poverty status. The study found out that microfinance plays an important role in poverty reduction and social capital formation in Nigeria, and as such, if properly positioned, microfinance institutions are useful tools for poverty reduction.

Owuor (2009) employed propensity score matching method to evaluate the effects of microfinance credit on borrowers' productive performance in Kenya. Owuor (2009) argued that participation in microfinance credit improves household productive incomes and that the microfinance credit among smallholder farmers is constrained by low literacy levels, gender differentials in asset endowment, poor road infrastructure, and maintenance of indigenous group structures, which are key factors for policy intervention. Hulme and Mosley (1996) used a similar methodology but suffered from a problem of a small sample of 36 borrowers. It is not clear whether the control group matched borrowers exactly in terms of characteristics such as education, gender or sector of activity.

Arun (2006) applied Nearest Neighbor and Kernel based Propensity Score Matching to analyze the effect of microfinance institutions in India. He found out that household in rural areas needed loans from MFIs for productive purposes to reduce poverty, while simply accessing MFIs was sufficient for urban households to reduce poverty.

The methodology widely used in the literature is the Instrumental Variables estimation or the Heckman sample selection model where the access to MFIs is estimated in the first stage and the effect of access to MFI on poverty is estimated in the second. However, the two approaches have serious limitations. A major limitation of the Instrumental variables (IV) is that it normally requires at least one variable in the treatment equation to serve as instrument in specifying the outcome equation. The major limitation of the Heckman Selection model is that it depends on the restrictive assumption of normally distributed errors. Finding such instruments remains hard task in empirical analyses (Arun, 2006). Moreover, Instrument Variable procedures tend to impose a linear functional form assumption, implying that the coefficients on the control variables are similar for participants and non- participants. The Propensity score matching is a better alternative in this respect.

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Sununtar (2008), using data from a survey of clients of a microfinance bank in Khushhali Bank Pakistan in 2005, employed the Propensity Score Matching Methods (PSM) to address the selectivity bias. This study found out that the lending program contributed significantly to income generation activities, such as agricultural production, and in particular, to poverty reduction. Comparing the results to previous impact estimates done by Montgomery on the same dataset using OLS and Logit estimation, the PSM method yielded different results. Although both studies recorded similar microfinance impacts on poverty, the degree of impact was less pronounced when the selectivity bias was addressed.

Anand (2006) used the Logit Model to analyze the impact of self-help groups on four villages in Cuddalore district of Tamil Nadu, South India and adopted the purposive sampling of 232 households. The results showed that the relationship between the asset index and access to healthcare services was positive and statistically significant at five per cent level of significance for the average asset holding members. However, the limitations of this analysis include crudity of some of the indicators, for example for income change, and the way in which a participant group of non-participants are selected. This simply ignores the issue of self-selection bias and does not control for factors like education and gender.

Yehuala (2008) pointed out that the logit model has an advantage in the analysis of dichotomous outcome variable in that it is extremely flexible and easily used model from the results in a meaningful interpretation. Hence the logit model was used in this study to assess the factors influencing the participation in microfinance services.

Despite methodological variations, the literature widely indicates that microfinance could improve the living standards of the poor in terms of their income and productivity. However, this would need to be empirically tested and confirmed.

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CHAPTER THREE

METHODOLOGY

3. 1. Conceptual Framework of the Study

Figure 1 below presents the conceptual framework adopted for this study which covers the socio-economic factors, microfinance services, and their effects on smallholder farmers' income.

Figure 1: Conceptual Framework of the Study

Microfinance Institutions

Policies and Strategies:

- Creating conducive policy environment
- Developing financial infrastructure
- Building viable Institutions

Financial Services:

- Credit
- Savings
- Insurance
- Money transfer
- Social capital created in finance transactions

Socio-economic Factors:

- Age
- Gender
- Education
- Main Occupation
- Size of Land owned
- Household size
- Home savings
- Perception of credit eligibility…

The effect of MFIs on: Smallholder farmers

1) Business and Employment creation:

- Income
- Expenditures/ Consumption
- Assets

2) Economic Security

- Housing
- Education
- Food Security
- Health

Source: *Authors*

The figure 1 above gives the conceptual framework of the study and shows that the Microfinance institutions as development organizations are to service the financial needs of the market as a means of meeting development objectives. They are designed to cover all their costs, but also benefit their clients. In this regard, development goals related to the empowerment and improved household welfare aim at self-financing with no subsidies.

The increasing access to microfinance services will in itself lead to individual economic empowerment by enabling smallholder farmers to make decisions about savings and credit use, and thus be able to increase their incomes and productivity. It is then assumed that this increased economic empowerment will lead to the increased well-being of smallholder farmers and also to social and even political empowerment.

The conceptual framework shows that microfinance enables the smallholder farmers to earn more, build their assets and invest in better health, education, nutrition and housing. Smallholder farmers borrow from MFIs and receive loans to improve their businesses and thus their income. Therefore, access to reliable monetized savings facilities can help the smallholder farmers' consumption over periods of cyclical or unexpected crises, thus greatly improving their economic security.

The study is therefore conceptualized as an investigation into the contribution of microfinance to agricultural development, with a view of up scaling the positive attributes, or reforming the system in line with the demand circumstances.

3.2. Description of Study Areas

The study was conducted in three sectors of Nyamagabe District which is situated in the South Province of Rwanda. This District is divided into 17 Sectors. The district lies between Huye and Cyangugu in the South-West of Rwanda. It also contains the eastern half of Nyungwe Forest, a popular tourist destination, being one of the last remaining forest areas of Rwanda and home to chimpanzees and many other species of primates (www.minaloc.gov.rw).

Nyamagabe District is the poorest district in Rwanda and is one of the areas that are most densely populated by smallholder farmers. The major economic activity of the people is agriculture and the major crops grown are potatoes, beans, wheat, peas, maize, sweet potatoes, and tea.

The agricultural sector in Nyamagabe is characterized by subsistence farming, depending on unreliable climate, poor infrastructure, poor markets, and precarious income flows that deny access of many rural households to credit facilities. Efforts can be made to develop the rural financial system to ensure its smooth operations and thereby contributing to poverty alleviation. The selection of the study areas was based on the number of microfinance institutions residing in the region, which are at least twelve.

Figure 2 below presents the administrative Map of Rwanda and Figure 3, the administrative Map of Nyamagabe District from where three sectors were purposively selected for the study due to their proximity to the major urban center where microfinance organizations operate from.

Figure 2: Administrative Map of Rwanda

Source: http://www.minaloc.gov.rw/events/Inzego.doc
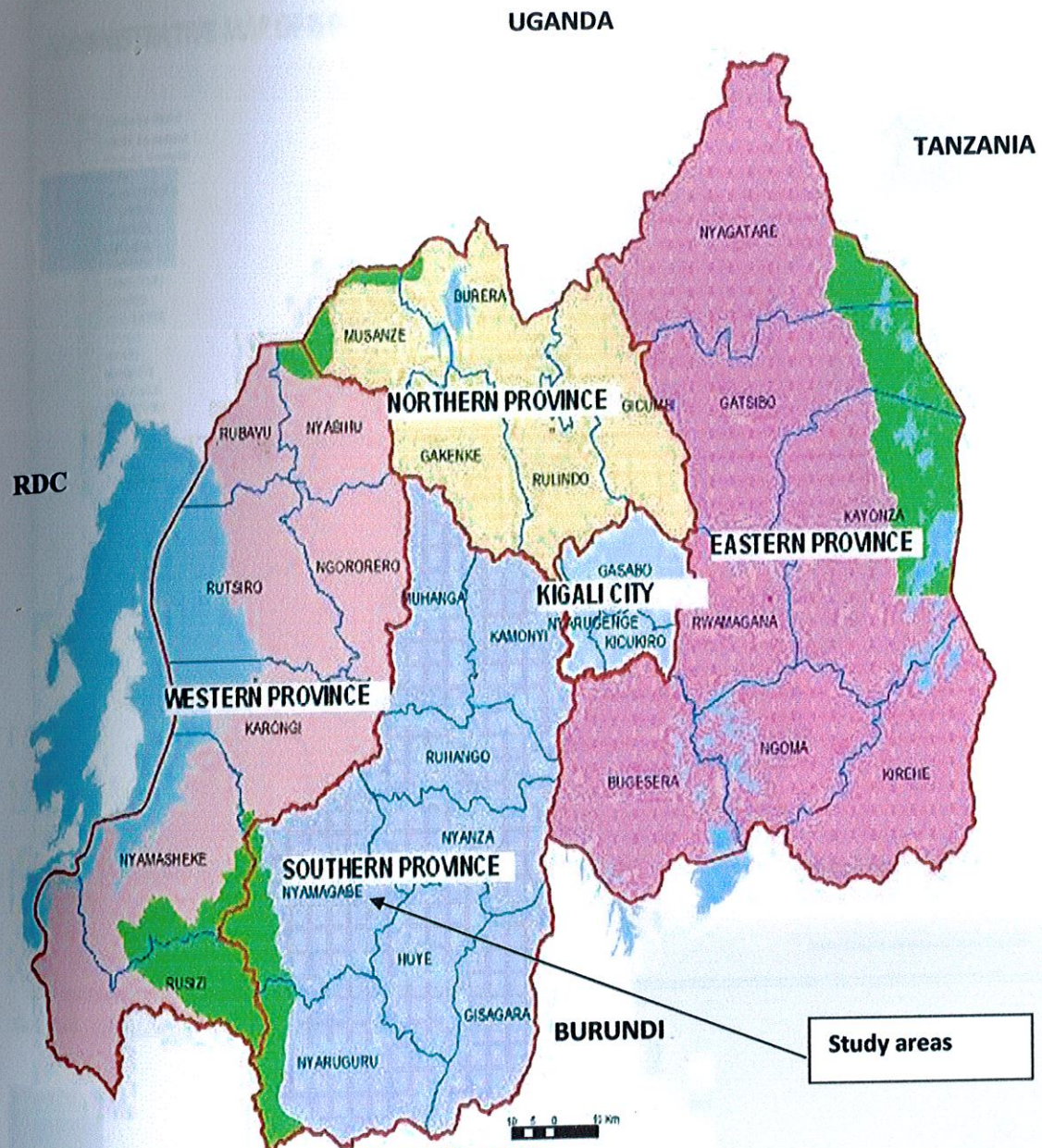
Figure 3: The Map of Nyamagabe District.

ADMINISTRATIVE MAP OF NYAMAGABE DISTRICT

Limite de district
Limite de secteur
Parc de Nyungwe
Secteur de
BURUHUKIRO
CYANIKA
GASAKA
GATARE
KADUHA
KAMEGERI
KIBIRIZI
KIBUMBWE
KITABI
MBAZI
MUGANO
MUSANGE
MUSEBEYA
MUSHUBI
NKOMANE
TARE
UWINKINGI

MUSANGE
MUGANO
MUSHUBI
NKOMANE
KADUHA
GATARE
MBAZI
MUSEBEYA
KIBUMBWE
CYANIKA
BURUHUKIRO
KIBIRIZI
GASAKA
UWINKINGI
KAMEGERI
TARE
KITABI

3 0   3   6 Kilometers

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3.3. Data Sources and Collection Methods

The study used both qualitative and quantitative data from primary and secondary data sources. Data were collected using structured questionnaires that were administered to the sample of households' heads via person-interviews. The primary data were collected during the month of March 2011 from a stratified multistage sample of 240 households located in three sectors of Nyamagabe District, namely Gasaka, Kibirizi and Tare.

The information collected focused on household socio-economic and demographic characteristics, such as age, gender, household size, farm labor participation, main occupation and access to essential services offered by microfinance institutions (credit, savings and insurance).

The respondents were asked about the quality of life in several dimensions, including income (source of income, main occupation), productive assets (land ownership), basic needs (food security, use of health care services), human capital (children's school, housing (material) and household assets (ownership of bicycle, TV and Cars). In addition, secondary data were collected from National Bank of Rwanda, Ministry of Finance and Economic Planning (MINECOFIN) and Rwanda Cooperative Agency (R.C.A).

The study included participants and non-participants in agricultural activities and others businesses. Both groups shared the same socio-economic and physiographic environment and hence assumed to have similar economic status before microfinance services.

3.4. Sample Distribution

The study sample was selected from the population of the smallholder farmers in Nyamagabe District. The sample size was estimated using the Cochran formula (Cochran, 1977). This study used the 95 percent level of confidence (Z=1.96) for a two tail test. Therefore, assuming that p = 20 percent, q = 80 percent of smallholder farmers in this areas, and is maximum variability defined by e of ±5% precision.

$$n = \frac{Z^2}{e^2} pq = \frac{(1.96^2)(0.2)(0.8)}{0.05^2} = 245$$

Where:

n is the sample size,

Z^2 is the normalized curve distribution value for the desired confidence level (95 percent in this case).

e is the absolute size of the error in estimating p that the researcher is willing to permit

p is the estimated proportion of an attribute that is present in the population. In this case, p is a probability getting a participant in microfinance services in entire population.

q is the maximum variability and is computed as 1-p.

Therefore, based on the above formula, the sample size was estimated to be 240 respondents to conveniently meet the sampling procedure.

All respondents were distributed in three Sectors as follows: Kibirizi 81 respondents, Gasaka 78 respondents and Tare 81 respondents. These areas were purposively selected to represent the diverse economic backgrounds in agricultural activities in Nyamagabe District.

The sampling framework in this research included two groups of households: a group of smallholder farmers who have participated in microfinance services, and a group of households who have never participated in microfinance services. In total, 240 households

were interviewed in the survey out of these, 117 (48.8 percent) households had participated in microfinance services, and 123 (51.2 percent) households had not participated in microfinance services. In terms of gender, 165 were male headed households and 75 were female headed households.

3.5. Data Analysis

Both qualitative and quantitative techniques were used to analyze the data. Descriptive statistics was used to describe the socio–economic and demographic characteristics of Respondents such as mean, percentage, standard deviation, tabulation, and frequency distribution. Logit model and Propensity Score Matching were also used to analyze the data.

3.5.1. Empirical Model Used in the Study

3.5.1. 1. Analysis of Smallholder Farmers' Participation in Microfinance Services using the Logit Regression Model

The study analyzed the participation of farmers in the MFIs, and the factors which contribute to this participation using a Logit Regression Model.

Logit regression was well suited for describing and testing hypotheses about relationships between a categorical outcome variable and one or more categorical or continuous predictor variables. It was preferred as a binary. It took a value of 1 (one) if smallholder farmers participated in microfinance services and a value of 0 if smallholder farmers did not participate in microfinance services. Because alternative outcomes are difficult to describe with an ordinary least squares regression (OLS) equation due to the dichotomy of outcomes, one may instead create categories for the predictor and compute the mean of the outcome variable for the respective categories. The study used the observed information on

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smallholder farmers' choice (participate or not participate in microfinance) services and estimated the conditional probability of socio-economic factors influencing smallholder farmers' participation in microfinance services in Nyamagabe District (using the binary logit model).

The logistic model is derived as follows:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + ... \beta_i X_i + \mu_i \quad .... (1)$$

This can be expressed in terms of probabilities as:

$$\pi = E(Y = 1/X_{1...}X_i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_i X_i$$

$$.................... (2)$$

In this case, the outcome variable Y is dichotomous, taking on values of 1 (if smallholder farmers participate in microfinance services), and Y=0 (when they do not participate in the programme).

In theory, the hypothetical population proportion of cases for which Y = 1 is defined as

π = P(Y =1). Then, the theoretical proportion of cases for which Y = 0 is $1 - \pi$ = P(Y = 0). Mathematical formulation is based on a linear model for the natural logarithm of the odds (i.e., the log-odds) in favor of Y = 1.

Taking the natural log of both sides of the equation we obtain:

$LogitY = Natural \log(odds) =$

$$\log_e \left[\frac{P(Y = 1/X_1....X_i)}{1 - P(Y = 1/X_1....X_i)} \right] = \log_e \left[\frac{\pi}{1 - \pi} \right] = \beta_o + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_i X_i \quad ....(3)$$

π is a conditional probability of the form P(Y=1| X_1,...,X_i).

That is, it is assumed that participating in microfinance services is depending on combinations of values of the predictor variables. The log-odds, as defined above is also known as the logit transformation of π and the analytical approach described here is known

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as logit analysis. Using substitution method and simplifying the fraction, this equation becomes:

$$P(Y = 1 / X_1 \ldots X_i) = \pi = \frac{e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i}}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i}} \quad \ldots\ldots\ldots\ldots\ldots\ldots(4)$$

The logistic function is sometimes presented in the form:

$$P(Y = 1 / X_1 \ldots X_i) = \pi = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Therefore, the probability of an event that the smallholder farmers do not participate in microfinance service is $1 - \pi$, and expressed as:

$$P(Y = 0 / X_1 \ldots, X_i) = 1 - \pi = \frac{1}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i}} \quad \ldots\ldots\ldots \ldots\ldots (6)$$

Where $e = 2.71828$ is the base of the system of natural logarithms.

β_0 = The constant term or intercept which is the value of Y when the value of all independent variables are zero

β_i = Regression coefficient

X_i = vectors of explanatory variables where:

X_1 = Gender of household head

X_2 = Age of household head (in years)

X_3 = Education level of household head

X_4 = Marital status of Household Head

X_5 = Distance from homestead to microfinance office

X_6 = Home Savings

X_7 = Perception of Credit Eligibility

X_8 = Off-farm income

X_9 = Total Assets

μ_i = The error term

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According to Equation (3), the relationship between the outcome variable (Y) and that of X is linear. Yet, according to equation (4), the relationship between the probability of Y and the probability of X is non linear.

For this reason, the natural log transformation of the odds in equation (3) is necessary to make the relationship between categorical outcomes variable and its predictor(s) linear.

The value of the coefficient β determines the direction of the relationship between X and the Logit of Y (or natural log odds). When β is not equal to zero, larger (or smaller), X values are associated with larger (or smaller) value of Y. Conversely, if β is less than zero, larger (or smaller), X values are also associated with smaller (or larger) value of Y. Within the framework of inferential statistics, the null hypothesis states that β equals zero, or there is no linear relationship in the population. Rejecting such a null hypothesis implies that a linear relationship exists between X and the value of Y. (Dayton, 1992).

Estimation of the equation (4) using the maximum likelihood method helps to identify the significant explanatory variables.

The coefficients β_0 and β_i were typically estimated by the maximum likelihood (ML) method, which is preferred over the weighted least squares approach. The ML method was designed to maximize the likelihood of reproducing the data, given the parameter estimates (Peng and Peng, 2010). Data were entered as 0 or 1 by coding for the dichotomous outcome, and continuous values for continuous predictors. The null hypothesis underlying the overall model states that all β_i are equal to zero, which means that the coefficients of the relevant explanatory variables equal zero. If β_i is not equal to zero, then the null hypothesis is rejected. The interpretation of the results was rendered using the odds-ratio for both categorical and continuous predictors.

3.5.1.2. Analysis of the Effect of Microfinance Services on Smallholder Farmers' Income using the Propensity Score Matching

The objective of MFIs in Nyamagabe District is to reduce poverty of rural poor households. Microfinance services contribute to agricultural productivity and income, thereby enabling the poor to cope with unpredictable shocks and emergencies. (Hulme and Mosley, 1996) show that when loans are associated with an increase in assets, and when the very poor are encouraged to save and to invest in low-risk income generating activities, the vulnerability of the very poor is reduced and their poverty situation improves.

This study used Propensity Score Matching to assess the effect of microfinance services on smallholder farmers' income. Rosenbaum and Rubin (1983) defined propensity score as a conditional probability of participation, given pre-participation characteristics of the subject. It is the predicted probability that an individual receives the treatment of interest in participation in an activity, such as microfinance services, and involves making comparisons between individuals with the treatment and those without (Heinrichet et al., 2010).

Microfinance services may be diverse, from financial intermediation only to an integrated approach which has financial and social intermediation for enterprise development. In this study, Propensity Score Matching was used to evaluate marginal effect of financial services on smallholder farmers' income, by comparing outcomes between the treatment sample and the non-treatment sample. Treatment sample refers to the participants in microfinance services. A group of non-participants served as a control group to correct for selection bias (Duvendack, 2010). To assess the effect of microfinance services on smallholder farmers' income, the factors influencing participation in microfinance services were first identified using the Logit estimate, which helped to construct a household specific selectivity variable.

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Subsequently, the selectivity variable was added to the outcome equation to control for selection bias. Specifically, the outcome used in this study was the *''household total annual income''*. Household income refers to the total income earned by all household members, which encompasses the income from all possible sources, such as agriculture, non-agriculture, self-employment and wages.

To identify the effect of microfinance services on income, the extent to which the microfinance programme has changed the outcomes of smallholder farmers was measured by comparing the outcome (Total Annual Household Income) when a person participates in the microfinance services to the outcome when he/she does not participate in the microfinance services. Propensity score were estimated using the function:

$$P(X) = Pr\{D = 1 \backslash X\} = E\{D \backslash X\} \quad \dots\dots\dots\dots (7)$$

Where D = {0, 1} is the binary variable indicating whether a household has participated in microfinance services (1=Yes; or 0=No), X is the multidimensional vector of pre-treatment characteristics or relatively stable household characteristics and P(X) is a Propensity Score (Rosenbaun and Rubin, 1983).

The purpose of the matching approach is to estimate the counterfactual outcome and therefore to correct for the selection biases created by nonrandom sampling of the microfinance service participants (Dehejia and Wahba, 2002).

The statistics adopted in this study is the 'Average Effect of Treatment on the Treated (ATT). The ATT estimation depends strongly on the assumption that the distribution of the outcome variables for control group is the same as the counterfactual distribution that the treatment group would have followed in the absence of treatment (Abadie, 2005).

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The expected value of ATT is defined as the difference between expected outcome values with and without treatment for those who actually participated in treatment (Becker and Ichino, 2002).

Average Treatment Effect on the Treated can be estimated as:

$$\mathbf{ATT} \equiv E\left\{W_{1i} - W_{0i} \backslash D_i = 1\right\} \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(8)}$$

$$= E\left\{E\left\{W_{1i} - W_{0i} \backslash D_i = 1, p(X_i)\right\}\right\} \quad\dots\dots\dots\dots\dots\dots\dots\dots \text{(9)}$$

$$= E\left\{E\left\{W_{1i} \backslash D_i = 1, p(X_i)\right\} - E\left\{W_{0i} \backslash D_i = 0, p(X_i)\right\} \backslash D_i = 1\right\} \dots\dots \text{(10)}$$

Where i denote the **i-th** household, W_{1i} is the potential outcome as the wellbeing status in the situations with participation in microfinance services and W_{0i} is the potential outcome in the counterfactual situations for those who do not participate in microfinance services.

The equation 1 is defined as the expectation of the difference of the *i-th* household with participation in microfinance services and that for the same household in the situation where it would not participate in microfinance services. The question 2 is the same as the equation 1 except that the expected effect is defined over the distribution of the propensity score. The equation 3 is component an expected difference of the expected score for the *i-th* household with participation in microfinance services, given the distribution of the probability of the household participating in microfinance services and that for the same household without participating in microfinance services given the same distribution (Becker and Ichino, 2002).

To estimate (ATT) based on propensity scores, two alternative matching methods (Nearest Neighbor Matching and Kernel Based Matching) were used to assess the effect of microfinance service and were compared. All the analyses were based on implementation of common support so that the distributions of treated and non-treated units were located in the same domain.

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Kernel Based Matching

The Kernel is a function that weights the contribution of each comparison group member usually so that more importance is attached to those comparators providing a better match. The most common approach is to use the normal distribution (with a mean of zero) as a kernel, where the weight attached to a particular comparator is proportional to the frequency of the distribution for the difference in scores observed. This means that exact matches get a large weight, and poor matches get a small weight (Drake, 1993).

With Kernel Matching, all treated are matched with a weighted average of all controls with weights that are inversely proportional to the distance between the propensity score of treated and controls. We conceive that none of these matching methods is superior to the other and all should be used at once for more robust estimation of the propensity score. In line with this common support restriction is complementary with these matching methods and it helps to improve the quality (Becker and Ichino, 2002).

In Kernel Based Matching, all members of the non-treatment group are used, to some extent, to construct a match for each treatment group member, although the contribution of those for whom the match is poor may be negligible. The matching algorithms have in common that only a few observations from the comparison group are used to construct the counterfactual outcome of a treated individual. One major advantage of the Kernel Based Matching is the lower variance which is achieved because more information is used. A drawback of this method is that possibly observations are used that are bad matches. Hence, the proper imposition of the common support condition is of major importance for Kernel Based Matching (Caliendo and Kopeining 2005).

The Kernel Based Matching estimator is given by the formulation:

$$ATT^K = \frac{1}{N^T} \sum_{i \in T} \left\{ Y_i^T - \frac{\sum_{i \in c} Y_j^c G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k \in c} G\left(\frac{p_k - p_i}{h_n}\right)} \right\}$$

.... (11)

Where G ($\cdot$) is a kernel function and h_n is a bandwidth parameter, under standard conditions on the bandwidth and kernel and the formulation below is consistent estimator of the counterfactual outcome Y_{0i}.

$$\frac{\sum_{i \in c} Y_j^c G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k \in c} G\left(\frac{p_k - p_i}{h_n}\right)}$$

.... (12)

Nearest Neighbor Matching

Nearest Neighbor Matching is the most straightforward matching estimator. Several variants of Nearest Neighbor Matching were proposed. Nearest Neighbor matching ''with replacement'' and ''without replacement''. In the former case, an untreated individual can be used more than once as a match, whereas in the latter case it is considered only once. Matching with replacement involves a trade-off between bias and variance. If we allow replacement, the average quality of matching will increase and the bias will decrease.

A problem which is related to Nearest Neighbor matching without replacement is that estimates depend on the order in which observations get matched. Hence, using this approach it should be ensured that ordering is randomly done (Smith and Todd, 2005).

The nearest-neighbor matching involves taking each treated individual in turn and identifying the non-treated individual with the closest propensity score.

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The resulting set of non-treatment individuals constitutes the comparison group. It may be that a single non-treatment individual provides the closest match for a number of treatment individuals. In this case, the non-treatment individual will feature in the comparison group more than once. The end result is that the comparison group is of the same size as the treatment group, although the comparison group may feature fewer individuals. That is, each treated individual has one match but a non-treated individual may be matched to more than one treated individual. (Dehejia and Wahba, 2002).

With Nearest Neighbor, each treated unit is matched with a control unit. The difference between the outcomes of the treated units and the outcome of the matched control was computed. The Nearest Neighbor Matching method allowed us to identify the specific matched observations that entered the calculation of the ATT, which we then used for parametric regressions. The ATT of interest is obtained by averaging these differences. Nearest Neighbor Matching formulation is given as:

$$C_i = \min_j \| p_i - p_j \| \ \dots\dots\dots\dots\dots\dots\dots \ (13)$$

Where C_i is a singleton set of control units matched to the treated unit (i), with estimated value of the propensity score p_i.

The consequence of this matching method is all treated units find matches and even for fairly poor propensity score of the control group (Becker and Ichino, 2002).

Covariance Balancing Indicator

In order to perform and to conduct the after matching balancing tests, we used covariate balancing indicators, such as the likelihood ratio test of the joint significance of all covariates and the pseudo- R^2 from a logit of treatment status on covariates before matching and after

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matching on matched sample. After matching, there should be no systematic differences in the distribution of covariates between both groups; as a result, the pseudo- R^2 should be fairly low and the joint significance of all covariates should be rejected

(Smith and Todd, 2005).

Various matching algorithms have been proposed in the literature to overcome this problem. Asymptotically, all the two matching algorithms should yield the same results. However, in practice, there are tradeoffs in terms of bias and efficiency involved with each algorithm. We therefore implemented two matching algorithms: Nearest Neighbor Matching, and Kernel Based Matching. Basically, these methods numerically search for "neighbors" that have a propensity score for non-treated individuals that is very close to the propensity score of treated individuals and to determine if the treatment and comparison groups are still balanced after the use of these matching algorithms (Caliendo and Kopeinig, 2005).

The after matching, we tested for standardized differences, for the equality of each covariate mean across groups and for the joint equality of covariate. The idea of balancing tests when employing propensity score matching methods is to check if observations with the same propensity score have the same distribution of observable covariates independent of treatment status.

3.5.1.3. Description of the Variables Used in the Models

3.5.1.3.1. Dependent Variable (Partmfs)

The dependent variable used in the models was (Y_n) designated as ''participate in microfinance services'' (takes the values of 1 and 0, where 1= participate and 0 = does not participate).

3.5.1.3.2. Independent variables

The set of independent variables hypothesized to influence smallholder farmers' decision to participate in microfinance services in Nyamagabe District. (X_i) include a range of demographic and socio-economic factors for the households, and were categorized as the following: Gender, age, education, marital status, household size, distance from homestead to microfinance office, home savings, total annual assets, land size, perception of credit eligibility, household main occupation, and off-farm income.

Gender of the Head of Household (hhgender)

Gender refers to the sex of the household head. This is a dummy variable which takes a value of one if the household head is male and zero if the household head is female. In the study area more males were actively participating in microfinance service as compared to female-head household and it was hypothesized that female-headed household is more disadvantaged in securing micro loans than a male-headed household. Rural women might have less access to information, technology information in particular, due to their potentially lower demand for credit as an input to improve production, and this reduces their likelihood of accessing microfinance services (Yehuala, 2008). It was hypothesized in this study that gender would increase the probability of participation in microfinance services, given the coding used.

Age of the head of household (hhAge)

The age of household head was expected to influence participation in microfinance services. Generally, older people have more experience and better responsibility. They find it easy to understand the condition of financial institutions.

Therefore, they are more likely to participate to microfinance services for savings and getting loans to increase the income earning potential of the household (Nguyen, 2007).

Education level of household head (hheducation)

Education level of households head was measured by number of school years attendance of household head. Five levels of education were represented in the study.

1=illiteracy, 2= Primary education, 3=Secondary education, 4= University education and 5 =vocational education. Educational attainment of the household head reflects household human capital. Household heads with formal education (for example, Secondary or University) might require more credit for consumption and/or production, compared to uneducated household heads. It was hypothesized that the more educated household heads were likely to have access to microfinance services. The likelihood in the participation in the microfinance services will increase with knowledge and better educated household heads can better understand the services offered by microfinance institutions and might be more ready to comply with the formalities required by microcredit providers Yehuala, (2008); Okunade, (2007); Okurut (2006); Vaessen (2001).

Marital status of household heads (hhMaristat).

Marital status was categorized as follows: being married, never married, widow, divorced and separated. It was hypothesized that the married household heads were more likely to participate in microfinance services and could have higher income than widows, separated and never married household heads.

Household size (HHsize)

Household size refers to the number of people living in a homestead and eating from the same source. Household size may affect household income generating ability in two ways. Large household sizes may increase the household labor resources resulting in higher output. On the other hand, higher household sizes could have various needs ranging from capital investment to consumption smoothening (Odumbe, 2006). Therefore, it is likely to resort to participate in microfinance services to meet these needs. In this study, it was hypothesized that the household size would influence negatively the participation in microfinance services.

Main occupation of household head (hhOccupation)

The Household head main occupation was considered as a dummy variable.
(1=if household main occupation is agriculture and 0= Otherwise). It was expected that main occupation could influence head household decisions to request for additional money and hence access to microfinance services. The smallholder farmers were more likely to participate in microfinance services for increasing their productivity and their income.

Land size (Sizeland)

Land size is the total land owned by the household in acres. Land has been the most important collateral demanded by formal lenders (Binswanger, *et* al.1992). Also, household head with larger land size would have a higher repayment capacity. It was hypothesized that land size would influence positively the households' participation in microfinance services

Distance from homestead to the microfinance office (Distance):

Distance from homestead to the microfinance office could be an influencing factor in microfinance services accessibility. Household located far from microfinance office is less likely to participate in microfinance services than those located near the microfinance office. This is because Households located very far would incur high transaction costs, such as travelling expenses and time opportunity costs involved (Ho, 2004). It was hypothesized that distance to the microfinance office would influence negatively households' participation in microfinance.

Annual total assets: (Totalassets):

The total annual assets were determined by the total amount of the assets, such as agricultural equipments, vehicle, machinery and houses .The physical assets could indicate the ability of the household to meet collateral requirement of microfinance lenders. Therefore, it was hypothesized that the total annual value of assets owned by the household would have positive influence on participation in microfinance services.

Off-farm income of Household Heads (Off_farm_incom):

Household with low income would have higher tendency to access microfinance services for increasing their income. In this study, it was hypothesized that the ''off-farm income ''influenced negatively the participation in microfinance services, implying that households with less off-farm income were likely to participate in microfinance services to invest in farm and in other family needs.

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Home Savings (Hsavings)

Home savings is a dummy variable taking a value of 1 if a household kept money at home and zero otherwise. Therefore, the lack of household confidence in the traditional banking system is reflected in the number of people keeping money at home. They preferred having control and possession of their own money rather than giving it over to a bank, which had excluded them any way. In this study, it was hypothesized that Home savings will positively influence the households' participation in microfinance services.

Perception of Credit Eligibility (Percredel):

Perception of Credit Eligibility is a dummy variable taking a value of 1 if household was eligible to apply for a loans and 0 "otherwise" from microfinance institutions. It was hypothesized that "Perception of Credit Eligibility" may influence positively the participation in microfinance services for increasing the level of their livelihood.

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CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1. Characteristics of Farming Household in Nyamagabe District

4.1.1. Demographic and Socio-economic Characteristics of the Household Heads in Gasaka, Kibirizi and Tare, Nyamagabe District (n=240).

The following tables and figures give and illustrate respectively the household characteristics in the study areas of Gasaka, Kibirizi and Tare in Nyamagabe District.

4.1.1.1 Gender and Marital status of Household Heads.

The table 1 presents the gender of household heads of the household head in the study areas.

Table 1. Gender of Household Heads

The table 1 represents the gender of household heads in the study areas.

Gender	Frequency	Percent	Cumulative Percent
Male	165	68.7	68.7
Female	75	31.3	100.0
Total	240	100.0	

Source: Author's survey, 2011

Table 1 shows that 68.7 percent of the households were male headed, while 31.3 percent were female headed. This suggests that more men were likely to decide to be involved in making decision on whether to participate in microfinance services.

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It is thus evident from the results that despite the presence of some targeted services schemes in favor of women, they still face difficulties in their freedom to decide on whether to participate in microfinance services as compared to men.

Table 2. Marital Status of Household Head

The table 2 presents the marital status of household heads in the study areas in terms of four categories of household heads: Married and Single (Widow or Widower, Divorced, Separated, and Never married).

Characteristics	Frequency	Percent	Cumulative Percent
Married	168	70.0	70.0
Widow/ Widower	26	10.8	80.8
Divorced	8	3.3	84.2
Separated	13	5.4	89.6
Never married	25	10.4	100.0
Total	240	100.0	

Source: Author's survey, 2011

The table 2 shows that 70 percent were married men and women, while the Widow or Widower household heads were 10.8 percent, divorced were 3.3 percent, separated were 5.4 percent and never married were 10.4 percent.

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4.1.1.2. Level of Education of the Household Heads

The level of education of the household heads is given in table 3.

Table 3: Education level

Education level	Frequency	Percent	Cumulative Percent
Nil	64	26.7	26.7
Primary	122	50.8	77.5
Secondary	38	15.8	93.3
University	10	4.2	97.5
Vocational	6	2.5	100.0
TOTAL	240	100.0	

Source: Author's survey, 2011

Table 3 shows that more than one –fourth of the sample household heads received no formal education 26.7 percent while 50.8 percent attended primary school, 15.8 percent attended Secondary school, 2.5 percent got vocational training after their primary education and only 4.2 percent attended University. Considering formal education, male-headed households appear to have had better access to education as compared to female-headed households.

It is expected that education can increase the efficiency of resource allocation and also help smallholder farmers to choose more effective means of production by adopting new technologies. Education is important in determining a smallholder farmers' ability to adopt new technologies and thus increase the productivity and income.

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With limited formal education, the implication is that investments in production resources and economic development are handicapped (Mohammad and Rahaman, 2005).

Households with higher levels of education would therefore be expected to have better access to the services offered by microfinance institutions.

4.1.1.3. Age, Household Size and Annual Income Level of the Sample Households

The table 4 shows the mean characteristics of sample households in the study areas.

Table 4: Mean of Age, household size and annual income level (n = 240)

Factor	Minimum	Mximum	Mean	Std. deviation
Age of the household head (Years)	20	82	42.4	14.819
Household size	1	7	3.8	2.059
Annual income level (Rwandan francs)	60,000	6,000, 000	625,299	804,871.303

Source: Author's survey, 2011

Table 4 shows that the mean age of the household heads was 42.4 years with a standard deviation of 14.8 years. The youngest respondent was 20 years, while the oldest was 82 years. This suggests that economically active individuals headed households, which may imply active economic development in the study area. The table 4 shows also that the mean household size was 3.8 approximated to 4 persons per household with a standard deviation of 2. The smallest family had 1 member and the largest had 7 members.

This suggests that households with big family sizes were more likely to participate in microfinance services to improve their livelihoods.

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The Table 4 also shows that most of the households had a low annual total gross income. The mean annual household income was 625,299 Rwandan francs, approximated to 890 USD and based on the household revenues from agriculture production, livestock production and revenues from salaried employees, gifts, commerce, home transfer and subventions or income from any other business initiated by the households, this is approximately 2 dollars a day per household. It points out that the majority of the household in the study area could hardly meet their basic needs.

4.1.1.4. Land Ownership and Farm Land Size for Household Heads.

Table 5 shows the characteristics of household land ownership and farm land size in Gasaka, Kibirizi and Tare of Nyamagabe District.

Table 5: Characteristics of household Land Ownership and Farm Land Size

Factors	Characteristics	Total Number N=240	Percentage
Land Ownership	Privately owned	145	60.4
	Lease or Rent	91	37.9
	Communal land	4	1.7
Size of land farm	Less than 0.1Ha	175	72.9
	Between 0.1-0.5 Ha	59	24.6
	More than 0.5 Ha	6	2.5

Source: Author's survey, 2011

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The table 5 shows that 60.4 percent of the households have privately owned land, 37.9 percent used rented land and only 1.7 percent used communal lands for grazing.

In Nyamagabe District, there is a problem of land scarcity. For instance, 72.9 percent of the households in the survey were cultivating lands which are less than 0.1ha, while 24.6 percent of households are cultivating land between 0.1 and 0.5 ha and only 6 percent of the households are cultivating land more than 0.5 ha. There were also some smallholder farmers who were cultivating land parcels that had no title deeds. That means that those farmers could not have access to informal and formal credit due to lack of collateral (land title deeds), and to informal due to the vicious circle of poverty.

4.1.1.5. Farm Labor Participation and Main Occupation of Household Heads

The table 6 below shows the characteristics of household heads participation in farm labor in Nyamagabe District.

Table 6: Characteristics of Farm Labor Participation

	Frequency	Percent	Cumulative Percent
Full-time	129	53.7	53.7
Part-time	70	29.2	82.9
Non-participation	41	17.1	100.0
Total	240	100.0	

Source: Author's survey 2011

Table 6 shows that 53.8 percent of the heads of households were full-time farming, while 29.2 percent were part-time farming and 17.1 percent of household heads were not participating in farming activities.

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4.1.1.6. Main Occupation of Household Heads

Figure 4 shows the main occupational activities into which respondents were grouped: Agriculture, Business, Salaried, Handicrafts, Livestock and Fishery.

Figure 4: Main Occupational Activities
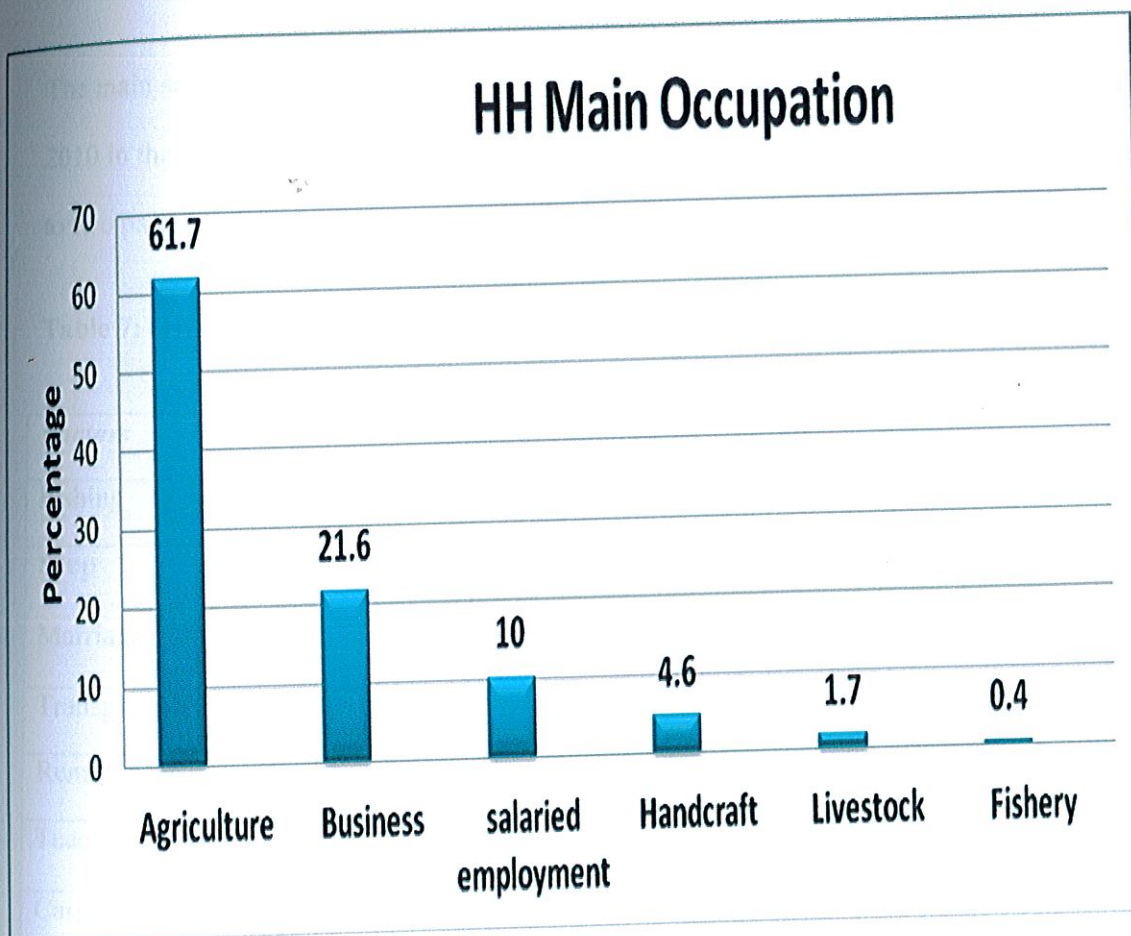
HH Main Occupation

Source: Author's survey, 2011

The figure 4 above shows that agricultural production is a major activity in the study areas. Out of the sample, 61.7 percent reported that agriculture is their main occupation, while 21.6 percent are doing businesses, 10 percent are salaried, 4.6 percent are involved in handicraft, 1.7 percent reported livestock keeping, and 0.4 percent of household heads are fish keeping.

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In Nyamagabe District, agriculture represents an important part of the economic activities of the household. However, some respondents reported that they had more than one occupation. Multiple occupations may be the result of efforts to diversify sources of income in a risky environment. From Table 6 and Figure 4, most of the household heads are actively involved in agriculture.

4.1.1.7. Major Sources of Households' Income

The main sources of income for the respondents between 1st January 2010 and 31st December 2010 in the three sectors (i.e. Gasaka, Kibirizi and Tare) of Nyamagabe District are divided in to two parts: Off-farm and Farm income sources as shown in tables 7 and 8.

Table 7: Off - farm Income Sources

Factors	Number of respondents N=240	Percentage
Fishing	56	23.3
Shop	62	25.8
Marriage gifts	25	10.4
Transport service	9	3.8
Remittances (Transfers)	2	0.8
Teaching	15	6.3
Carpentry	9	3.8
Other Salaried employment	30	12.5
Business	15	6.3
Sewing	8	3.3
Hair salon	1	0.4
Handicraft	8	3.3

Source: Author's survey, 2011

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Table 7 shows that 25.8 percent ran a shop, while 23.3 percent earn income from fishing and 10.4 percent earn income in the form of marriage gift, like the dowry. Other income sources reported included salaries, handcraft, businesses, teaching, sewing, carpentry, transport services and remittances from urban and non-urban friends and relatives. Therefore, promoting small non-farm enterprises in rural area could alleviate poverty. The household off farm income was one of the factors hypothesized to affect participation in microfinance services.

Table 8 gives the main sources of farm income which were crops and livestock related.

Table 8: Farm – Income Sources

Sources	No. of respondents N=240	Percentage
Sales of food crops (banana, wheat, maize, beans, ect.)	98	40.8
Cash crops (Coffee, and Tea)	54	22.5
Sales of Fruits (avocado, orange, sweet bananas…ect.)	37	15.4
Sales of milk	13	5.4
Sales of Eggs	3	1.3
Sales of livestock (chicken, Cows, Goats …..)	35	14.6
TOTAL	240	100

Source: Author's survey, 2011

The major farming activity in Nyamagabe District is crop and livestock production.

The table 8 shows that 40.8 percent got most of their income from selling food crops, while 15.4 percent got their income from selling fruits and 22.5 percent got their income from

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selling cash crops like Coffee and Tea which are the major cash crops for Rwanda's economy.

The food crops produced are bananas, wheat, rice, sweet potatoes, beans, English potatoes, peas, and maize and vegetables. Some fruits also are produced (sweet banana, avocado, oranges, pineapple).

Livestock production, especially for dairy and eggs, is practiced but at a very small degree (only 14.6 percent of the sample households earned their income selling such livestock and livestock products as chicken, cows and milk). However, farmers face liquidity constraints related to low levels of output, poor access to agricultural credit and low investment in agricultural production, lack of processing technologies and lack of storage facilities.

4.2. Household Participation in the Microfinance Services categorized by Gender

This section presents, by gender category, the extent to which smallholder farmers were found to have participated in the microfinance services in Gasaka, Kibirizi and Tare.

The formal lenders are SACCOs and MFIs. In the study areas, 7 SACCOs are distinguished: Umutanguha SACCO, Twizigamire SACCO, UCAPEC (Unions des Caisses Populaires d'Epargne et de Crédit), Umwarimu SACCO, Ingenzi Gasaka SACCO, Tuzamurane Tare SACCO, and Indatwa Kibirizi SACCO. The Microfinance Institutions (MFIs) found in Nyamagabe District are Cooperative des travailleurs de Nyamagabe (CT Nyamagabe), Agaseke MFI, Duterimbere Microfinance, ZIGAMA CSS (Credit and Saving Society), and Rwanda Microfinance Limited. Both the traditional MFIs and the newly emerging type known as SACCOs require collateral alternatives in form of compulsory savings. SACCOs, on the other hand, have emerged to encourage ownership and participation by the beneficiaries.

Figure 5 below shows that 35.4 percent male and 13.4 percent female had participated in microfinance services in the last 12 months prior to the survey, while 33.3 percent males and 17.9 percent females had not participated in microfinance services.

The results show that in Nyamagabe District, more men than women participated in microfinance activities. Despite the existence of microfinance programs to improve women participation in targeted microfinance services, there were less women in microfinance services. The study also reveals that the age factor was very important as far as all participants on microfinance services were concerned: In this study, all participants were above the age 20 years. This is because microfinance institutions were not providing the services to young and to very old people because this category of people are less productive adequately and cannot get the credit and other services offered by microfinance institutions.

Figure 5: Participation in microfinance services by Gender of Household Heads.

Source: Author's survey, 2011

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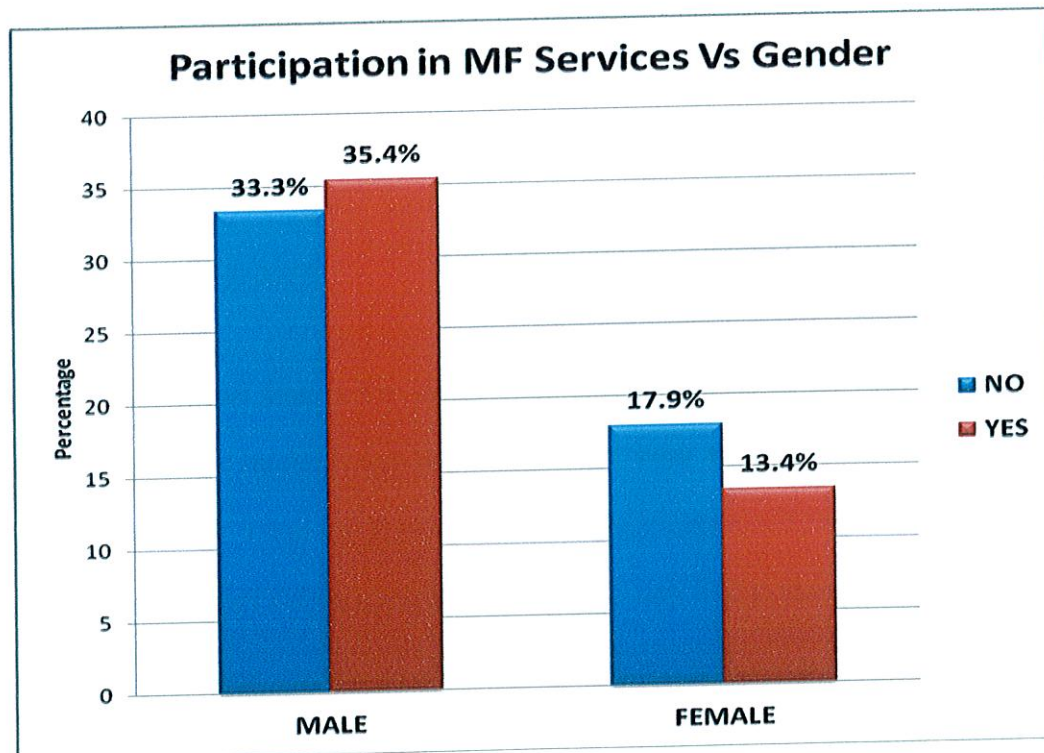
4.2.1. Services offered by Microfinance Institutions in Gasaka, Kibirizi and Tare

The figure 6 below shows the services offered by microfinance institutions. They provide different services to the clients and the most common are savings and credits.

Figure 6: The microfinance services
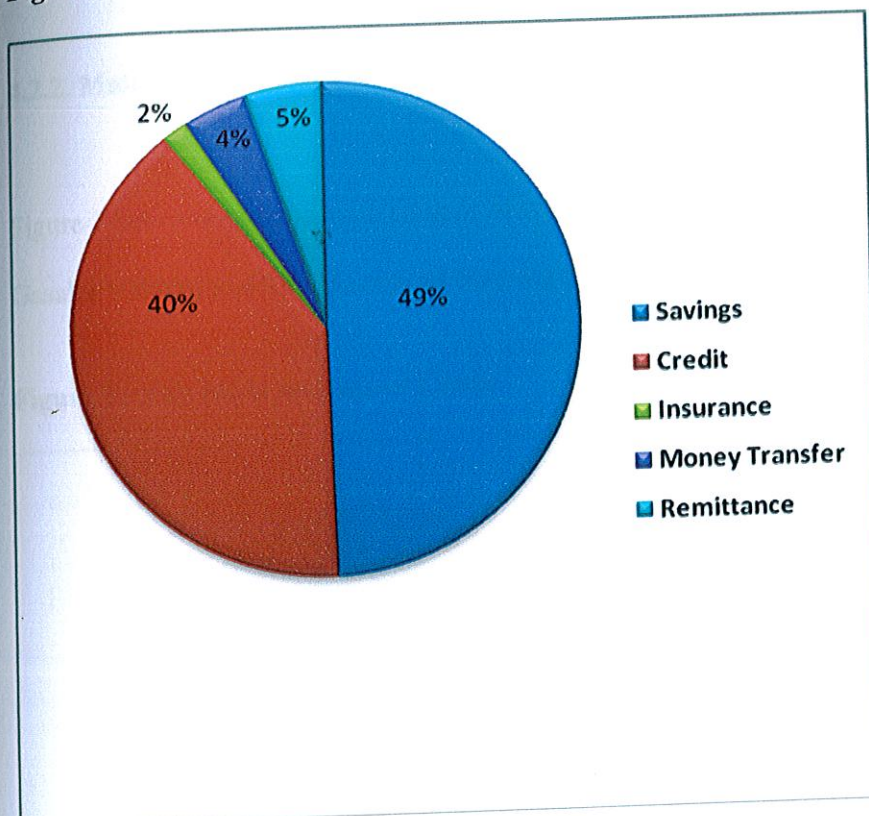
Sources: Author's survey, 2011

The figure 6 above shows that, in the survey locations, 49 percent of the household heads have access to savings services and that 40 percent were able to borrow from those microfinance institutions. These credit services lead to the clients modifying their agricultural productivity and their small enterprises activities which in turn lead to increased income.

The changes in household income in turn lead to greater household economic security. Savings services have often been seen as a critical component in improving access to

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additional investible funds in Nyamagabe District. In this case, the smallholder farmers can accumulate money and then draw it for investing in physical and other household assets. Other services offered by microfinance institutions, like remittance, money transfer and insurance, are generally not used by the respondents. Only 5 percent used remittance, while 4 percents used money transfer and only 2 percent used insurance services.

4.2.2. Main Household Sources of Credit in Nyamagabe District

Figure 7 below shows the main sources of credit for the formal and informal lenders in Gasaka, Kibirizi and Tare Sectors of Nyamagabe District.

Figure 7: The Main Sources of Credit
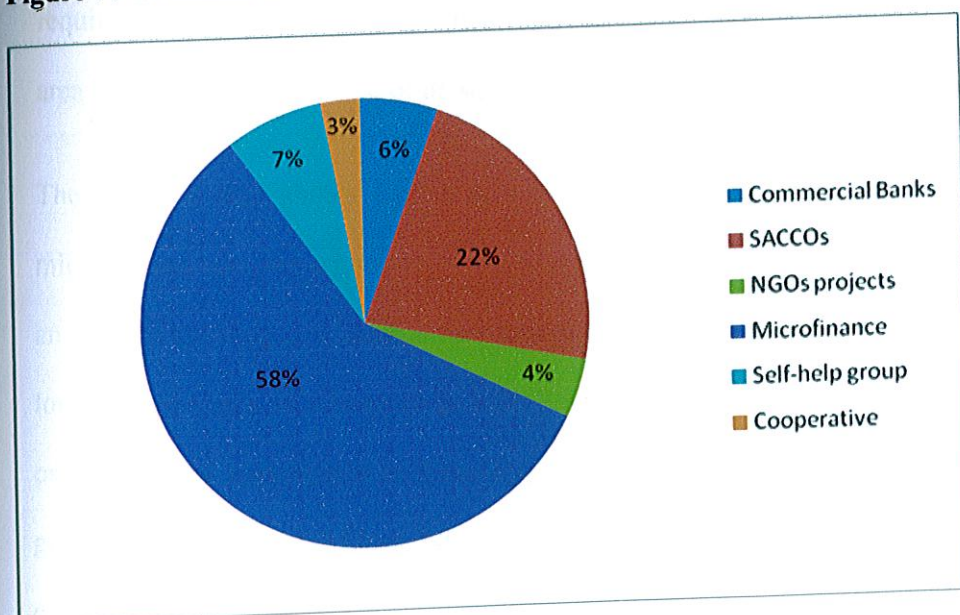
Source: Author's survey, 2011

The financial sector reforms in Nyamagabe district have not yet attracted many bank establishments. The credit policy of the MFIs and SACCOs is to provide short-term credits

to people with low income, but the credit is repayable within a period not exceeding 12 months. The lending in the study areas is still very low. The MFIs and SACCOs are the important sources of credit in Nyamagabe District. Overall, 58 percent of the respondents got loans from MFIs and 22 percent got loans from SACCOs. The figure shows that only 6 percent of the Household Heads got loans from Commercial Banks.

Generally, the lending rules and procedures of commercial banks exclude farmers who basically farm on non-secured lands and possess no tangible assets to offer as collateral or security for bank loans. Moreover, commercial banks regard farming as the most risky investment areas and avoid farmers in a bid to reduce loan transaction costs and raise their profitability. Lack of enthusiasm of commercial banks to lend to farmers is influenced by the fact that farmers groups are numerous and widely dispersed geographically and that they require small amounts of loans which are costly to administer, while farming is a high risky area for investments because of its susceptibility to weather and external shocks.

The figure 7 also shows that 4 percent of the Household Heads participated in NGO microfinance services whose objective was to introduce quasi-formal credit arrangement in an attempt to catalyze economic development for poverty reduction by providing loans with lower interest rate. NGOs typically offer small, short-term capital loans for periods of up to one year. They concentrate on financing micro-enterprises that have high turnover and that generate regular income flows. NGOs do not demand collateral for the security of the loans offered.

The figure 7 shows that only 7 percent of the household heads were participating in self –help groups and 3 percent participated in Cooperatives. Such groups also have the objective of reducing poverty, and the poor who have a low income can create the activities which are generating revenue. Smallholder Farmers also get money from such groups to pay school fees for their children and run businesses. Even though self –help groups are expected to increase

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the livelihoods of smallholder farmers and spearhead financial services to the poor, the results of this survey show that their outreach was very slow.

4.2.3. Purpose of Microfinance Loans in Gasaka, Kibirizi and Tare

The purpose of obtaining loans from microfinance institutions are mainly attached to investment in income generation activities and there are considerable costs involved in diverting funds to other uses.

The figure 8 below shows the main purposes of microfinance loan in the study areas.

The figure 8 below shows that 32.5 percent of the household heads have obtained loans for paying school fees for their children, 21 percent for business, only 20 percent for financing Agriculture, 14.7 percent for constructing and repairing houses, 8 percent for buying tools and equipments, 2 percent for marriage, and 1.8 percent for paying fees to hospitals for sickness.

Generally, microfinance loans were used to increase farm and off-farm activities, thus enhancing the income generating capacity of participating households and thus they could be important in reducing household vulnerability to poverty.

Figure 8: Purposes of Microfinance Loans

Purposes of microfinance Loans

- Education
- Agriculture
- Tools,equipement
- Health purpose
- Business
- Housing/Housing repair
- Marriage

2%
14.7%
32.5%
21%
8%
1.8%
20%
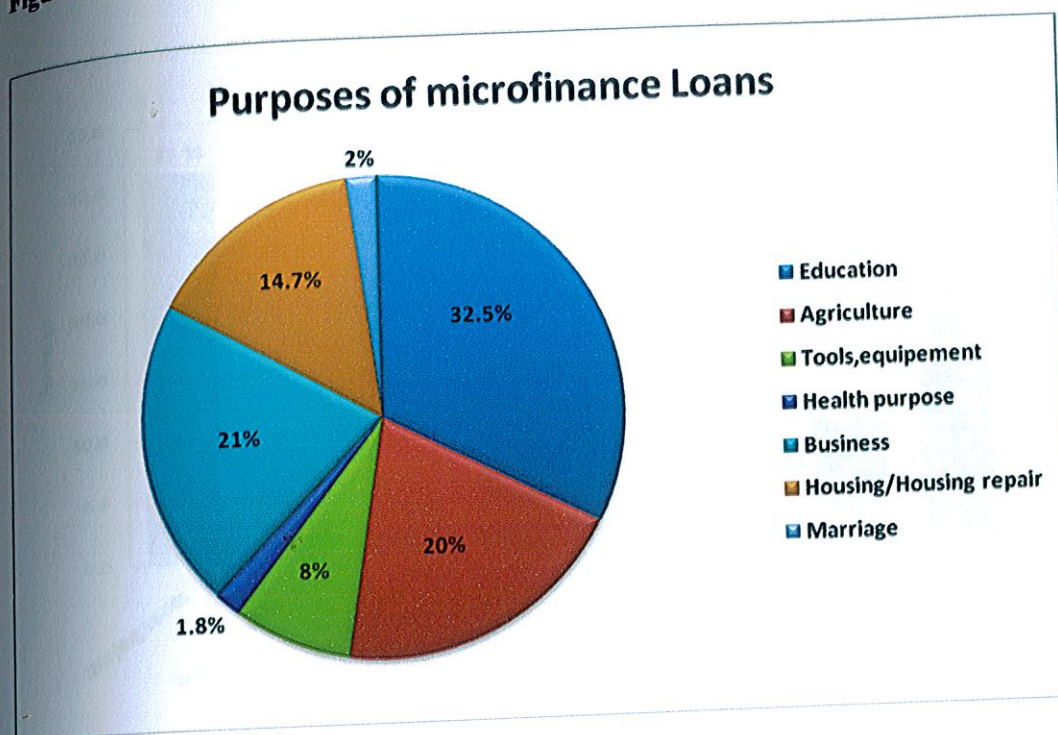
Source: Authors' survey, 2011

4.2.4. The Main Purpose of Agricultural Loan for Smallholder Farmers

The agricultural loans offer opportunities to smallholder farmers to obtain capital and mainly to increase their income. Figure 9 shows the main purposes of agricultural loans in Gasaka, Kibirizi and Tare.

From the results, 31 percentage of farmers used agricultural loans for buying seeds, 22.5 percent for buying seeds and fertilizers, 14.1 percent for buying farm equipment, 9.9 percent for buying land, 8.5 percent for investing in irrigation, 5.6 percent for buying only fertilizer, 4.2 percent for paying labor, and 4.2 percent for buying oxen. All those farm inputs lead to increasing agricultural productivity in Nyamagabe District.

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Figure 9: The Main Purposes of Agriculture Loan

Purposes of Agricultural Loan
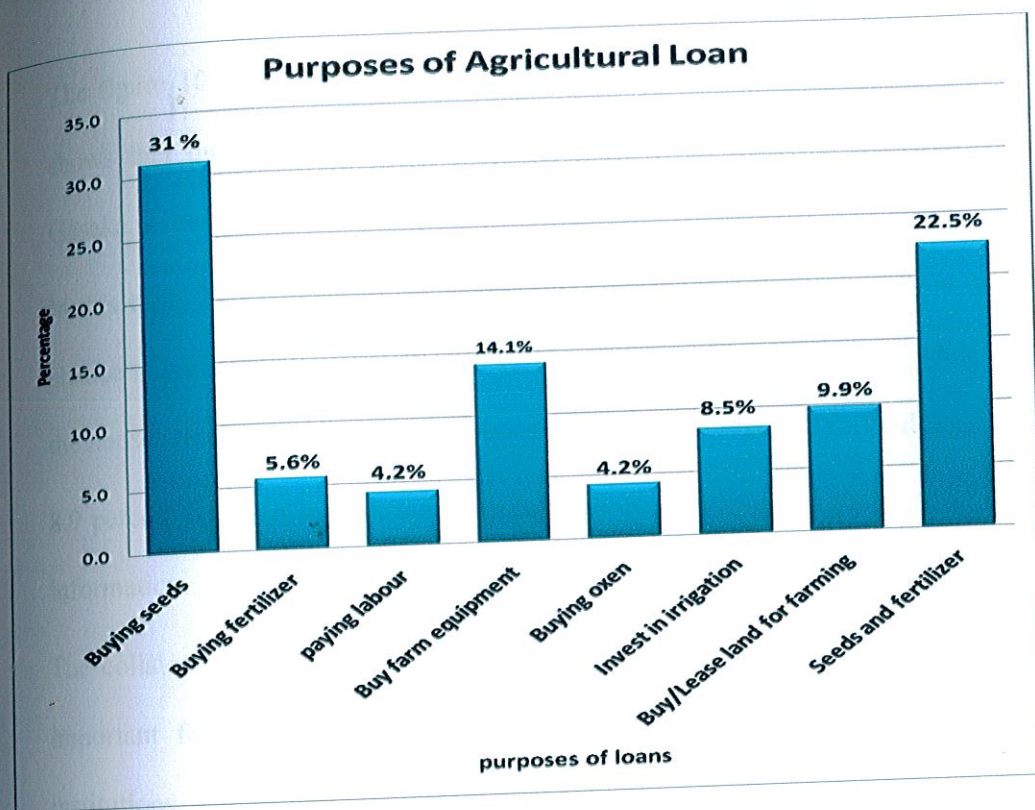
Source: Authors' survey, 2011

4.2.5. Loan Duration and Repayment

This study found that the general microfinance institutions in Nyamagabe District granted short-term loans with repayment periods of between three months to one year. The self help-groups and cooperatives lenders require strict repayment and loans deposit terms, such as weekly, and monthly. Monthly collection of repayment installments by microfinance personnel is one of the key features of microfinance that is believed to reduce default risk in the absence of collateral and make lending to the poor viable.

All informal and formal institutions charge interest rates that range between 5 and 13 percent per annum. The main sources of loan repayment funds were profits from businesses, salary or what was received from the sale of agricultural crop or livestock.

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4.2.6. Factors Limiting Participation in Microfinance Services

The figure 10 below gives the factors that limit participation in microfinance services and shows that there are five factors that limit the participation in microfinance services in Gasaka, Kibirizi, and Tare in Nyamagabe District.

In this case, 38.2 percent of the households reported that the main factors which limit their chance to participate in microfinance services are the lack of collateral, while 28.5 percent of the households reported lack of awareness, 22.8 percent reported difficult loan conditions, 8.9 percent reported long distance to travel to get services and 1.6 percent reported lack of information.

The collateral requirement from the formal and informal lenders in the study areas was an important feature limiting smallholder farmers to access the services offered by these institutions. The majority of these household owned small parcels of land and depended on farming as the main source of their income. Others did not know about services offered by the lenders because of the lacked of awareness and lacked of information.

Therefore, they feared borrowing and lacked confidence in decision making to participate in microfinance services. Another factor was that most smallholder farmers lived in rural areas far from microfinance offices and this lead to high transportation costs that further constrained microfinance services access. Smallholder farmers also cited the very long credit procurement procedures as a limiting factor for participation in microfinance services.

The figure 10 below shows the factors limiting participation in microfinance services in Nyamabage District.

Figure 10: Factors Limiting Participation in Microfinance Services
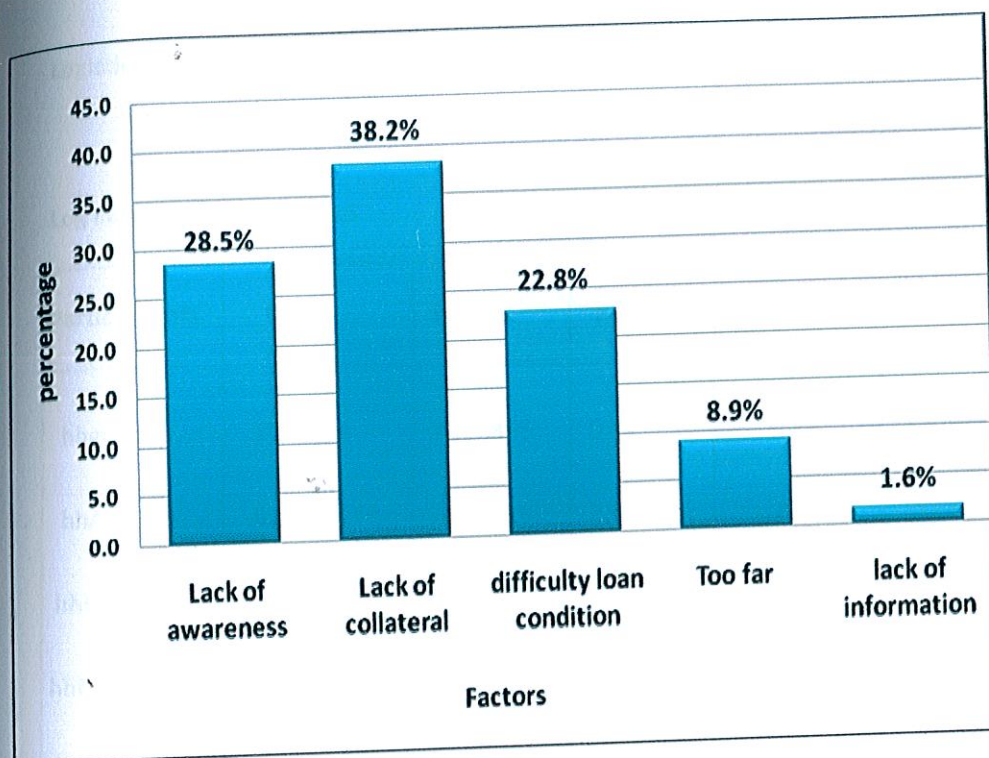
Source: Author's survey, 2011

4.2.7. Factors Affecting Participation in Microfinance Services

Logit Regression Analysis was conducted to find out the factors that contribute significantly to microfinance services' participation by smallholder farmers. The participation in microfinance services variable (whether a smallholder farmer has participated in microfinance services or not) was regressed on gender, age, education, marital status, distance, Home savings , total annual assets, Perception of credit eligibility, and off-farm income. The factors that were found to influence the likelihood of participation were the levels of age, education, home savings, total annual assets, and off-farm income. These results are presented in table 9.

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Table 9: Logit maximum likelihood estimates of the probability of participating in microfinance Services

Logistic regression

Number of obs = 240

LR chi^2(9)   =   146.64

Prob >chi^2 =   0.0000

Log likelihood = - 92.96015

Pseudo R^2 =   0.4409

Participatmfs	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
hhgender	.1776079	.4328865	0.41	0.682	-.6708341	1.02605
hhAge	.0290582**	.0143616	2.02	0.043	.00091	.0572064
hheducation	.4776276**	.2429245	1.97	0.049	.0015043	.953751
hhMaritalstat	.1679166	.1472072	1.14	0.254	-.1206043	.4564375
Distance	-.0148378	.2941358	-0.05	0.960	-.5913334	.5616579
HSavings	4.025625***	.5986532	6.72	0.000	2.852286	5.198964
Percredel	.1582576	.4361623	0.36	0.717	-.6966049	1.01312
Off_farm_inc	-.1018213*	.0606822	-1.68	0.093	-.2207561	.0171136
Totalassets	9.62e-07*	5.79e-07	1.66	0.096	-1.72e-07	2.10e-06
_cons	-5.430968	1.355027	-4.01	0.000	-8.086772	-2.775165

Source: Computed by the author from the field Survey data 2011

Note: ***, ** and * denote statistical significance at 1%, 5% and 10 % levels respectively.

It has been argued that the estimated logit coefficients obtained by maximum likelihood estimation do not generate a direct economic interpretation, and that the sign of an estimated coefficient only provides the direction of the effect of that explanatory variable on the probability of a success (Greene, 2003). To address this limitation, marginal effects that is, the change in the predicted probability associated with changes in the explanatory variables, are calculated. Following these modifications, the results are given in table 10.

Table 10:   Marginal effects for factors that influence participation in microfinance services

Y=Pr (Participatmfs) (predict) = 0 .40783975

variable		dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
hhgender	.0428935	.1046	0.41	0.682	-.162113	.2479	1.3125
hhAge	.0070177**	.00349	2.01	0.044	.000177	.013858	42.4458
hheducation	.1153502**	.05916	1.95	0.051	-.000594	.231295	2.05
hhMaristat	.040553	.03561	1.14	0.255	-.029233	.110339	1.75417
Distance	-.0035834	.07103	-0.05	0.960	-.142795	.135629	1.50833
Hsavings*	.7021034***	.05092	13.79	0.000	.602306	.8019	.629167
Percredel *	.038467	.10653	0.36	0.718	-.170324	.247258	.25
Off_farm_inc	-.0245905*	.01467	-1.68	0.094	-.053336	.004155	4.44167
Totalasset	2.32e-07*	.00000	1.64	0.098	-4.5e-08	5.1e-07	228744

Source: Computed by the Author from the field survey data, 2011

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Note *, ** and *** denote significance level at 10 %, 5 % and 1% respectively

Table 9 presents the estimated results of the logistic model. The likelihood ratio test has a Chi-square statistic which is the difference of the values of the two log likelihood functions (i.e. the null model -2 Log Likelihood and the full model -2 Log Likelihood), is equal to 146.64. The Log likelihood is equal to -92.96015. The pseudo-R^2 = 0.4409. It indicates how well the regressors X explain the participation probability (Caliendo and Kopeinig, 2005). From table 10, the results shows that the predicted probability of **Y** is equal to 0 .40783975.

Therefore, the null hypothesis that the parameter estimates for the model are equal to zero is rejected. It can be concluded that the explanatory power of the logistic model is satisfactory and that the model can be used to explain the probability of participation in microfinance services by the smallholder farmers.

Table 10 shows the marginal effects on the significant variables on conditional probabilities, focusing on the effect of changes in the statistically significant variables on the probability of smallholder farmers' participation in microfinance services. Five variables were found significant, namely age, education, savings access, off-farm income and total annual assets. The significant variables are discussed hereafter.

Age: The Logit results show that the coefficient for age was positive and significant at 5 percent level. The implication is that the age of the smallholder farmers had an influence on the participation in microfinance services. Marginal effects show that if the age of a smallholder farmer increases by one year, the probability of participation in microfinance services will increase by 0.0070177 (0.7 percent). This finding suggests that the older household heads accumulate more experience (practical and professional wisdom) and have chances to participate in microfinance services to increase their income generating activities. In addition, the older farmers may be more familiar with the conditions of financial institutions and are thus also able to apply for loans.

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Education: The results indicate that education was significant at 5 percent and influenced positively the probability of participating in microfinance services. The partial effect of a unit increase in the number of school years attendance in the conditional probability of participation in microfinance services was 0 .1153502 (11.5 percent). Thus, an increased in level of education by 1 year increases the probability of participation in microfinance services by 11.5 percent. Meaning that household heads who have better level of schooling have high chance of being participant in microfinance services. The likelihood in the participation in the microfinance services will increase with knowledge.

Home savings: The results indicate that Home savings were significant at 1 percent level and positively influenced the households' participation in microfinance services. It is thus expected that the households who have kept the money in the house are more likely to participate in microfinance services. The partial effect results shows that home savings will increase the probability of participation in microfinance services by 70.2 percent.

Total assets: The coefficient of total annual assets variable is significant at 10 percent and has a positive influence on participation in microfinance services. Since the value of total assets owned influenced positively participation in microfinance services, this means that the amount of total assets owned increases the accessibility to microfinance services.

Off-farm income: The results from table 10 indicate that the coefficient for off-farm income was negative and significant at 10 percent level. Hence, the partial effect of a unit increase in off-farm income on the conditional probability of participation is -.024. This means that with each unit increased in off-farm income, the probability to participate in microfinance services will decrease by 0. 024 (2.4 percent). Thus, this finding suggests that households with high off-farm income are less likely to participate in microfinance services to invest in farm activities.

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4.3. Effects of Microfinance Services on Smallholder Farmers' Income.

4.3.1. Results from Kernel Based Matching and Nearest Neighbor Matching

The determination of the average effect of microfinance services (measured using ''Kernel-based Matching Score'' and Nearest Neighbor Matching) involved matching 117 participants in microfinance services to 123 non-participants, and gave an average effect on annual total income of 625,152 Rwandan francs, equivalent to 1,042 USD per household.

Tables 11 and 12 below show the Kernel-based Matching Score and Nearest Neighbor Matching Score Results.

Table 11. Kernel Based Matching Score Results (KBM)

Logistic regression
Number of obs = 240
Prob > chi^2 = 0.0000

LR chi^2 (11) = 66.91
Pseudo- R^2 = 0.2012

Log likelihood = -132.82727

Participatmfs	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
hhgender	-.0753121	.3375753	-0.22	0.823	-.7369475	.5863232
hhAge	.0194483*	.0111916	1.74	0.082	-.0024868	.0413835
Sizeland	.2790351	.3219144	0.87	0.386	-.3519054	.9099757
hheducation	.5810336***	.2080773	2.79	0.005	.1732096	.9888575
HHsize	-.0121269	.0781294	-0.16	0.877	-.1652577	.1410038
hhMaritalst	.1229581	.1211538	1.01	0.310	-.114499	.3604151
hhOccupation	.1907174***	.0729472	2.61	0.009	.0477435	.3336914
Distance	-.7411689***	.2190114	-3.38	0.001	-1.170423	-.3119145
Totalassets	7.39e-07	5.68e-07	1.30	0.193	-3.74e-07	1.85e-06
Percredel	.0546439	.3532308	0.15	0.877	-.6376758	.7469636
Off_farm_inc	-.1322959***	.0498543	-2.65	0.008	-.2300085	-.0345833
_cons	-1.465257	1.007525	-1.45	0.146	-3.439969	.5094557

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Annualtotalincome	Unmatched	873, 484.991	389, 219.545	484,265.447	99,316.468	4.88
	ATT	873, 484.991	607,810.496	265,674.495	113,983.58	2.33**
	ATU	389,219.545	627, 587.914	238, 368.37	.	.
	ATE		251, 680.106	.	.	

Source: Computed by the Author from the field survey data, 2011

Note: *, ** and *** denote significance level at 10%, 5 % and 1% respectively.

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Table 12: Nearest Neighbor Matching Results

Logit regression

Number of obs = 240   Prob > chi^2 = 0.0000

LR chi^2(11) = 66.91   Pseudo R^2 = 0.2012

Log likelihood = -132.82727

Participatmfs	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
hhgender	-.0753121	.3375753	-0.22	0.823	-.7369475	.5863232
hhAge	.0194483*	.0111916	1.74	0.082	-.0024868	.0413835
Sizeland	.2790351	.3219144	0.87	0.386	-.3519054	.9099757
hheducation	.5810336***	.2080773	2.79	0.005	.1732096	.9888575
HHsize	-.0121269	.0781294	-0.16	0.877	-.1652577	.1410038
hhMaritalst	.1229581	.1211538	1.01	0.310	-.114499	.3604151
hhOccupation	.1907174***	.0729472	2.61	0.009	.0477435	.3336914
Distance	-.7411689***	.2190114	-3.38	0.001	-1.170423	-.3119145
Totalassets	7.39e-07	5.68e-07	1.30	0.193	-3.74e-07	1.85e-06
Percredel	.0546439	.3532308	0.15	0.877	-.6376758	.7469636
Off_farm_inc	-.1322959***	.0498543	-2.65	0.008	-.2300085	-.0345833
_cons	-1.465257	1.007525	-1.45	0.146	-3.439969	.5094557

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Annualtotalincome	Unmatched	873,484.991	389,219.545	484,265.447	99,316.468	4.88
	ATT	873,484.991	645,239.176	228,245.816	125,549.482	1.82*
	ATU	389,219.545	563,417.099	174,197.554	.	.
	ATE		200,546.082	.	.	

Source: Computed by the Author from the field survey data, 2011
Note: ***, * significant at 1% and 10 percent respectively.

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4.3.2. Covariate Balance Indicators before and after Matching

The Matching estimators were evaluated via matching the participant and non-participant households in common support region. Therefore, a low R^2 value means participant households do not have much distinct characteristics over all and as such finding a good match between participant and non-participant households becomes easier (Yibeltal, 2008).

Table 13 shows results of balancing test of the covariate by comparing the before and after matching algorithm significant differences.

Table 13: Results of balancing before and after Matching

Before Matching	
Pseudo- R^2	0.2012
LR chi ^{2}	66.91
p-value	0.0000***
After Matching	
1. Nearest Neighbor Matching	
Pseudo - R^2	0.037
LR chi ^{2}	11.93
p-value	0.369
2. Kernel Based Matching	
Pseudo- R^2	0.029
LR chi ^{2}	9.47
p-value	0.578

Source: Computed by the Author from the field survey data, 2011
Note: *** significant at 1%

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The tables 11 and 12 showed that the smallholder farmers who participated in microfinance services did better than non-participants. However, the important point was how significant the differences between microfinance services participants and non-participants were. Generally, participation in microfinance services were found to have a positive effect on household annual income.

The results from Kernel and Nearest Neighbor Matching show that out of 11 variables only 5 were significant. The results show also that age was significant at 10 percent, education was significant at 1 percent level and household main occupation was significant at 1 percent. All these variables were hypothesized to have a positive effect on households' likelihood of participating in microfinance services. The variables ''distance from homestead and off-farm income'' were both significant at 1 percent influenced negatively the smallholder' participation in microfinance services.

Results from Propensity Score using the Kernel (table 11) showed that the ATT (Average Treatment Effect on the Treated) is equal to 265,674 Rwandan Francs (equivalent to 443 USD)[1] This means that the household participating in microfinance services had increased their total annual income by 265,674 Rwandan francs (equivalents to 443 USD) relatives to that of the non-participants. The results show also that the t-statistics for the ATT is equal to 2.33. It was found to be significant at 5 percent level.

Results from the Nearest Neighbor Matching (table 12) showed that the ATT is equal to 228,246 Rwandan Francs (equivalent to 380 USD). This means that the households participating in microfinance services had increased their total annual income by 228,246 Rwandan francs (equivalents to 380 USD) relatives to that of the non-participants.

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1 Exchange Rate : 1USD = 600 RWF

The results show also that the t-statistics for the ATT is equal to 1.82. It was found to be significant at 10 percent.

The results from both Kernel and Nearest Neighbor matching show that the households participating in microfinance services increased their total annual income relatives to that of the non-participants. This implies that there is a positive significant effect on smallholder farmers' income for those participating in microfinance services.

Based on the empirical results, it can be deduced that the effect of participating in microfinance services is contingent on the factors that influence smallholder farmers to participate in microfinance services. The empirical results also provide evidence that participation in microfinance services has a positive effect on poverty reduction in terms of increasing income and asset levels, implying that microfinance services might be successful in reducing the poverty of those close to the poverty line.

From table 13, the results show the balancing test of the covariate by comparing the before and after matching algorithm significant differences.

Before matching, the results shows that there was large difference in the covariates between the treatment and comparison groups in the original full sample, as all the p-values of the test for differences in individual covariate means are highly significant and LR chi^2 is equal to 66.91. After nearest neighbor matching and after kernel matching, the results show that p-values were equal to 0.369 and 0.578 respectively and were not significant. From nearest neighbor matching and Kernel Matching, the results show also that LR chi^2 were equal to 11.93 and 9.47 respectively. Before matching, the table 13 shows also that Pseudo- R^2 is equal to 0.2012. After matching, the table 13 shows also that for Kernel Based Matching, the pseudo-R^2 equals to 0.029 and for Nearest Neighbor Matching, pseudo-R^2 is equal to 0.037.

In line with the above indicators of matching quality, Kernel Based Matching resulted in relatively low pseudo R^2, equal to **0.029** and then it was selected as a best fit matching estimator. The low pseudo-R^2 supports the hypothesis that both groups have the same distribution in covariates x after matching.

These results show that the matching procedure is able to balance the characteristics in the treated and the matched comparison groups. We therefore used these results to evaluate the effect of microfinance services on the income of smallholder farmers having similar observed characteristics. This allowed us to compare observed outcomes for participants in microfinance services with those of a comparison group sharing a common support.

In conclusion, the study found out that the smallholder farmers who had participated in microfinance services in Nyamagabe District had increased their annual total income by about 50 percent and it can thus be deduced that the use of microfinance services is one of the best ways to increase income in Nyamagabe District. It was observed that the major use of microfinance funds were education, agriculture, tools and equipments, health , business, housing and marriage (Figure 8). Most of these would normally contribute to increase incomes, and hence the importance of microfinance.

4.3.3. Distribution of Propensity Score on the Treated and Non - Treated.

It was important to examine whether the propensity scores obtained for participants and non-participants fulfilled the common support assumption. If the Propensity Score for treated and non-treated overlap reasonably well, then the common support assumption is satisfied and it is recommended comparing those two groups where 123 households are untreated and 117 are treated.

Figure 11 presents the distribution of the propensity score for participants as well as non participants. The bottom half of each graph shows the propensity score distribution for the non-treated, while the upper-half refers to the treated individuals. Y is an axis frequency of Propensity Score and X is an axis Propensity Score.

Visual inspection of the density distribution of the propensity scores in both groups is the most straight forward way of checking the overlap and the region of common support between the treatment group and the comparison group (Akhter and Awudu, 2009).
As indicated earlier the treatment effects are only defined in the region of common support hence Heckman et al. (1997) argues that a violation of common support condition is a major source of evaluation bias in conventional approaches.

The histogram of propensity score depicts that there is a high chance of getting good matches and large number of matched sample size from the distribution. The propensity score distribution in figure 11 shows the treated on support and treated off support. Treated on support indicates the individuals among the participants who find a suitable match whereas treated off support indicate the individuals among the participant who did not find a suitable match.

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Figure 11: Histogram of Propensity Score
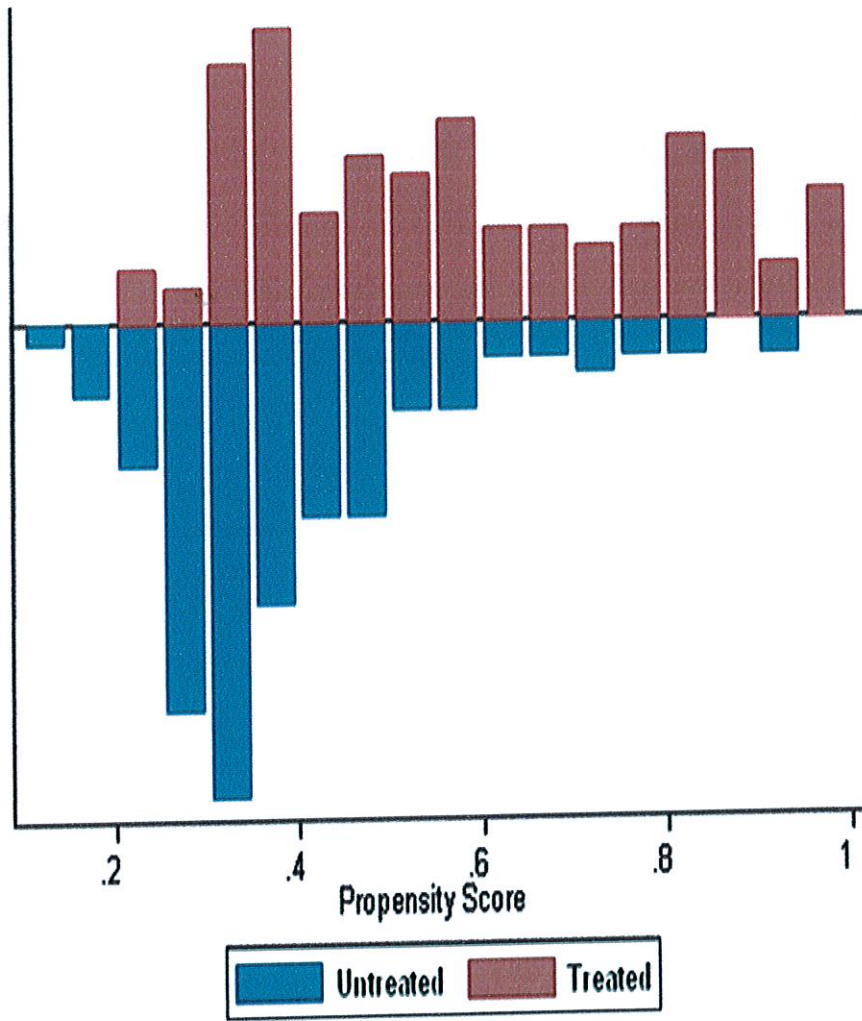
Source: Computed by the Author from the field survey data, 2011

CHAPTER FIVE

SUMMARY, CONCLUSIONS, POLICY IMPLICATIONS

5.1. Summary

Microfinance in Rwanda is considered as one of the most important and effective mechanisms in the implementation of the government program to reduce poverty and to increase economic growth. Microfinance services involve the supply of loans and savings services to low income earners which include small-scale farmers. Major goal is to improve their income and welfare.

This study sought to examine the contribution of microfinance services to the income of smallholder farmers in Nyamagabe District, based on a household survey in 3 sample sectors of the District. The study assessed the factors that influence smallholder farmers' participation in microfinance services and the effects of participation in microfinance services on smallholder farmers' income.

In order to achieve the study objectives, data were collected using structured questionnaires in 3 sectors of Nyamagabe District, namely Gasaka, Kibirizi and Tare Sectors. The Sectors were selected based on the number of microfinance institutions residing in the region. Out of the sample of 240 households interviewed, only 117 had participated in microfinance services.

Descriptive statistics and empirical modeling (Logit model and Propensity Score Matching) were used to analyze the data. The results from the descriptive statistics showed that the more men were involved in microfinance services than women. The major factors limiting the

participation in microfinance services were the lack of collateral, lack of awareness, long distance from homestead to the lenders' offices, difficult loan conditions, and lack of information.

The results from descriptive analyses show that the main sources of income were characterized by farming and off-farm activities, including businesses and remittances. The objective of giving agricultural loans to smallholder farmers in Nyamagabe District was to facilitate farmers to buy seeds and fertilizers which lead to increased agricultural productivity.

Maximum likelihood and marginal effects were estimated on the socio-economic factors that influence smallholder farmers' participation in microfinance services using a Logit Model. The results indicated that the coefficients for age, education, total annual assets, home savings and off-farm income were significant as the factors that influence smallholder farmers' participation in microfinance services.

On positive influences, the results indicated that age was significant at 5 percent level of significant, education was significant at 5 percent level, Home saving was significant at 1 percent and total annual assets was significant at 10 percent. Off-farm income was significant at 10 percent, but it negatively influenced the participation in microfinance services.

The Average Treatment Effect on the Treated (ATT) was measured using the Propensity Score Matching Model on the basis of the Kernel Based Matching and Nearest Neighbor Matching with the results showing that 117 microfinance services participants were matched with 123 non-participants. The outcome from Kernel Based Matching was that the ATT (Average Treatment Effect on the Treated) on annual productive incomes was 265,674 Rwandan Francs (equivalent to 443 USD) per household.

This implies that the households who had participated in microfinance services had increased their total annual income by 265,674 Rwandan Francs (443USD).

The outcome from Nearest Neighbor Matching, was that the ATT on annual productive incomes was that the ATT was equal to 228,246 Rwandan Francs (equivalent to 380 USD) per household; this implies that the households who had participated in microfinance services had increased their total annual income by 228,246 Rwandan Francs (380 USD) over that for the non-participants.

The study had hypothesized that participation in microfinance services leads to an increase in smallholder farmers' total annual income, and an increase in agricultural productivity. The most outstanding effects of participation in the microfinance services were expected to be an increase in income of the smallholder farmers through the creation of businesses. Therefore, microfinance institutions in Nyamagabe District should be considered to be an instrument for the provision of financial services for a broader development strategy to improve material conditions of low income sectors.

5.2. Conclusion and Policy implications

The microfinance institutions are important tools for development due to the various services they offer and the role they perform towards the development of the Rwanda s' economy. It is expected that with the current reforms put in place by the National Bank of Rwanda through its regulatory authorities, microfinance institutions in Rwanda will be able to compete favorably in the global market and gainfully increase Rwanda economic development.

Indeed, many countries in the developing World could benefit from establishing microfinance institutions to support low income earners in both credit and saving services.

The findings from the study in three sectors of Nyamagabe District indicate that the microfinance services had positive effects on smallholder farmers, particularly by raising in households' income.

In Gasaka, Kibirizi and Tare sectors of Nyamagabe District non-clients of microfinance institutions have not joined microfinance services for four reasons: They were afraid not to be able to repay the loans by the lack of collateral, they found the loan conditions to be unsuitable or restrictive for their potential or existing business, they lack awareness and information. Lastly, the loans for agriculture with suitable conditions were not available.

There is need for policy measures to increase participation of smallholder farmers in the services offered by Microfinance institutions in Nyamagabe district. Microfinance institutions are playing a very important role in improving the livelihoods of smallholder farmers, and the analysis shows that microfinance services have become a strategy for reducing poverty in Nyamagabe District. Participation in microfinance services by smallholders is able to provide the opportunities to improve the quality of life in low-income households. The results in this study underscore the fact that the services offered by microfinance institutions in Rwanda, especially in Nyamagabe District could increase agricultural production and the income of smallholder farmers.

Based on the results of the study, it is recommended that the Rwandan Government should take the microfinance sector as a pillar of economic growth which could complement the industrial sector which has so far not been vibrant. It is also evident that designing, experimenting with and building microfinance institutions for smallholder farmers requires a new thinking and access to new resources.

Public policy will need to support and evaluate this experimentation process and take care of those designs or institutions that hold promise for future success.

In order to set up an efficient agricultural credit system, some actions will be necessary:

i) Mobilization of funds by the Government on long term basis, to be injected in the banks in order to finance the agricultural sector at flexible conditions;

ii) Setting aside adequate funds from the government to allow smallholders farmers to get access to the credit line.

The government needs to develop concrete strategies for mobilizing the savings culture among the general public, both in urban and rural areas for sustainability of financial institutions and poverty reduction. The use of SACCOs and Microfinance services needs to be promoted and encouraged in order to provide an instrument for mobilizing savings and extending credit.

The government, donors, development practitioners and research institutions must work together closely to identify future potential of emerging microfinance institutions in rural areas. Appropriate incentive structures must be established so that all actors have a stake in a well-functioning microfinance system. Greater clarity of distinct responsibilities for developing rural financial systems between the state on one hand, and microfinance institutions on the other, would promote such an outcome.

As shown in this study, women in Nyamagabe District had less participation in microfinance services than men. Encouraging women to participate in microfinance services indeed improves women's decision-making power, particularly over income from their businesses. Since women's participation in microfinance services would give them a significant control over the households' income, they could use part of their loans for independent income-generating activities and thus enhance household incomes.

Targeting smallholder farmers with new agricultural technology in term of education can help improve their farm productivity, income and reduce poverty. Supporting policies in this

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direction would include increasing their access to formal credit for them to overcome liquidity constraints. In addition, efforts to improve their human capital in the form of education and providing them with better infrastructure, as well as advanced extension services, would go a long way to help facilitate the adoption of new technologies.

Public and Private sectors will need to support microfinance institutions in rural areas. Appropriate incentive structures must be established so that all actors have a chance to participate in well- functioning microfinance institutions. These sectors must invest in these operations since microfinance institutions will not be able to achieve their role in the absence of essential complementary services.

The Government should encourage the smallholder farmers to participate in off-farm activities for increasing their incomes and their productivity.

To provide a comprehensive understanding of Rwanda Microfinance systems, a systematic evaluation of the different types of microfinance programmes implemented should be conducted. This may include investigations on how the funds sourced from the microfinance institutions are used by the clients. Future research should be extended to examine the sustainability of microfinance institutions in order to promote microcredit which is the major concern of the Rwanda policy makers in economic development.

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APPENDICES

Appendix 1: Pstest for Quality of Matches in Propensity Score Matching (Kernel)

Variable	Sample	Mean		%reduct		t-test	
		Treated	Control	%bias	|bias|	t	p>|t|
hhgender	Unmatched	1.2735	1.3496	-16.4		-1.27	0.205
	Matched	1.2735	1.2711	0.5	96.9	0.04	0.968
hhAge	Unmatched	42.752	42.154	4.0		0.31	0.756
	Matched	42.752	40.592	14.6	-261.4	1.13	0.258
Sizeland	Unmatched	1.3675	1.2276	27.6		2.14	0.033
	Matched	1.3675	1.3004	13.2	52.0	0.92	0.356
hheducation	Unmatched	2.3248	1.7886	61.9		4.80	0.000
	Matched	2.3248	2.1994	14.5	76.6	0.93	0.353
HHsize	Unmatched	3.7863	3.8049	-0.9		-0.07	0.945
	Matched	3.7863	3.6874	4.8	-433.4	0.36	0.718
hhMaritals~t	Unmatched	1.7436	1.7642	-1.5		-0.12	0.906
	Matched	1.7436	1.9831	-17.6	-1060.4	-1.23	0.220
hhOccupation	Unmatched	3.6923	2.0407	69.8		5.42	0.000
	Matched	3.6923	3.2633	18.1	74.0	1.25	0.211
Distance	Unmatched	1.3333	1.6748	-46.1		-3.56	0.000
	Matched	1.3333	1.3629	-4.0	91.4	-0.34	0.736
Totalassets	Unmatched	3.9e+05	73618	43.4		3.40	0.001
	Matched	3.9e+05	2.1e+05	25.0	42.3	1.77	0.079
Percredel	Unmatched	.2735	.22764	10.6		0.82	0.414
	Matched	.2735	.23773	8.2	22.0	0.63	0.533
Off_farm_inc	Unmatched	3.7607	5.0894	-42.9		-3.32	0.001
	Matched	3.7607	4.2112	-14.5	66.1	-1.16	0.247

Summary of the distribution of the abs (bias)

BEFORE MATCHING

Percentiles		Smallest			
1%	.8996249	.8996249			
5%	.8996249	1.520789			
10%	1.520789	4.031665	Obs	11
25%	4.031665	10.5538	Sum of Wgt.	11
50%	27.60648		Mean	29.56094
		Largest	Std. Dev.	24.71304
75%	46.09646	43.42199		
90%	61.8928	46.09646	Variance	610.7342
95%	69.822	61.8928	Skewness	.2588242
99%	69.822	69.822	Kurtosis	1.693313

AFTER MATCHING

Percentiles		Smallest			
1%	.5118651	.5118651			
5%	.5118651	3.985355			
10%	3.985355	4.79883	Obs	11
25%	4.79883	8.232648	Sum of Wgt.	11
50%	14.47228		Mean	12.28963
		Largest	Std. Dev.	7.222636
75%	17.64658	14.57069		
90%	18.13737	17.64658	Variance	52.16647
95%	25.03883	18.13737	Skewness	-.0648231
99%	25.03883	25.03883	Kurtosis	2.259817

Sample	Pseudo R^2	LR chi^2	p>chi^2
Unmatched	0.199	66.30	0.000
Matched	**0.029**	9.47	0.578

Appendix 2: Pstest for Quality of Matches in Propensity Score Matching (Nearest Neighbor).

Variable	Sample	Mean Treated	Control	%bias	%reduct |bias|	t-test t	p>|t|
hhgender	Unmatched	1.2735	1.3496	-16.4		-1.27	0.205
	Matched	1.2735	1.2335	8.6	47.5	0.70	0.484
hhAge	Unmatched	42.752	42.154	4.0		0.31	0.756
	Matched	42.752	39.119	24.5	-507.9	1.92	0.057
Sizeland	Unmatched	1.3675	1.2276	27.6		2.14	0.033
	Matched	1.3675	1.305	12.3	55.3	0.85	0.395
hheducation	Unmatched	2.3248	1.7886	61.9		4.80	0.000
	Matched	2.3248	2.2609	7.4	88.1	0.47	0.642
HHsize	Unmatched	3.7863	3.8049	-0.9		-0.07	0.945
	Matched	3.7863	3.5705	10.5	-1063.5	0.78	0.435
hhMaritalstat	Unmatched	1.7436	1.7642	-1.5		-0.12	0.906
	Matched	1.7436	2.1724	-31.6	-1977.6	-2.11	0.036
hhOccupation	Unmatched	3.6923	2.0407	69.8		5.42	0.000
	Matched	3.6923	3.6373	2.3	96.7	0.16	0.873
Distance	Unmatched	1.3333	1.6748	-46.1		-3.56	0.000
	Matched	1.3333	1.3363	-0.4	99.1	-0.03	0.973
Totalassets	Unmatched	3.9e+05	73618	43.4		3.40	0.001
	Matched	3.9e+05	2.3e+05	22.1	49.0	1.57	0.119
Percredel	Unmatched	.2735	.22764	10.6		0.82	0.414
	Matched	.2735	.21301	13.9	-31.9	1.08	0.283
Off_farm_inc	Unmatched	3.7607	5.0894	-42.9		-3.32	0.001
	Matched	3.7607	4.1486	-12.5	70.8	-1.00	0.318

Summary of the distribution of the abs (bias)

BEFORE MATCHING

Percentiles		Smallest			
1%	.8996249	.8996249			
5%	.8996249	1.520789			
10%	1.520789	4.031665	Obs	11	
25%	4.031665	10.5538	Sum of Wgt.	11	
50%	27.60648		Mean	29.56094	
		Largest	Std. Dev.	24.71304	
75%	46.09646	43.42199			
90%	61.8928	46.09646	Variance	610.7342	
95%	69.822	61.8928	Skewness	.2588242	
99%	69.822	69.822	Kurtosis	1.693313	

AFTER MATCHING

Percentiles		Smallest			
1%	.3974265	.3974265			
5%	.3974265	2.324463			
10%	2.324463	7.377777	Obs	11	
25%	7.377777	8.625994	Sum of Wgt.	11	
50%	12.33263		Mean	13.29136	
		Largest	Std. Dev.	9.445083	
75%	22.12684	13.92089			
90%	24.5087	22.12684	Variance	89.20959	
95%	31.59605	24.5087	Skewness	.5526352	
99%	31.59605	31.59605	Kurtosis	2.461149	

AN ANALYSIS OF MICROFINANCE SERVICES AND THEIR EFFECTS ON SMALLHOLDER FARMERS' INCOMES IN NYAMAGABE DISTRICT, RWANDA

1. Name of enumerator: ....

2. Name of respondent: ....

3. Sector: ....

4. Cellule ....

5. Date of interview...

Time started...Time end...

INTRODUCTION

Good morning/afternoon/evening. My name is …………..I am conducting a study on "**An analysis of microfinance services and their effects on your income in Nyamagabe district.**

I would like to request you to respond to the questions designed in this questionnaire. Your participation in this survey will be greatly appreciated. Once again, we assure you that the information you provide is for research purpose and will remain **STRICTLY CONFIDENTIAL**

1. GENENERAL INFORMATION

1.1. Household composition and characteristics

Name of family member (start by HH head)	Relation to hh head (A)	Gender Code (B)	Marital status (Code C)	Age (years)	Education (code D)	Main occupation (Code E)	Farm labour participation (Code F)

Codes:

Codes A	Code B	Code C	Code D	Code E	Code F
1. Household Head	1.Male	1. Married	1. Illiteracy	1. Agriculture	1. Full-time
2. Spouse	2.Female	2.Widow/Widower	2. Primary	2. Livestock	2. Part-time
3.Son/Daughter		3 Divorced	3. Secondary	3. Fishery	3. Not a work
4. Parents		4. Separated	4. University	4.Commerce	
5. Others(specify)		5. Single	5. Vocational	5.Handicraft	
		6. Others specify	6. Others specify........... .	6. Salaried	
				7. self- employed	
				8. Others (Specify)	

1.2. What is the type of land ownership and how is land used?

Land use / Type of tenure	Arable land on	Grazing land on	Forestry land
Customary land			
Lease land (title)			
Rented land in			
Rented land out			
Communal			
TOTAL			

1. 3. What is the size of your household farm land?

1. Less than 0. 1 hectare

2. between 0.1 - 0.5 hectare

3. More than 0.5 hectare

4. Other(s) please specify………………………………………………..………..

………………………………………………………………………………….

1.4. House type

2.2.1. Type of wall for the house   [1] mud   [2] wooden   [3] bricks   [4] stone

2.2.2. Type of roof for the house   [1] grass   [2] Iron sheet   [3] Tiles

2.2.3. Type of floor   [1] earth   [2] cemented   [3] Tiles floor

2. EMPLOYMENT AND SOURCES OF HOUSEHOLD INCOME

2.1. Off-farm income between 1st January 2010 and 31st December 2010

Sources of income	1=Yes 0= no	Quantity (units)	Price/ Units	Income per week	Income per month In Rwf	Total income in 2010 (in Rwf)
Fishing						
Horticulture						
Marriage gifts (e.g.dowry)						
Transport services						
Remittances						
Teaching						
Carpentry						
Salary						
Running a shop						
Salon						
Handcraft						
Others (specify)…………..						

2.2. Farm income

How much income did you get from sale of cash crops and livestock and livestock products in 2010 between 1st January 2010 and 31st December 2010?

Items	Quantity (units)	Price/ unit	Cash received per week (Rwf)	Cash received per month	Annual Total income in 2010
Sales food crops (beans, Maize, wheat, tomato, potatoes…)					
Sales of fruits (banana, avocado…)					
Sale of milk					
Sales of eggs					
Sales of animals(cow, goats, chicken..)					
Others (specify)………………………					

2.3. Do you expect your total income to change in 2011?

1. Increase   2. Decrease

3. Stay the same   4. Don't know

4. FINANCIAL ASSETS AND SOURCES OF CREDIT

4.1. Did you use any microfinance services in the last 12 months?

1=Yes   0 = No

4.2. If no, why did you not use any microfinance service? (if no skip to 4.4)

1. Lack of not aware of microfinance service

2. Lack of collateral

3. Microfinance in my sector does not promote credit

4. I don't know if microfinance exists in my sector

5. Other(s) please specify ………………………………………………………..

4.3. If yes, what is the distance to the nearest microfinance institution in your area? ......Km

1) 0 - 5 kilometers

2) 6 - 10 kilometers

3) 11 - 15 kilometers

4) 16 - 20 kilometers

5) More than 20 kilometers

4.4. What is the name Microfinance Institution do you participate?

…………………………………………………………………………

4.5. Which type of service(s) did you use?

1. Credit   2. Savings   3.Insurance   4.Money transfer

5. Others specify …………………………………………………………………….

4.6. Do you consider yourself eligibility to borrow from microfinance institution in the last 12 months?

1. Yes   0. No

If no, fill the table 4.6 for non borrowers of MFIs

If yes, fill the table 4.7, table 4.8 and table 4.9.

4.6. Non- borrowers of MFIs

Sources	Do you expected to borrow from this source in the next 12 months? Yes=1 No=0	If yes, what is the maximum amount you need to borrow?	If yes, what are your reason for borrowing? Code (A)	If No, what are your reason for not borrowing from MFI? Code (B)
Commercial Banks				
Relatives, friends				
MFIs				
SACCOs				
Savings and loans associations				
NGO				
Others(specify)				

Code

Code A

1. Quick processing of loan

2. Low interest rate

3. Can give bigger loan

4. Does not demand collateral

5. Others (specify) …………………………………………………………………

Code B

1. The loan application process takes too much time

2. Insufficient income/asset

3. Had difficulty in meeting required documents

4. Others (Specify)……………………..

4.7. What is the purpose of MFIs loans?

Purpose of loans	1=Yes 0= No
Food and daily needs	
Education (payment of school fees)	
Tools, equipments	
Health	
Business /microenterprises	
Housing /housings repair	
Marriage	
Others (specify)......	

4.8. Need and access to agricultural credit in 2010

Purposes for borrowing	Needed credit? (Codes A)	If YES, did you get it? 1=yes 0=No	If you did not get credit, explain why (codes B)	If you got credit, did you get the amount needed? 1= Yes 0=No
1. Buying seeds				
2. Buying fertilizer				
3. Paying labour				
4. Buy farm equipment				
5. Buying oxen				
6. Invest in irrigation				
7. Buy/lease land for farming				
Others (specify)....				

Codes

Codes A
1. Yes
0. No

Codes B
1. Borrowing is risky
2. Interest rate is too high
3. Too much paper work

4. No lenders in this area for this purpose
5. Lenders do not provide the amount needed
6. Other, specify……………………………….

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4.9. What is your main source of credit?

Type of credit source	Source of credit	Borrowed 0- No 1- Yes	How many times did you borrow Money? (code A)	Loan amount in RWF (Code B)	Rate of interest monthly (%)	Duration of micro-loan (Code C)	Mode of payment (Code D)
Formal	Commercial banks						
Semi-formal	SACCOs						
	NGOs project						
	Microfinance						
Informal	Self–help group						
	Family						
	Friends /relatives						
	Rural Aid						
	Money lender						
	Cooperatives						
	Others(specify						

Codes

Code A
1. Once
2. Twice
3. 3 times
4. More than 3 times

Code B
1. Between Less than 10,000
2. Between 10,001 - 20,000
3. Between 20,001 - 100, 000
4. Between 100,001 - 150,000
5. More than 150,000
6.Other (specify)………………………………………………………………

Code C
1. 3 to 6 months
2. 7 to 12 months
3. 1 to 2 years
4. More than 2 years

Code D
1.Weekly
2.Monthly
3.Annually
4.Other specify

4.10. Who borrow the money?

1. Wife   2. Husband

3. Wife and husband   4. Other (specify)……………………………………

4.11. Who uses the money obtained?

1. Wife   2. Husband

3. Wife and husband   4. Other family member

5. Others………………………………………

4.12. On average how long does it take to get a loan (Application /Approved /receipt of funds?
1. First loans?   1= ………….. Days   2= ………Months

2. Repeat loan?   1=……………Days   2= ………Months

4.13. Do loan officers/lenders explain to you the term and conditions of the loan?

<u>Orientation:</u>

1= Yes   2= No   3=Sometimes

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Disbursement

1= Yes   2= No   3=Sometimes

4.14. Has the lender ever asked you for feedback regarding the quality of their loan products and services or new products & services?

1=Yes   0=No

4.15. Where do you make regular repayments? (Current MFI loan).

1. Lender's office   3. Deposit to lender's Bank Account

2. Group meeting   4. MFI collector

5. Others, specify……………………………………………………………

5. Home Savings

home Savings	Do you have savings in this form? Yes=1 No= 0	Reason for not using services if available Code (A)
Savings deposits with commercial Banks		
SACCOs		
Savings and loan associations		
MFIs		
Time deposits with Cooperative		
Voluntary savings with NGOs		
Others(specify)		

Code A
1. Too far
2. Not member
3. No ID
4. Minimum too high
5. Low interest rate
6. Don't trust
7. No savings
   Others (Specify)……………………………………………………………

7. HOUSEHOLD ASSETS

Please specify in the table below the quantity, year of purchase and purchase price of the household assets you currently own.

Asset type	Quantity	Year it was purchase/built	Purchase price/cost (Rwf)
Vehicle			
Bicycle			
motorcycle			
Radio			
Mobile phone			
Television (TV)			
Computer			
Generator			
Refrigerator/freezer			
Air Conditioner			
Sofa seats/coach			
Cooker			
Furniture			
Chemical Sprayer/pump			
Planter			
Reaper			
plough			
Other(s), specify……………			

THANK YOU !!!