AN ECONOMIC ASSESSMENT OF THE FACTORS INFLUENCING

SMALLHOLDER FARMERS' ACCESS TO FORMAL CREDIT:

A CASE STUDY OF RWAMAGANA DISTRICT, RWANDA

by

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DECLARATION

This thesis is my original work and has not been presented for the award of a degree in any other academic institution.

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DEDICATION

I dedicate this thesis to my parents, brothers and sisters.

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ABSTRACT

Farm credit enhances productivity and promotes standard of living by breaking vicious cycle of poverty of small scale farmers. It is usually considered as an essential input to increase agricultural productivity. Agricultural credit is indeed an integral part of the process of modernization of agriculture and commercialization of the rural economy. Credit is a necessary input if agriculture intensification and agricultural growth is to be achieved. Despite financial institutions having been established to offer agricultural credit in Rwanda, access to credit in many rural households in Rwanda remains limited.

This study assesses the factors influencing smallholder farmers' access to credit in Rwamagana District, Rwanda. The study sought to establish the relationship between formal and informal credit use and to assess the factors that influence smallholder farmers' access to formal credit. It was hypothesized that informal credit participation is negatively associated with formal credit use and that access to credit is not determined mostly by household socio- economic and institutional factors such as land, agricultural extension service, gender. Both primary and secondary data were used in the analysis. Multi stage sampling technique was used. A sample of 185 smallholder farmers stratified by access to formal credit was drawn. The data for the survey was collected in the month of May, 2011. Both t-test and Chi-square test statistics were used to compare users (33 percent) and non users of formal credit (67 percent) with respect to the explanatory variables hypothesized to influence access to formal credit. Binary Logit is applied in assessing the factors influencing smallholder farmers' access to formal credit.

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Descriptive statistics show that farmers' credit users and non users were significantly different by gender of household head, keeping farm records head, off-farm incomes at5 percent level of significance. Moreover, education of household, agricultural extension service, participating in informal credit was significantly different at 1 percent level of significance. However, other variable such as age of household head and land size of household head were not significant different between users and non-users.

Results from the logistic model showed that, participating in informal credit increased the likelihood of participating in formal credit by 29.2 percent. It also found that off-farm income, agricultural extension service, participating in informal credit and education level of household head were statistically significant at 1 percent level of probability. The farmers earning more off-farm income increased the likelihood of participating in formal credit by 4.6 percent. In addition, farmers with higher levels of education and those who receive technical advice from agricultural extension services are more likely to use formal credit (14.9 percent versus 14.5 percent respectively).

The study recommends the following policies aimed at improving farmers' access to formal credit. The government should emphasize on policies aimed at increasing opportunities for off-farm activities, not only focusing on increasing agricultural production. The policy should also promote agricultural extension services geared towards increasing training to the farmers and redouble efforts to improve education levels at Rwamagana District since education makes people arrive at informed decisions about loans.

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ABBREVIATION AND ACRONYMS

COOPECs   :   Coopérative d'Epargne et de Crédit

DFID   :   Department for International   Development

EDPRS   :   Economic Development and Poverty Reduction Strategy

GDP   :   Gross Domestic Product

IFDC   :   International Center for Soil Fertility and Agricultural Development

LDC   :   Less Developed Countries

MFIs   :   Microfinance Institutions

MDG   :   Millennium Development Goals

NBR   :   National Bank of Rwanda

NGOs   :   Non Governmental Organizations

NISR   :   National Institute of Statistics Rwanda

SACCOS   :   Savings and Credit Cooperative Societies

UNDP   :   United Nations Development Program

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Agricultural credit is described as any loan or other extension of credit that a bank provides for agricultural or other rural use, according to the free on line dictionary. Farm credit enhances productivity and promotes standard of living by breaking vicious cycle of poverty of small scale farmers. Meehan (2001) reported that the provision of financial services to the poor has a crucial role to play in providing household food security and alleviating poverty. If the credit is found to be adequate and productive, it will positively influence the optimum use of resources and enables the full application of technology (Vasthoff, 1968). It is usually considered as an essential input to increase agricultural productivity mainly that of land and labour, to boost food output and income levels, to encourage employment and thereof to alleviate poverty. This is because smallholder farmers cannot implement improved agricultural technologies out of their own limited funds. Credit may provide them an opportunity to earn more money and improve their standard of living. Generally, farm credit is provided for relief of distress and for purchasing seed, fertiliser, cattle, farm implement and among other things.

While agriculture contributes most to Rwandan economy, the sector continues to be characterized by very low levels of input use. It is dominated by subsistence farming and practiced on the average farm size less than one hectare per household (IFDC, 2007). Compared to other countries, it is estimated that over the last decade, only 12 percent of farming population used improved seed varieties and 5.2 percent of household used approximately 4 Kg of fertilizer per hectare (GoR, 2009). This figure is far much below the estimated average use of fertilizer in

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the Sub Saharan Africa (SSA) which stands at 9 to 11 Kgs per hectare (GoR, 2009). Similarly, a survey carried out on the use of improved inputs in 2005 shows that only 12 percent of households   use of improved seeds (GoR, 2009).

Credit is the back- bone for any business and more so for agriculture which has traditionally been a non-monetary activity for the rural population in Rwanda. Agricultural credit is indeed an integral part of the process of modernization of agriculture and commercialization of the rural economy. The introduction of easy and cheap credit is the quickest way for boosting agricultural production. Agriculture as a sector depends more on credit than any other sector of the economy because of the seasonal variations in the farmers returns and a changing trend from subsistence to commercial farming (Abedullah *at al*, 2009). Credit may provide them opportunity to earn more money and improve their standard of living (Vogt, 1978).

In addition, a country like Rwanda, where primary resources such as land are underexploited and improved input such as seeds and fertilizer are inaccessible for the majority of population, it is challenging for smallholder farmers to grow out of poverty without being provided adequate and affordable financial services into the rural economy (Malimba and Ganesan, 2010).Credit accomplishes this task by enabling risk-averse smallholder farmers to overcome their liquidity problem and to make farm investments, particularly in improved farm technology and inputs that could lead to increased agricultural production (Fuentes, 1996). Thus farm credit is very essential if economic growth is to be achieved in a developing country like Rwanda. In spite of the vital role played by agriculture in employing and providing livelihood to over 88.6 percent of the population, resources allocated to the sector are limited. Two government-supported banks, the Rwanda Development Bank and the Rwanda Union of People's Bank, offer financial services to

agricultural customers, but the volume of rural lending by these banks amounted to less than 2% of bank loans in 2003 (Malimba and Ganesan, 2008). It is documented that more than 80 per cent of formal financial institutions are centralized in the city of Kigali and urban centers of provinces and districts with few branches in the rural areas (Malimba and Ganesan, 2010).

Rwanda "Vision 2020" spells out the importance of agriculture as the main driver in transforming the country into an industrialized state. In order to achieve this vision, the government has encouraged an accelerated agricultural growth through increased budgetary allocation (GoR, 2009 and World Bank, 2011). According to Strategic Plan for Agricultural Transformation, the government's budget allocation to the agriculture sector increased from about 4.2 percent in 2008, to 6.6 percent in the financial year 2010/11. Together with agricultural related spending allocated to other institutions, Rwanda now complies with the 10 percent commitment made under the Africa Union's Comprehensive African Agriculture Development Program (CAADP) compact, which Rwanda was the first signatory, (GoR , 2009).

In order to improve the situation of access to credit by smallholder farmers and low income earners, rural financial institutions such as Microfinance and Saving and Credit Cooperative Societies (SACCOs) have been promoted (Malimba and Ganesan, 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 framework for the microfinance sector. This law was brought into force in 2008.

The government has also promoted some specific programmes to encourage access to credit by the marginalized populations. These include; Women Guarantee Fund Project, Agricultural Export and Agro-business Guarantee, Guarantee Fund and Credit Line for the retrenched civil servant project and the Rural Investment Facility project (NBR, 2008). Musahara, (2006) indicates that Rwandan land policy reform was also based on the assumption that poor farmers will have access to credit when land tenure systems were formalized[1].

Despite these efforts, Straton (2007) documents that access to formal credit does not improve with the national economy. Similarly, financial services are not available in places where the poor can easily access them at affordable costs (DFID, 2010). Smallholder farmers are still constrained in their daily activities in different ways which also contributes to low participation in formal credit markets. For instance, they are faced with the problem of continuous land deterioration, climate change, high demand and price inelastic nature of agriculture production. These challenges further complicate the ability of the smallholder farmers to acquiring productive agricultural inputs and funding the necessitate investments (GoR, 2002 and MINECOFIN, 2006).

1.2 Problem statement

The concern of this study is the overall aspect of credit in Rwanda. The problem of this study is arisen from the identified limited access to credit, inadequate distribution of credit among the economic sectors and the preferred source of credit for the consumer.

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[1]When everyone who has land is also having title deed; so that land can be used at any time as his own fixed asset.

The limited access to finance industry is evident: Out of a population of more than 9 million people in Rwanda, borrowers from commercial banks are estimated at 29,000 individuals and depositors are approximated at 123,000 individuals in 2006 (Paul *et al.,* 2007). Only 14 percent of adult population had bank accounts, about 78 percent among active population were constrained to access the whole package of formal financial services while 52 percent were excluded from financial services at all, whether formal or informal (Tony *et al.,* 2008 and DFID, 2010).

Table 1.1: Sector Contribution to GDP and Flow of Bank Credit (1990 to 2005 in percent)

Year	1990		1995		2000		2005	
Sectors	**GDP**	**Credit**	**GDP**	**Credit**	**GDP**	**Credit**	**GDP**	**Credit**
Agriculture and allied activities	43.8	0.9	44.3	1.2	40.5	1.2	39	4.0
Industry	23.8	25.0	16.1	25.4	19.6	37.5	14	36
Services	31.6	70.1	40.3	69.5	39.8	55.2	41	50.5
Others-unclassified	0.7	4.0	-	3.9	0.1	6.1	6	9.5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Ministry of Finance and Economic Planning (MINECOFIN, 2007)

In addition to limited access to credit for the majority of Rwandese, while agriculture contribute most to the economy, resources allocated to is remarkably low. The Central Bank of Rwanda (NBR) reported annual growth of Rwandan finance sector in terms of saving and lending; depositors for example increased by about 7.4 percent and the resource allocated to primary sector increased from 0.9 to 4.0 percent over 2008 to 2009 (NBR, 2009). However, from Table 1.1 which shows the contribution of various sectors to GDP and the flow of bank credit share; during the years 1990 to 2005, agriculture contributed an average of about 41.9 percent to the

total gross domestic product but the amount of credit allocated to the agricultural sector is about 4 percent which is much less than the proportional contribution of agriculture to the GDP.

Moreover, informal finance plays a big role for many in Rwandese. It is argued that many Rwandeses prefers to borrow from informal sources such as; friends, family, shop, or someone in the community for some reason, such as having no collateral to offer or being discouraged by the procedures bottleneck (DFID *et al,* 2008). About 39 percent of adults save in informal financial and the access to credit in that kind of informal market ranges from 32 to 56 percent whereas access to formal credit ranges from 2 to 7 percent (Ephraim *et al*., 2009).

Given the little access to credit, disproportionate distribution of credit among the economic sectors and from which model most people source credit in Rwanda, this study builds on previous studies by analyzing how different factors affect access to credit. The study therefore seeks to identify the host of various factors that affect access to credit in Rwanda adding to similar studies that have been conducted in Africa.

1.3 Objectives of the Study

The purpose of this study is to assess the factors influencing smallholder farmers' access to formal credit in Rwamagana District, Rwanda.

The specific objectives of the study are:

1. To examine the relationship between formal and informal credit use.

2. To assess factors that influence smallholder farmer access to formal credit.

1.4 Hypotheses to be tested

1. The informal credit participation is negatively associated with formal credit use

2. Access to credit is not determined mostly by household socio- economic and institutional

    factors such as land, agricultural extension service, gender and so on.

1.5 Justification of the Study

Agriculture is the dominant sector in the Rwandan economy. The level and the speed of economic development are determined to a great extent by the growth of agricultural sector. This sector, which is composed of small, fragmented and subsistence farming families has limited or no working capital to purchase inputs to improve productivity. Hence, credit is a vital component of modern agriculture. As stated by Meehan, (2001) and Tsehay and Mengistu, (2002), agricultural credit helps to bring the requested productivity, improve farmers lives for better and to attain food self-sufficiency through the adoption of new and improved technologies.

A developed financial system, especially for rural areas is one of the pillars to meet long run Rwandan economic development objectives stipulated in the Vision 2020. It is also stated in the Millennium Development Goals (MDGs) that access to credit is expected to play a critical role in vulnerability and poverty alleviation. The lack of capital and the absence of attractive investment opportunities are considered to be key reasons behind inadequate economic development in many developing countries. This is why an attempt is made in most developing countries to encourage, through development policy measures, capital formation as well as the supply of financial means in the form of credit through official financial institutions (Manig, 1996). As a result of the lack of access to credit in the formal sector, productive assets of the poor are

depleted; assets used as collateral are transferred from the poor to wealthier informal lenders, and households may become impoverished.

Therefore the findings of this study inform policy by providing information to lenders and policy makers that will enable appropriate measures to improve farmers' access to formal credit in the study area. The outcome of the study would be useful to identify innovative options and institutional arrangements that would serve as an input for policy makers in formulating rural credit policy. Above all, it can be a benchmark for further study.

1.6 Organization of the Thesis

This thesis is organized into five chapters. Chapter one presents the introduction, which focuses mainly on the background, problem statement, objectives, hypotheses to be tested and justification of the study. Chapter two presents review of relevant study gaps. Chapter three discusses the methodology used. Chapter four presents the results and discussion. The last chapter presents main findings, conclusions and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of Smallholder Farmer

The concept of smallholder farmers arises as a classification based on; the size of the landholding; the purpose of production which may be own home consumption or market and income levels of the farmer. Machethe *et al.* (2004) argues that limited purchased input and use of actual technologies often associated with small-scale and subsistence farming in resource-poor conditions are major characteristics of smallholder farmer. Nevertheless, smallholder farmers operate in different conditions which vary across geographic regions; whether a farmer is urban or rural and also whether in a developed or a developing country.

Though, there is no defined specific characteristics of smallholder farmer in Rwanda, different statistics such as land scarcity, little use of input, purpose of production whether business or own consumption, rural population fall in category of smallholder farmers. According to a study carried out by Ministry of Agriculture (MINAGRI) on production systems in 1991, the small farmer is defined as a farmer with a small piece of land, his homestead, which cannot produce enough food for the family's subsistence. He has to engage in other activities (trader, hauling, crafts etc...) or sell his labour to someone else to complement his farm output.

Dixon *et al.* (2003) stated that smallholder farmers are the backbone of African agriculture. The author notes that majority of the population in Sub-Saharan Africa are considered as smallholder farmers and reside in the rural areas. According to Delgado (1998), smallholder agriculture is important to employment, human welfare, and political stability in Sub-Saharan Africa (SSA).

Eicher and Rukuni (1996) pointed out that smallholder agriculture is a source of growth linkages by enlarging the market for industrial goods and moderation of the urban migration.

2.2 Concept of Credit

The subject of credit is a major subset in finance. Financial dictionaries define credit as involving money, time, and risk all together. Ellis (1992) defined credit as a sum of money in favor of the person to who control over it is transferred, and who undertakes to pay it back. This definition by Ellis (1992) best suits the understanding of the term credit for this particular study. It implies and requires a trust in one's ability to make payment when due. Moreover, Beckman and Forster (1969), defined credit as the power or ability to obtain goods or services in exchange for a promise to pay later.

Therefore, access to finance refers to the possibility that individuals or enterprises can access finance service, including credit, deposit, payment, insurance and other risk management services. According to (Demirgüç et al., 2008), access to finance varies greatly between countries and ranges from about 5 percent of the adult population in Guinea and Tanzania to 100 percent in the Netherlands (for a comprehensive list of estimated measures of access to finance across countries). Diagne et al., (2000) stated that a household is said to have access to a type of credit if at least one of its members has a strictly positive credit limit for that type of credit. Similarly, a household is classified as credit constrained for a type of credit if at least one of its members is constrained for that type of credit.

The distinction between access to formal credit and participation in formal credit programs is not well understood (Aliou, 1999). The study argued that a household has access to a particular source of credit if it is able to borrow from that source, although for a variety of reasons it may choose not to borrow. Such reasons may be that the farmer does not need the credit at that time or may even be limited in terms requirements by the lending institutions. The study further indicates that the extent of access to credit is measured by the maximum amount that a household can borrow. A household is said to be participating if it has borrowed from any source of credit. A household is credit constrained when it lacks access to credit or cannot borrow as much as it wants.

2.3 Credit Access in Rural and Agricultural Development

A controversy persists whether credit is better way for poverty alleviation and further development. The results from different studies show that even new rural financing system is questionable. Some studies argue that microfinance has very beneficial economic and social impacts (Kidane, 2003) while others argue that microfinance system can be an instrument of defaults and stagnation rather than an instrument of progress, unless it is promptly and efficiently used (Adams and Von Pischke, 1992; Buckley, 1997 and Dhawan and Kahlon, 1977). The latter justify their position arguing that farmers operate under uncertainty especially in developing countries.

Despite differences in opinion pointed out above, credit and other finance services remains important to rural capital development and to rural economic growth. Moshar (1966) classified education for development, production credit, group action by farmers, improving and expanding

agricultural land and national planning for agricultural development as the top five accelerators involved in agricultural modernization. He argued that credit found its role among essential factors that enable the adoption of innovation and accelerator factors that enable to maintain innovation. Briquette (1999) stated that enhanced provision of rural credit would accelerate agricultural production and productivity. Aliou and Zeller (2001) show that access to credit can significantly increase the ability of poor households to acquire agricultural inputs. They further indicate that it reduces the opportunity costs of capital-intensive assets relative to family labor, thus encouraging labor-saving technologies and raising labor productivity. Tefera (2004) stated that the lack of capital in rural areas is one of the major factors which undermine the development of agriculture. According to Straton (2007), credit is useful for poor households to take advantage of new business opportunities, expand income-generating activities, and cope with shocks and life cycle events. He also states that poor people, particularly those who live in rural areas, need savings, credit, cash transfer and insurance services in the same way as others who live in urban areas. Therefore, credit and its supply conditions plus its use remain subjects of economic discussion.

2.4 Problem associated with Access to Credit in Less Developed Countries

According to information from different sources such as World Bank, International Financial Statistics, and the IMF's World Economic Outlook Database 2005, access to credit is mostly the problem of less developed countries Shimek and Sengupta (2007). It is observed that for a country the access to credit ranking was related to its income per capita and also its governance. Shimek and Sengupta (2007) argued that getting credit measures the ease with which a country's institutions facilitate lending to entrepreneurs. It also argued that lenders make more loans if they

have good information about borrowers and effective legal recourse to protect their interests in case of defaults. Uncertainty in finance area and underdevelopment of financial institutions are highlighted as causes of limited finance in those countries.

2.4.1 Asymmetric Information: Moral Hazard and Adverse Selection

The rural financial markets are characterized by information asymmetry between borrowers and lenders. This is confirmed by Conning et al. (2005) who argued that that the major cause of adverse selection by suppliers and moral hazards by clients in the rural credit market is information asymmetry between the suppliers and rural clients of financial services.

2.4.1.1. Adverse selection

A key condition for the existence of adverse selection, in the usual case is an asymmetry of information (Akerlof, 1970). In economics, information asymmetry occurs when one party to a transaction has more or better information than the other party.

The adverse selection theory of credit markets originated with the paper by Stiglitz and Weiss (1981) (as sighted by Ghosh and Mookherjee, 1999). The theory rests on two main assumptions: that lenders cannot distinguish between borrowers of different degrees of risk, and that loan contracts are subject to limited liability (i.e., if project returns are less than debt obligations, the borrower bears no responsibility to pay out of pocket).

Adverse selection arises when borrowers have characteristics that are unobservable to the lender (Karlan and Zinman, 2004). A lender can try to deal with this information problem directly, by trying to assess these characteristics, or indirectly by offering loan terms that only good risk will

accept. The typical method for separating good risks from bad risks is to ask the borrower to pledge collateral such as land title deeds, houses, proof of job and so on. Risky borrowers are likely to fail more often and lose their collateral. If the bank offers two different contracts, one with high interest rates and low collateral and the other with the opposite, risky borrowers will select the former and safe borrowers the latter. But poor people by definition do not have assets that make useful collateral, meaning that lenders have no effective way to separate good risks from bad. Group lending deals with adverse selection by drawing on local information networks to achieve the equivalent of gathering direct information on borrowers and using differences in loan terms to separate good from bad borrowers (Eston and Gersovitz, 1981).

2.4.1.2. Moral hazard

The problem of moral hazard is immense for formal sector lending but even moneylenders have not fully overcome it although they can distinguish between bad luck and poor performance, especially when their clients reside in the same villages (Mohiuddin, 1993).

Moral hazard has been defined as a problem that results when one party insures another against some event over which the insured party has some control (Gould and Lazear, 2002). Once a borrower has taken a loan, it would be expected that the returns from the proposed project should be able to fully repay the loan. The project's payoff partly depends on the borrower's actions, including levels of labor and other inputs put in the project. Ordinarily, we would expect the borrower to efficiently choose these actions such that the marginal benefit of each action equals its marginal cost so as to generate maximum returns. However, with asymmetric information that is not necessarily the case. In the absence of collateral, the lender and borrower do not have the

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same objectives because the borrower does not fully internalize the cost of project failure. Moreover, the lender cannot stipulate perfectly how the borrower should run the project, in part, because some of the borrower's actions are not costlessly observable.

According to Mohiuddin (1993), problem of moral hazard is solved in formal sector by tying credit and savings together, by having a built-in mechanism for emergency fund to handle unforeseen shocks (due to weather or price changes), and by its emphasis on borrower-initiated lending to avoid loan use in risky unknown ventures where markets or input supplies are uncertain.

Asymmetric information makes it difficult for a would-be creditor or insurer to be sure whether the expected probability distribution over state-contingent payoffs associated with a contract promise is the one being represented by the seller or not, as in the case of adverse selection (private information about the agent or the project's characteristics) or moral hazard (private information about whether a specified action or contingency has occurred or not). In practice variants of each of these problems may be the concern.

2.5 Characteristics of Credit Market in Developing Countries Rural Area

2.5.1 Informal and formal credit

Informal and formal credits are the most common types of credit market in developing countries (Aryeetey and Udry, 1997). On formal credit markets, the activity is controlled by the government which provides directives between depositors and lenders. The formal credit is mostly known to be used for financing production (Feder *et al.,* 1990) and interest rate is relatively low that usually are government subsidized. On the contrary, for informal credit

markets money is borrowed from private individuals, professional moneylenders, traders, commission agents, land lords, friends and relatives (Mohieldin and Write 2000).

The interest rate on informal credit is assumed to be higher and is characterized by irregularity in many aspects. This is perhaps due to the speculative spirit and the lack of government regulation on that market (Mohieldin and Write, 2000). The formal financial institutions operate in areas where they perceive lower risks, where enforcement and transaction costs are least while the informal financial sector operates in areas and sectors where the former financial institutions fail to provide lending and deposit services. The informal credit market was mainly relevant only for issues that were not directly productive and through which the expenditure for social obligations was met (Manig, 1996; Aliou, 1999) and (Fengxia *et al.,* 2010). Therefore, informal finance system is deemed weak because appropriate financial institutions assisting farmers in credit administration are still wanting. For that reason, policy makers discourage informal credit to the benefit of formal credit.

2.5.2 New Rural Financing

It is assumed that microfinance programme' interventions would have changed human behaviors and practices in ways that will lead to the achievement of desired outcomes. Green (2006) gives an example by saying that "the provision of a microfinance package of technical assistance and a loan is intended to increase household income which in turn may lead to greater household economic security, and thus lead to positive changes in the morbidity and mortality of household members, in educational and skill levels and in future economic and social opportunities". However, there are conflicting views from different authors on impact of microfinance; on one

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hand, some studies clearly point out that the microfinance programs do not have beneficial impacts on development and do not assist the poorest (Hulme and Mosley, 1996; Mosley and Hulme, 1998). On the other hand, other studies argue that microfinance has very beneficial economic and social impacts (Holcombe, 1995 and Hashemi and Schuler, 1997).

Notwithstanding, introduction of microfinance programmes and institutions into the development economics arena about two decades ago have become an increasingly important component of strategies for Medium and Small Enterprise (MSE) development promotion and poverty reduction (Green, 2006). To shed light on these, the study by (Hulme, 2005) argued that credit contributes positively by microfinance programmes and institutions to household welfare through improving household production or smoothing consumption over time. Specifically, it is shown that although most credit programmes may not serve the poorest of the poor, all categories of the poor may be able to benefit through increased income and reduced vulnerability to 'shocks', as noted in Khandker (1998).

From the literature review, this new rural financing system through Microfinance programs is supported by two different stands. First, microfinance approaches tend to feature three sets of agents: households which are potential borrowers, formal lenders and informal lenders such as money lenders, relatives, friends and Rotating Savings and Credit Associations. Second, as experienced in Grameen Bank's group lending program, the new approach resolved the problem of collateral by substituting it to group lending system.

It is also argued that microfinance services characterized by group lending with joint liability may lead to peer-monitoring or peer-pressure among group members which reduces problems of moral hazard and enforcement (Besley and Coate, 1995).

The first stand is not only criticized that microfinance services are provided at high transaction cost but also its difficulties in the identification of the determinants of the credit supply to households; specification of the determinants of credit rationing and determinants of the channels through which credit may contribute to household welfare. On the other hand the criticism due to the second stand is that microfinance can reduce but not solve the problem of effective information since the real world is characterized by frictions due to imperfect information (Green *et al.,* 2005, and Green 2006).

2.6 An overview of financial sector in Rwanda

Financial sector in Rwanda is composed of nine commercial banks; namely Banque de Kigali (BK), Banque Commerciale du Rwanda (BCR), FINA Bank, Ecobank, Access Bank and Compagnie Générale de Banques (COGEBANQUE), Kenya Commercial Bank (KCB), Urwego Opportunity Bank, and recently Union des Banques Populaires du Rwanda[2] transformed into commercial bank known as Banque Populaire du Rwanda. It is also has one housing bank namely Rwanda Housing Bank (RHB) and one development bank namely Banque Rwandaise de Développement (BRD). Other foreign finance institutions from East African Countries such as Equity Bank from Kenya are being established.

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[2] Before the Union des Banques Populaires du Rwanda (UBPR) was transformed into a Commercial Bank, it was a union of local microfinance (well organized and experienced).They started operation in 1975. It has about 55 percent of all deposits in Rwanda.

The last two decades, has seen the introduction of many microfinance institutions and saving and Credit Cooperatives in Rwandan economy. In total by 2009, 145 MFIs and SACCO had been established. By June 1999, the Law No. 08/99 of June 1999 governing banks and other financial institutions gave authority to the Central Bank to supervise banks and other financial institutions including MFIs. In 2002 and 2003, the National Bank of Rwanda further introduced two regulations; the first governing microfinance institutions in general, and the second regulating SACCOs (NBR, 2007 and NBR, 2008).

Therefore, the Rwandan formal finance sources are financial institutions that are set up legally and engaged in the provision of credit and mobilization of savings. The system includes National Bank of Rwanda (NBR), commercial banks, Rural Development Bank (BRD), credit and savings cooperative, insurance companies and microfinance institutions (NBR, 2009). Formal finance Institutions are regulated and controlled by the Central Bank of Rwanda.

The informal market on the other hand comprises a range of diverse credit sources such as relatives and friends, moneylenders, neighbours and 'Tontines' or Rotating Savings and Credit Agencies (ROSCA). The tontines (ROSCA or IKIMINA) operate on the basis of the contributions made by their members. They require no legal status or license and control from the Central Bank to exercise their activities. The tontine can be defined as a collection system for rotating savings funds which benefited in turn to each of the members. The tontine groups together people who have some affinity between them such as neighbors, students, workers of the same company, and members of the same chorale. These groups are characterized primarily by their diversity and found in the villages and they mobilizing significant resources.

The informal credit market is used more extensively than the formal market. As stated by Malimba and Ganesan (2008) that before the war and genocide of 1994, the rural credit market in Rwanda was dominated by informal sector which accounted for more than 80 per cent of the total rural credit market shares (Integrated Household Living Conditions Survey, 2000/2001). Encompassing a variety of sources, the informal market is more flexible and typically better suited to the credit needs of poor borrowers since they do not ask for collateral and other restrictive credit requirements as opposed to the formal sector. In addition, contrary to the formal market, informal credit is used primarily for personal reasons related to the more mundane aspects of day-to-day life. Loans taken in the informal market are used by households mainly for living expenses.

Informal credit is best understood as borrowing meant for the servicing of everyday debts; for example, informal credit at stores. The second most popular type of informal credit is a revolving credit that allows customers to maintain an account that can be paid off over time. Informal markets often lack the stringent collateral requirements that formal lenders can enforce, allowing poorer borrowers access to smaller pools of funds. However, the informal creditors make up for the added risk by charging poor borrowers higher interest rates (Bradley, 2005). This is due to lack of collateral for instance when farmers do not own their own land.

2.7 Empirical Literature Review

Several studies, on access to credit, have been done. This section, presents a review of some related past studies in which the current study builds on. I therefore present a summary on the methodologies used, the key findings as well as their contribution to this study.

A study conducted in Vihiga Division of Kakamega District showed that there was no relationship between farm size and the supply of institution credit (Musebe, 1990). But these results were not conclusive because farm size would influence the amount of credit demand. In real life, the larger the farm, the more funds demanded. The study established that this value of the marketed surplus is positive and statistically significant and this means that this value has a relationship with the amount of institution credit actually obtained. It is expected that farmers with greater marketed surplus have a higher probability of own-savings compared to those with less off-farm income. In view of this, the results of the study should not be generalized to other areas without further investigation. The variable tested will be adopted expecting that it influence smallholder farmer's access to formal credit in the study area.

A study by Taslim et *al.,* (2003), conducted during July 2001/ 2002 in Central Lombok, Indonesia on government credit scheme pointed out that the farmers generally show a negative attitude to credit. The analysis of the reasoning underlying this attitude showed that farmers perceived credit as being risky and liable to cause severe losses. The uncertainties that are prevalent in agriculture specifically uncertainties on price, and production explains the farmers' reluctance to participate and their lack of borrowing due to the fear of embarrassment as a result of risk default.

Kiiza and Pederson (2001) with an objective of analyzing the factors that affects households' participation in micro-credit programmes and their investment behaviour in Uganda adopted the bivariate logistic model. The results show that proximity to the institution, dual sources of income and income stability were the significant factors influencing the rural households' participation in the credit programmes. The estimated model found that the likelihood of

participation increased with the level of education of the borrower and that farmers were less likely to participate probably because of the uncertain nature of farm income. Using the logit model, the authors acknowledged that it does not capture the underlying credit constraints but noted that it served the useful purpose of identifying factors that are important in the initial design and implementation of credit programs to reach poor households. The current study adopted this approach

Shah *et al.* (2008) used a binary Logistic regression model in identifying the factors affecting household access to credit and participation in credit programme in Pakistan. The study found that at household level, the participation to credit was influenced by age of the head of household, years of schooling of household head, income earners in a household and household size. The study pointed out that the ownership of a house increased the probability of obtaining loan and the presence of formal financial institution increased the access to credit by a household. Also result showed that the households were indifferent of the rate of interest, they prefer liquidity even at high rate of interest. The authors observed that major source of external financing were the informal credit market. The current study has adopted similar variables and methodology in a different region (Rwanda) to test the variables influencing smallholder farmers access to formal credit.

A study by Oboh and Kushwaha(2009) employing the Multiple regression analysis on a data set of 300 farm households revealed that income, distance between home and bank, farm size and evidence of previous loan as having significant effects on the size of loan received. The study recommended that government should increase the volume of loan facilities to the Nigerian

Agricultural Cooperative and Rural Development Bank (NACRDB) for onward disbursement to qualified applicants. By so doing, the individual loan size of farmers will increase and this may lead to increased farm output, productivity and income. Some of those variables such as level education, age, gender, farm size and household size are used in the present study. However, the present study is based on one agricultural zone and focused on specific smallholder farmers beneficiaries of any formal financial institution unlike Oboh and Kushwaha (2009) study that was based on a different agricultural and geopolitical zones in the state and focus on specific farmer beneficiaries of the Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB). The multiple regression analysis was not used for this study since the nature of the dependent variable differs; this study has a binary dependent variable as opposed to Oboh and Kushwaha (2009) where the dependent variable is continuous.

Sisay (2008) analyzed the determinants of smallholder farmers access to formal credit in Ethiopia, using a binary logit. The results showed that the probability of accessing formal credit was positively and significantly affected by participation in extension package programs, cultivated land size, experience in credit use from the formal sources and membership of households in multipurpose cooperatives. However, farmers' perceptions of group lending and number of livestock in Tropical Livestock Unit (TLU) negatively and significantly affect access to credit from formal source. Also the study noted that the status of women and different wealth groups' affect access to formal and informal credit sources. The study recommended that in order to accelerate agricultural development in the area the factors (Participation in extension package programs, Experience in credit use from the formal sources, total cultivated land size, number of livestock , collateral or group formation and membership) were founded to be highly

important in influencing access to formal credit use and problems should be taken into consideration to access credit from the formal financial sources. A similar methodology was adopted to assess factors that influencing smallholder farmers access to formal credit in Rwanda. This was found appropriate as it is easy to compute and interpret .The present study adds value by identifying and evaluating factors that influencing smallholder farmers' access to formal credit which were not considered by Sisay (2008) for example: keeping farm records, participation in informal credit, off-farm income. Also the study was done in Ethiopia and there is need to find out if their findings would be applied to the Rwandese situation.

Mohamed (2003) analyzed the access to formal and quasi-formal credit by smallholder farmers and artisanal fishermen in Zanzibar. He compared borrowers and non-borrowers by applying t-test and determined the factors that influence an individual's ability to secure and access loan from formal and quasi- formal financial institutions using a logistic regression model. In addition to socio economic factors such as age, gender, education, income levels and degree of awareness on credit availability there was significant relationship between income levels and value of productive assets owned by both users and non-users. The choice of the appropriate econometric model and the selection of variables to be included in the model have been useful in informing the current study. The current study is conducted in landlocked area in which transport is more difficult and household activities are diverse whereas Zanzibar has a coastline and most households were fishermen. Thus the factors affecting credit access in a landlocked country like Rwanda are likely to be different to those of a country with a coastline such as Zanzibar.

Nguyen *et al.,* (2008), used the Heckman two-step model, to determine the farming households' access to formal credit in Mekong Delta, Vietnam. The authors found that among other factors land size was a significant factor in explaining access to formal credit since it is considered as a major collateral. Therefore borrowers with large land sizes are likely to get the big amount of loan. However, the Rwandan case will be different since most the farmers don't registered title deeds. Rwanda is dominated by households relying on agriculture at more than 80 percent, with population density of more than 380 people per square kilometer. It is therefore evident that land may not be major factor influencing credit access, especially in the study area (East province of Rwanda) where there is a problem of insecure land rights Musahara(2006). Additionally, this study cannot employ the Heckman two step method and other participatory methods since the objective is to assess the factors affecting access to credit and not to estimate the impact of credit access.

Musyimi (2010) assessed access to formal credit in Mwingi District, in Kenya. The study used participatory methods to determine the factors that influence access to credit services among beekeeping farmers. The author pointed out that majority of sampled farmers had no access to credit due to low and unsteady income, high interest rates and lack of knowledge on how to access and manage credit. The financial institution dominated in network establishment with farmers has been successful in gaining customers and influenced their positive believes on formal finance services. However, the study selected a limited range of explanatory variables (such as education level, source of income of farmers, occupation, limitation to credit access, Financial Institutions Identified, distance to credit service providers) and focused only on agricultural credit. In addition to the factors included by Musyimi (2010), the current study seeks

to establish the effect of participation in informal credit on access to formal credit; which could be one of the major determinants of access to formal credit.

Tang *et al.,* (2010) evaluated formal and informal credit markets and rural credit demand in China. They used binary choice probit models and a multinomial probit model to analyze both determinants of credit market access and credit constraints. From that study household size, agricultural land size, and household head's education level were found to increase the probability of borrowing from formal credit markets. The effect of the variables with regard to informal credit demand was inconsistent. Household with more social network or social capitals and more off-farm activities had a higher likelihood of borrowing from formal or informal markets. China and Rwanda share similarities in terms of coexistence of informal and formal credits in the rural areas. However, the productive capacities of each country differ. The authors explained in their study one of the econometric models used in the analysis of access to credit.

From the empirical literature review, the authors used different approaches such as binary probit models, multinomial probit model, Heckman two-step model and the logistic regression model. The observation is that the choice of the model to be used was based on the nature of the dependent variable and the objective of the study. In this study the dependent variable is of a binary form taking a value of one if the respondent uses credit and zero otherwise. Such models are estimated using either Logit or Probit models. Both the Logit and Probit models estimate parameters using maximum likelihood method. Probit assumes normally distributed error term whereas the Logit model assumes a logistic distribution of the error term. The Logit model is often preferred due to the consistency of parameter estimation associated with the assumption

that error term in the equation has a logistic distribution (Ravallion, 2001 and Baker, 2000). Therefore the current study adopts the logit model. More details on econometric models are given in the next chapter.

In addition, the past studies discussed different factors that affected household or farmers access to credit. Those factors can be characterized as socio- economic, institutional and environmental factors. This study is not much different from others studies discussed above especially in terms of the methodology. However, each study presented some particulars with regard to analyzed factors which influenced access to credit. This may be due to the fact that the study areas are different especially in its population, institutions that regulate the credit market as well as the environmental factors. From the available studies, none of the study was conducted in a landlocked zone, over populated rural area like Rwanda where the density population is about 383 inhabitants per square kilometer. As we know the higher the population density the less land per capita gets and when there is lack of adequate land policy, the more the land gets fragmented. In addition, Rwanda has not experienced modern rural finance for long. The market is small and actors are few (only 14 percent have bank accounts) and MFI are being introduced now.

Therefore, these different empirical studies undertaken in different countries identified the most probable causes of factors influencing access to credit and recommended the remedies that might mitigate these problems. The results of these different empirical studies from different countries such as Kenya, Tanzania and China may not be applicable in the current study area. For those reasons, some factors were picked and others were left out depending on the way they were responding to the Rwandan perspective. Therefore, this study will add to the empirical literature on factors that influence access to credit for a specific context such as Rwanda.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This Chapter contains five sections. The first section of this chapter present conceptual framework. In section two empirical model is presented. Section three and four present methods, procedures and data analysis tools respectively. Section five describes the study area.

3.1 Conceptual Framework

A number of factors affect access to and demand for credit. According Sisay (2006) they are classified into three categories, namely institutional factors, socio-economic factors and environmental factors (Figure 3.1). Institution factors include; culture, government policies and extension services while household socio-economic factors are the size of land holding, age, education and finally, the environmental factors include , the national resource endowment, presence of technology to invest in and financial institutions.

The framework shows that when more profitable resource conserving or improving technologies are available and presence of financial institutional, farm households may able demand credit. Enabling policies (e.g., secure rights to land), access to markets and institutional arrangements (e.g., credit services and extension systems) create incentives to demand of financial service that expand future production and consumption possibilities.

Considering the economy in which this study was carried out (small economy in which actors are among the poorest with less than one dollar as income per capita), a household with limited capacity to access credit is assumed to be vulnerable to different shocks such drought, plant or animal disease and adoption of new agricultural technologies:

On the other hand, it is assumed that household able to access credit have the ability to participate in the process of new technological innovations, i.e adopt new technological innovations and use available resources such as human capital and time.

Figure 3. 1: Conceptual Framework

Institutional Factors
- Culture (perception)
- Government policies

Socio-economic Factors
- Households' characteristics
- Resource endowment for a farmer

Environmental Factors
- Technology in place
- Resource endowment

Demand of financial service such as credit

Limited access to credit:
- Vulnerability (unable to resist to different chocks such drought, plant or animal disease)
- Unable to adopt the technologies in place

Access to credit:
- Able to adopt the New Technology
- Able to participate in innovation
- Efficiency use of available resources (human capital, time and other resources

Outcome:
- Market creation (Employment, More supply and consumption)
- Equity and economic growth

Source: Conceptual idea adopted from New Institutional Economics Perspectives on African Agricultural Development (Dorward and Omamo , 2009)

As show in Figure 3.1; the study assumed that institutional, socio economic and environment factors, together influence farmers access to credit. As result, on one hand, a household has access to credit and hence influence positively market creation, equity and economic growth. On other hand, a limited access to credit implies limited employment, supply and consumption. Failure on credit market reaches gradually a small group of population and lives out to big portion of it to national wellbeing while access to credit impacts positively national equity.

3.2 Empirical Model

The dependent variable is dichotomous in nature, that is either a household has access to formal credit or not. It implies that the dependent variable takes only two values of either 0 or 1. According to Green (1993) and Maddala (2001), the ordinary least square leads to a linear probability model stated as follows:

$$y_i = \alpha + \beta i X_i + \mu_i \; ; \; where \; y_1{}^i = \{\blacksquare(1@0) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 3.1$$

Where y_i is one or zero.

Where, y_i is the probability that an individual used formal credit or did not use given X_i ;

X_i represents the explanatory variable to be estimated;

α and β_i are parameters to be estimated .

μ_i represents *e*rror term

That phenomenon became a limitation which arises from the fact that one of the dependent variables may be or not be observable. Omissions of the unobservable variable results in an inadequate use of the Classical linear models like Ordinary Least Squares (OLS). The use of such a model may be inappropriate because it may result into biased and inconsistent parameter estimates; the expected value of the error terms [E (ui)] will not be necessarily zero. The problem

that comes from the dichotomous choices of use of access to formal credit is typically remedied

by using Maximum Likelihood Estimation (MLE) (Green, 2000 and Wooldridge, 2000).

According to Pindyck and Rubinfeld (1981), Green (1993) and Maddala (2001) the MLE results

to a model with a variable:

$$y_i = \begin{cases} 1 \ if \ y_i^* > 0 \\ 0 \ otherwise \end{cases} \dots\dots\dots\dots\dots\dots\dots\dots 3.2$$ From   equation

(3.2) y_i^* which is not observed became a latent variable as expressed in the following equation:

$$y_i^* = \beta_0 + \sum_{j=1}^{k} \beta_i X_{ij} + \mu_i \dots\dots\dots\dots\dots\dots\dots\dots 3.3$$

Depending on the distribution of error term ($\mu_1 i$) in previous equation, it is a logit or probit

models. Therefore, a logistic model was used; it is an extension of the probit model which has a

restrictive assumption that the error term has to be normally distributed (Johnston and Dinardo,

1997). In the dichotomous analysis outcome variable, Hosmer and Lemeshew (1989) pointed out

that the logistic distribution (logit) has got advantage over the others because of its extreme

flexibility and ease of use from mathematical point of view and results in a meaningful

interpretation.

Following Pindyck and Rubinfeld (1981) the cumulative logistic probability function is specified

as: $$P_i = F(Z_i) = F\left(\alpha + \sum_{i=1}^{n} \beta_i X_i\right) = \frac{1}{1 + e^{-z_i}} \dots\dots\dots\dots\dots 3.4$$

Where, P_i is the probability that an individual used formal credit or did not use given X_i ;

X_i represents the ith explanatory variables; and n is the total number of explanatory variables;

e denotes the base of natural logarithms, which is approximately equal to 2.718;

α and β_i are parameters to be estimated .

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Hosmer and Lemeshew (1989) pointed out that the logit model could be written in terms of the odds and log of odds, which enables one to understand the interpretation of the coefficients. The odds ratio implies the ratio of the probability (P_i) that an individual would choose an alternative to the probability and ($1 - P_i$) that the person would not choose it. But P_i is non-linear not only in X_i but also in α and β_i which creates an estimation problem. So, we cannot use the familiar OLS procedure to estimate the parameters (Hosmer and Lemeshew ,1989). But,

$$(1 - P_i) = \frac{1}{1 + e^{z_i}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.5$$

Therefore, the odds ratio becomes,

$$\left(\frac{P_i}{1 - P_i}\right) = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.6$$

Or

Getting linearity, we take the natural logarithms of odds ratio equation (3.6), which results in the logit model as indicated below (Hosmer and Lemeshew ,1989):

$$Z_i = ln\left(\frac{P_i}{1 - P_i}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \dots\dots\dots\dots\dots\dots\dots 3.7$$

As P goes from o to 1, the logit goes from $-\infty$ to ∞. That is, although the probabilities lie between 0 and 1, the logit are not so bounded (Gujarati, 1995).

Taking the disturbance term (μ_i) into account the equation (3.7) becomes:

$$Z_i = \alpha + \sum_{i=1}^{m} \beta_i X_i + \mu_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.8$$

Hence, the above econometric model was used in this study and was treated against the potential variables affecting smallholder farmers' access to credit. The coefficient of the logit model presents the change in the log of the odds associated with a change in the explanatory variables (Hanushek and Jackson, 1977 quoted by Edilegnaw, 1997).

3.2.1 Model Specification

3.2.1.1 The Dependent Variable

The dependent variable for the logit analysis is smallholder farmer's access to formal credit. The sample was divided into credit user and non credit users based on the question whether the household head applied for the credit or not. All of those who applied for credit but were not successful (rejected) and who did not apply were all classified as non users of credit while those respondents that got credit were classified as credit users. Distinguishing between those users or non-users of formal credit in the study area, the dependent variable takes value of "1" for users and "0" for non-users. The regression model was used to analyze some factors affecting access to credit by respondents.

3.2.1.2 The Following Independent Variables used in the Model

Gender of Household Head (GENDHH): This is a dummy variable that assumes a value of "1" if the head of the household is female and "0" otherwise. Gender represented in terms of household head sex has been identified by different authors as an important factor defining the economic role of rural people in Africa (McSweeney, 1979 and Dey, 1980). The view on human, either a man or woman credit access is not shared: different authors such as Mayada *et al* (1994) argued that women are especially discriminated against in formal financial markets while others such as Zeller (1994) argued that gender appeared to have no impact on credit access. According to Buvinic *et al.* (1979), factors related to woman's lack of control over the economic resources and the nature of their economic activity are two categories of major factors that restrict women's access to formal credit compared to men. Therefore, in this study, it was expected that female headed households were less likely to use formal credit.

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Age of Household Head (AGEHH): It is a continuous variable, defined as the farm household heads age at the time of interview measured in years. In this study, the age of the head of the household is considered because he or she is the one who makes management decisions in the house or farm. He or she is also the one responsible for making decisions regarding whether or not to request for credit for any activities. Age of household heads goes with characteristics which may differentiate their ability of credit access. On one side, older people have more experience in the economic activities being financed and increase their trust and confidence regards to lenders institution officers (Gershon *et al.,* 1988 and Zeller *et al.,* 2001). One the other side, young people have not yet constituted enough wealth and need more finance for adoption of new technology (Nguyen, 2003). Therefore, old are privileged and less demander (risk averse) while young people are more credit seeker but disadvantaged. Therefore, the expected sign of effect of age on the probability of access to credit is ambiguous; either positive or negative sign is expected.

Education Level (EDUCL): Education level of households head is independent variable which measured by number of the school years of household head. According to Gershon *et al.,* (1988), education especially formal schooling constitutes an asset as human capital which determines the efficiency of the owner. Arene (1992) and Njoku (1997) state that with environment change in different aspect such as climate and competitiveness conditions, increasing return in agriculture production is nothing as adoption of new technologies which goes with farmer ability from different form of knowledge acquisition. Musebe et al, (1993) argued that as household gets more formal education, the access to credit ability increase. Marge (2003) generalized the argument by stating that, in general, more educated persons were less constrained. In this study, more educated people are supposed to have more level of awareness on the available credit

facilities in their areas and more seekers. Therefore education is expected to have positive influence on access to credit.

Size of Household (SIZEH): The family size has been defined as the number of people under the same roof. On production side, according to Bizoza *et al.* (2007), the size of household is synonym of labor endowment for business enterprise in Rwanda. From his study, the more the labor force available from the larger the family members, there is possibility of more income to overcome credits risk (Schereiner and Nagarajan, 1997). On the consummation side, a family size may increase with an increase of dependence rate and loss of potential to attract lenders despite more need to spend and demand for credit. Therefore, looking any side, the negative and positive signs are expected.

Off-farm Income (OFF-FARMI): It is defined as amount of off-farm income by the household in Rwandan francs. Off-farm income, on one side, may build confidence to borrower and it can be major source of finance to ensure repayment (Sharma and Zeller, 1997). On the other side, higher off-farm incomes may reduce household's borrowing needs because such household's may be able to meet their investment needs, without having to resort to borrowing. According to Diagne (1999), Bhuiya *et al* (2001), Marge (2003) and Johnston and Morduch (2007), the increase in income raises access to credit. So, the expected effect of off-farm income on access to credit is either negative or positive.

Land Size (LANDSIZE): It is defined as the total land owned by the household in acres. Binswanger *et al.* (1989) states that land has been the most important collateral for formal credit and he also argued that farmers with more land are more likely to seek credit and as long as the exploitation requires more capital. Therefore, in this study, land is hypothesized to increase the

probability of farmers' access to credit.

Keeping Farm Records (KEEPFARE): This is a dummy variable which takes a value "1" and "0" for keeping farm records and non-keeping farm records respectively. When applying for credit a borrower is required to produce finance documents that relate to his financial position. Therefore, the household which keeps regularly it finance records such as cash flow; income statement and balance sheet fulfill one of the lenders conditions. Such as household is aware about its strengths and weakness and is more likely to access credit. Having already those documents can show the capacity of household in management of its finance.

Participation in informal credit (PARTINFIN):

This is a dummy variable which takes a value "1" and "0" for non participation and participation in informal credit respectively. According to Jacobson and Petrie (2008) and Malimba and Ganesan (2010) informal finance sector may be observed through three aspects or types of informal finance such as savings groups, insurance groups and informal loans in Rwanda.

Savings groups (tontines): A fixed amount at a given fixed period of time is deposited and each member of savings groups receives all money at his round. It is a rotating credit association that allows members to accumulate finance for a projected investment that a member cannot afford himself once. It can also serve for members to pool risk. There is no penalty to leave the group for any member once a cycle in which all group members receive the pool of money is complete. There is also no limited size or rotating period.

Insurance groups: present two general forms; rotating work group for construction or agricultural work by exchanging labor to help each other among the group members and offering financial assistance in the case of a bad shock such as death, illness. It is insurance characteristic and members typically pay a periodic fee to belong well as not only monetary is the existence matter of the group.

In addition to this informal credit indicated above, **informal loan** come in as usually short-term, small, and are largely used for immediate consumption smoothing. It is hypothesized that participant in informal credit are less likely to participate in formal credit. This is because may be risk averse in way that they still want to bear the cloth of other group members. This is because they fear the risk of default once they take the formal credit.

Agricultural Extension Service (AGREXTSERV):

This is a dummy variable which takes a value "1" and "0" for participation and non-participation in agricultural extension service respectively. Extension service in this study was categorized in two aspects: extension to modern agriculture use and finance service aspect. A household which accessed extension service on fertilizer use, mechanization, and improved seeds may be a potential borrower and producer. The household may interest more lenders by having more working capital than the one which did not use such modern technologies. Therefore, it was expected that, this variable positively influences farmer's access to credit from the formal sources.

3.2.2 Econometric Models Diagnostic Tests

Green (1993) noted that the data in hand for a researcher rarely conform exactly to the theory underlying the model. Therefore, before proceeding with the estimation of the multiple linear regression equation, the use of economic theories, logic of small scale farmer and stress econometric realization in modeling has been imperative for analyzing factors that influence access to credit. The process started with testing the degree of correlation among explanatory variables (multicollinearity), their relationship with the random term (Heteroscedasticity) and the viability of specified model itself (fitness of the model).

3.2.2.1 Multicollinearity

The correlation coefficients were determined to identify any variables that might be correlated and the variables which were found to be highly correlated were either matched or one of them was excluded from the model. Koustoyiannis (1973) stated that multicollinearity refers to the presence of linear relationships (or near linear relationships) among the explanatory variables. He argued that multi-collinearity is always present in sample data and the degree of its severity in the exogenous variable should be tested. According to Kennedy (1985), for no continuous variables, a value of 0.8 or higher in absolute terms in one of the correlation coefficients indicates a high correlation between the two independent variables. Gujarati (1995) contributed also by arguing that if the Variance Inflation Factor (VIF) of a variable exceeds 10 (this will happen if R^2 exceeds 0.90), that variable is said to be highly collinear (rule of thumb) and it can be concluded that multicollinearity is a problem. Therefore, two techniques that are the contingency coefficients and Variation Inflation Factors (VIF) for discrete variables and for continuous variables, respectively, were used.

The result of the degree of the Variance Inflation Factor (VIF) technique is calculated as:

$$VIF_{x_i} = \left(\frac{1}{1 - R_j^2}\right)$$ (Where: x_i = the jth continuous explanatory variable regressed on the other

explanatory variables. R_j^2 = the coefficient of determination in the (auxiliary) regression of x_j on

the remaining regressors)

The results from the application of the contingency coefficients test calculated as:

$$c = \sqrt{x^2/n + x^2}$$

Where: c = Contingency Coefficient; x^2 =Chi-square statistic and n = total sample size

3.2.2.2 Heteroscedasticity Test

Kennedy (1985) states that heteroscedasticity is the tendency of the disturbances to vary with

some or all the explanatory variables. As a result of violation of constant variance assumption of

the disturbance term, this tendency renders the parameter estimates inefficiency in independent

variable prediction (Greene, 1993). This study tested for heteroscedasticity (see chapter 4,

section 4.3.2.3)

3.2.2.3 Model Specification Errors Test

Inclusion of unimportant or omitting important variables renders the parameter estimates

inefficient. Therefore, the computed likelihood ratio and linear predicted values ensured the

appropriate model to consider.

According to Green (1993), Likelihood ration (LR) is generally denoted in the form

$$LR = -2\{log[L(H_o)] - log[L(H_1)]\},$$ where $L(H_o)$ and $L(H_1)$ denote the values of the likelihood

function under the null (H_o) and alternative $[(H]_1)$hypotheses, respectively. By imposing a set of

constraints[3], different models were compared from their LR. In addition, the linear predicted values which are linear predicted value *(_hat)* and linear predicted value squared *(_hatsq)* were computed to find out whether the model has been correctly specified or whether it could be improved if extra variables were added. The selected variable to be included in thrifty model are indicated in table 3.1

Table 3.1: variables to be included in logit regression model

Variables	Unit	Expected sign
Gender of household head	Male=0 Female=1	+/-
Age of household head	Number	+/-
Education of householder head	Number	+
Size of household	Number	+/-
Agricultural extension service	dummy variable participation =1 non-participation=0	+
Keeping Farm Records	Dummy variable Keeping Records=1 Non -Keeping Record=0	+
Size of land holding	Acres	+
Participation in informal credit	Dummy variable participation =0 non-participation=1	-
Off-farm income	Rwandan francs	+/-

3.3 Methods and Procedures

3.3.1 Data need and Data sources

Structured questionnaire was prepared to collect quantitative data for the study. Primary data sources were the sample farm households both male and female headed from different wealth groups, and other key informants. Secondary data was collected from savings and credit

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[3]The model with more parameters will always fit at least as well as it has greater log-likelihood; thus, nested models were used (a model by which, the more complex one can be transformed into the simpler model by imposing a set of constraints on the parameters

cooperatives (SACCOs, COOPECs), the Union des Banques Populaires du Rwanda (UBPR) and Microfinance Institutions.

3.3.2 Sampling Procedure and Data Collection

The study adopted multistage sampling procedure to select the farm households for this study. The Eastern Province was selected purposely out of the total 4 provinces of Rwanda. The motivations for such choice are that it is a potential agricultural zone; the area is qualified for food diversity and a food reserve of the country. It is sub-divided into seven districts by which Rwamagana district was purposively selected since it is a strategic district which hosting the Eastern Province administration. It touches on the border of Tanzania and it is also bordering the Eastern province and Kigali city, the capital of Rwanda. The sample unit was a household head who is a farmer either received formal credit or not before the survey.

Following the Cochran (1963) formula the sample size was determined as follows:

$$n = \frac{[Z^2 (1 - p)p]}{e^2}$$

Where:

n : is the sample size

Z : is the desired confidence level, e.g. 95 % (Z =1.96 for a two tailed test)

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

p : is an estimated proportion of an attribute that is present in the population.

In this study a p-value of 0.86 was used. This is based on the fact that only 14% of adult population was banked (we assume that the national average can be applied to that study area). (DFID, 2009)

The sample was calculated as shown in the equation below;

$$n = \lceil 1.96^2 (1 - 0.86)0.86 \rceil / 0.05^2 = 185$$

The monograph of the district in which the statistics about offered credit was used to determine the sample size for each smallest local administration (Republique du Rwanda, 2008).

Table 3.2: Selection of Household to be interviewed and effectively interviewed

District	Number of head who had bank account	Minimum credit participants household to be interviewed	Interviewed credit participants	Interviewed no credit participants
Fumbwe	503	5	12	19
Karenge	1428	14	10	21
Muhazi	849	8	11	20
Muyumbu	525	5	10	21
Mwulire	376	4	10	20
Rubona	535	5	11	20
Total	**4216**	**41**	**64**	**121**

Source: Field survey, 2011

From table 3.2, a targeted sample of 185 households was drawn. The number of household for each sector expected to be interviewed and those effectively interviewed by randomly selected are indicated. The hypothesis that selection might lead to at least a minimum number of banked household needed for better analysis was verified positive. For example in Fumbwe sector, 12 (a number which is above 5) individual households were found banked, only in Karenge sector where the number was found low. Therefore, the random sampling selection approach had been effective.

3.4 Data Analysis Tools

Data was analyzed using STATA 10 program and SPSS (Statistical program for Social Sciences). The analysis includes both descriptive and econometric models.

3.5 Study Area

This research was conducted in Rwamagana District. It is situated in East Province of Rwanda with an area of 691.6 square kilometers. The population of Rwamagana District is estimated at about 223 653 inhabitants spread over 14 sectors known as ''Umurenge'' in local dialect (GoR, 2007).

Rwamagana is a strategic district. Not only is it among the most agricultural productive area of Rwanda, but it also hosts the Eastern Province administration. It borders Tanzania and the capital of Rwanda, Kigali city. The Households was about 48,754 and among them 34 percent female were headed in 2008 and the population density was about 323 persons per square kilometer. In the entire district, 3.58 percent of the individuals possessed bank accounts and 4,175 received credit at the end of 2008. Agriculture and livestock are the main activities in the district where smallholder farming dominates the overall economy. Farming system is undermined by continuing land fragmentation as a result of land acquisition system (inheritance from father to son) and increasing population. The crops grown are principally food crops such as banana, maize, sweet potato, irish potato, cassava and sorghum. The Rwamagana district on the finance aspect doesn't show particularities in finance aspects. The monograph of Rwamagana District only shows the number of Household head who have bank accounts but doesn't show the peoples who borrowed finances.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents and discusses results. It is divided into two main sections. The first section summarizes the results of descriptive analysis of farm household interviewed, while the second section presents the econometric analysis that identifies the most important factors that affect smallholder farmers' access to formal credit.

4.2 Descriptive Statistics

These results are based on cross-sectional data collected from a total of 185 smallholder farmers from 6 out of 14 sectors[4] that constitute Rwamagana district (Table 3.2). The descriptive statistics presented include mean, percentage, standard deviation and frequency distribution. In addition, t-test and Chi-square test statistics were employed to compare formal credit users as and no credit user groups with respect to the hypothesized explanatory variables.

4.2.1 Socio-economic and Institutional characteristics (Discrete Variables)

Out of 185 interviewed households 64 (33 %) use formal credit and the remaining 121 (67 %) do not. Table 4.1 shows the proportion of credit users and non users defined across some household categorical variables (including keeping farm records, participation in agricultural extension, gender, education levels and participation in informal credit). It also shows the chi square test of proportion between the two groups.

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[4] The sector is known as Umurenge in native language and it is the smallest local administration

Table 4.1: Proportion of credit users and non users defined across categorical variables.

	Users		Non users		Chi^2	Total	
Characteristics	**No.**	**Percent**	**No.**	**Percent**		**No.**	**Percent**
Keeping Farm Records					7.24		
Yes	16	26	13	11		29	16
No	46	74	110	89		156	84
Gender					3.891		
Female	17	27	52	42		69	37
Male	45	73	71	58		116	63
Participation informal credit					36.784		
Yes	45	73	32	26		77	42
No	17	27	91	74		108	58
Agricultural extension service					0.624		
Yes	41	66	48	39		89	48
No	21	34	75	61		96	52
Education					1.141		
Never went to school	1	1.6	7	5.7		8	4.3
Primary school	27	43.5	70	56.9		97	52.4
Secondary school	29	46.8	46	37.4		75	40.5
Attended university	5	8.1	0	0		5	2.7

Source: Computed from the field survey data, 2011

From the Table 4.1 , the sample comprised of both male and female-headed households. For the total households interviewed, the proportion of male headed households was 63 percent and that of female headed households was 37 percent. Among the credit users, the number of female headed households was lower than that of male headed households.The differences in terms of gender among the two groups was statistically significant at 5 percent level of significance. The implication is that male headed households had more access to credit from the formal financial sources.

From Table 4.1 , the proportion of illiterate respondents (that is, those who never went to school) for the whole sample was 4.3 percent, 1.6 percent for the credit users and 5.7 percent for non credit users. The table further shows the proportion of farmers who attended primary school that is about 52.4 percent, 43.5 and 56.9 percent for the whole sample, credit users and non-users respectively. Also about 40.5 percent for the sample and 46.8 and 37.4 percent for credit user and non-users respectively have attended secondary school. Proportion of respondents with university education was higher among the credit users compared to the non credit users. Generally the proportion of credit users that have higher levels of education is higher compared to the non credit users significantly different at one percent level of significance as shown by the Chi square test. This may implies that educated farmers have more experience to the external environment and information which can facilitate them easily connect to credit sources.

The collected information on extension was about farming aspect and use of financial products aspect. The number of respondents who received agricultural extension service was 48 percent. As indicated in Table 4.1, out of the total respondents, among the credit users 66 percent received agricultural extension service while among the non-users only 39 percent received agricultural extension service. In general it can be seen that more credit users received advice from extension services compared to the non credit users. The proportion of credit users who received extension services was significantly higher compared to that of non credit users at 1 percent level of significance. This implies that farmers who access extension service are more knowledgeable on formal credit source and will have more opportunities to get agricultural credit.

Out of the total formal credit users 73 percent of household also participate in informal credit, whereas among the non credit users only 26 percent participate in informal credit (Table 4.1). This is implies that there was complementarily or dependence between formal credit and informal credit; the proportional of household which accessed formal credit was higher among informal credit users than their counterpart. The chi- square test also indicates that the proportion of formal credit users who participate in informal credit was significantly higher compared to the non credit users at 1 percent level of significance.

From table 4.1, among the users credit, only 26 percent had been keeping records whereas 74 percent did not. While among the non users credit 11 percent have been keeping records whereas 89 percent did not. Chi square test indicate the proportion of credit users who keep record was significantly higher than the non credit users at 5 percent level of significance. This is an assumed indicator that borrowers were more conscious about farm management. They had an advantage accessing credit because they are required to provide finance historical records on their enterprise when applying for loan in order to assess their credit worthiness.

Table 4.2 Summary statistics of Household credit users and non users

	Users		Non Users		t value	P value	Total Sample (185)	
Characteristics	N=62		N=123				N=185	
	Mean	Std Dev	Mean	Std Dev			Mean	Std. Dev
Land size (acres)	2.615	5.590	3.429	7.675	0.741	0.460	3.156	7.040
Age (Years)	43.484	10.651	41.780	10.301	-1.050	0.295	42.35	10.42
LnOff farm income	8.072	7.897	4.948	8.507	- 2.4**	0.017	7.510	8.202
Household size	6.452	2.427	5.764	2.265	-1.902**	0.059	5.99	2.337

*** Significant at 1 percent, **significant at 5 percent

Source: Computed from the field survey data, 2011

The oldest and youngest for the sample were 73 and 21 respectively. The age structure of the sample households was not significantly different between credit users and non users (P>0.1). The average age was 43 years and 41 years for credit users and non users respectively. This probably implies that older farmers accumulate more information and have adequate experience about the institutions that help them to access to formal credit.

From Table 4.2, the average family size of the sample respondent households was found to be 6 persons for the whole sample. Average family size was significantly higher among credit users (approximately 7 persons) compared to the non credit users (approximately 6 persons) at 10 percent level of significance. The results showed that the total sampled households for both the non-users and users had a family size that ranges from 1 to 15 persons (Appendix 1).

Land is basically an asset for Rwandan household which is used in production and which can be sold at any time by the owner. Land is known to be scarce and mainly distributed as inheritance from father to son or daughter (Musahara, 2006), and can be also acquired through the market. The table 4.2 shows that the household own land size ranged from 0 to 60 hectares with an average of 3.43 hectares for non users and 2.62 for users. We found landless among both group and land was unequally distributed for both group, the standard deviations were 5.59 and 7.68 for credit users and non-users respectively. However there was no significant difference between the two groups (P>0.1). In general, land is used as collateral for accessing formal credit. However, in Rwanda large land holdings is not a necessary requirement for accessing formal credit since most households do not own land title deeds and as such land cannot be used as collateral. Statistics show that out of 7.7 million plots only around 80,000 land plots (1.03 %) have formal title deed; this support the statement by Tony *et al* (2008) that the institutions that support the land and property market are poorly developed in Rwanda.

Table 4.2 shows the Comparison between the two groups (users credits and non users credit) was done based on the natural logs of the off farm income and it was found that two groups are significant difference at 5 percent level of significance. On average the credit users earn more off farm income compared to the non credit users by 427,703 Rwandan francs (713 US $) and 176,008 Rwandan francs (293 US $) respectively. The maximum earned off-income were 3,134,000 Rwandan francs (5,223 US $) and 1,240,300 Rwandan francs (2,067 US $) and among the credit users and non credit users respectively.

4.3 Maximum-Likelihood Estimation of Factors Influencing Access to Credit

4.3.1 Introduction

As indicated in methodology section, the analysis started by testing whether the hypothesized variables fit the model well. Tests such as multicollineality, heteroscedacity, inclusion of unnecessary or omission of important variables were performed. This section precedes discussing significant independent variables

4.3.2 Econometric Model Diagnostic Result Tests

The result of econometric model led to exclusion or merging of some variable in the analysis in order to get a thrifty model. The analysis was conducted in the following the steps below:

4.3.2.1 The Specified Model and MLE of Multiple Regression Models for Logistic Model

Different model were compared each other and a model with the minimum Likelihood Ratio equal to 62.87 was chosen. It also has a chi-square probability values equal to 0.0000 and was responding economics theory and logic for further analysis.

Table 4.3: Link test analysis

Access	Coef.	Std. Err.	P>|z|	[95% Conf. Interval]	
Predicted Value(_hat)	0.99	0.16	0.00	0.66	1.31
Predicted Value square	-0.00	0.07	0.90	-0.14	0.13
_cons	0.01	0.24	0.95	-0.46	0.49

Source: Author's computation, 2011

In additions to link test, the predicted value *(_hat)* indicates how level the dependent variable is explained by the independents variables that were included in the model and the predicted valuable square *(_hatsq)* indicates how important the omitted variables are.

From the Table 4.3 the coefficient of (*_hat*) was statistically significant at 1 percent while one of (*_hatsq*) was not statistically significant even at 10 percent. Therefore, the two hypothesizes that the models did not fit the data well and that some variable (s) might have been omitted were rejected.

4.3.2.2 Test of Multicollineality

As indicated in Chapter 3, there are two measures that are often suggested to test the presence of multicollinearity. These are: Variance Inflation Factor (VIF) for association among the continuous explanatory variables and contingency coefficients for dummy variables Gujarati (2003). From Table 4.4, as suggested by Kennedy (1985) and Gujarati (1995), the hypothesis that there was high degree of association between the variables was rejected. The decision is based on the fact that the high coefficient correlation was 0.20.

Table 4.4: Contingence Coefficients' Estimate

	KEEPFARE	GENDHH	EDUCL	PARTINFIN	AGREXTSERV
KEEPFARE	1.00				
GENDHH	-0.08	1.00			
EDUCL	-0.00	-0.10	1.00		
PARTINFIN	-0.20	0.19	0.01	1.00	
AGREXTSERV	0.06	-0.09	0.08	-0.19	1.00

Source: Author's computation, 2011

Contingency coefficients were computed to check the existence of multicollinearity problem among the discrete explanatory variables. The decision rule for contingency coefficients is that when its value approaches 1, there is a problem of association between the discrete variables.

The negative sign shows the negative relationship between variables that is an increase in one variable will cause a decrease in the other. From table 4.4 the hypothesis that there was high degree of association among the discrete variables was rejected since the highest coefficient correlation was 0.20.

Table 4.5: Variance inflation factor for continuous explanatory variables

Variable	VIF	1/VIF
SIZEH	8.08	0.12
AGEHH	8.40	0.11
LNOFF-FARMI	1.40	0.71
LANDSIZE	1.21	0.82
Mean VIF	4.77	

Source: Author's computation, 2011

Table 4.5 shows the VIF for the continous variables included in the model. According Gujarati (1995) presence of multicollinearity among variables is indicated by a VIF greater than 10. As such the hypothesis of presence of mulicollinearity among the continuous variables was rejected. Generally, the data was found to have no serious problem of multicollinearity.

4.3.2.3 Test of Heteroscedasticity

One of the assumptions in regression analysis is that the errors, u_i have a common (constant) variance σ^2. If the errors do not have a constant variance we say they are heteroscedastic (Maddala, 1992). The problem in this study is minimized by choosing the best functional form and also checks the result using statistic test. Based on the Breusch-Pagan and Cook-Weisberg test which resulted to chi2 (1) = 0.12 that means fail to reject the null hypothesis, no heteroscedasticity problem in the model.

H_o: Constant variance (homoscedasticity)

H_1: Not constant variance (heteroscedasticity)

Therefore we concluded that there is no violation of the assumption of homoscedasticity; that is the variance of the error term is constant.

4.3.3 Discussion of Significant Variables

Table 4.6 below presents the estimated results of the logistic model. The likelihood ratio test has a Chi-square statistic equal to 62.87 with 9 degrees of freedom. The Log likelihood is equal to - 86.55. Therefore, the null hypothesis that the parameter estimates for the model are equal to zero is rejected.

The results (Table 4.6) below give us the probability of household use of formal credit. The maximum likelihood estimates of the logistic regression model show that participating in informal credit, agricultural extension service, education and the off-farm income were important significant explanatory variables.

From Table 4.6, the logit coefficients are function coefficients which do not correspond on average partial effect and are interpreted in terms of changes in the logit index. The computation of marginal effects allows getting changes in probability of an event as a consequence of unit change in independent variable.

Table 4.6: Logit Regression of the Factors Influencing Access to Formal Credit

Variable	Maximum likelihood estimates			Marginal effects		
	Coef.	Std. Err.	P-value	Coef. (dy/dx)	Std. Err.	P-value
KEEPFARE	0.69	0.54	0.19	0.10	0.08	0.19
LANDSIZE	-0.02	0.03	0.48	-0.00	0.00	0.48
AGEHH	0.01	0.02	0.39	0.00	0.00	0.39
GENDHH	0.05	0.41	0.89	0.00	0.06	0.89
SIZEH	0.04	0.09	0.60	0.00	0.01	0.60
EDUCL	0.98	0.35	0.00***	0.14	0.04	0.00***
PARTINFIN	-1.92	0.40	0.00***	-0.29	0.04	0.00***
AGREXTSERV	0.95	0.38	0.01***	0.14	0.05	0.00***
LNOFF-FARMI	0.04	0.02	0.06*	0.00	0.00	0.05**
CONST	-3.01	1.11	0.00***			

***, **, * Represent level of significance at 1%, 5% and 10 %, respectively.

Pseudo R2 0.2664

LR chi2(9)   =   62.87

Prob > chi2   =   0.0000

Log likelihood = -86.552163

The result of this study as shown in Table 4.6 confirms the hypothesis that off-farm income influenced positively the access to formal credit. The effect was significant at 5 percent. A unit increase in the off farm income will increase the likelihood of the farmer to access formal credit by 4.6 percent. This finding suggest that farmer's financial endowment increases the probability of formal credit use. The finding that households with higher levels financial endowments are more likely to participate in formal credit than their counterparts suggests poor farmers can be excluded from accessing formal credit perhaps because they lack appropriate collateral.

It is also apparent from the results that households which receive technical advice from agriculture extension agents are more likely to use formal credit as shown by the positive and statistically significant coefficient. The result in Table 4.6 shows that the probability of formal credit use for those households who had accessed advice is higher by 14.5 percent compared to those who do not access these services. This finding holds true if extension on use of modern

technology such as improved seeds, pesticide and fertilizers requires more capital in farming enterprise.

We had hypothesized that participating in informal credit for a household disfavored access to formal credit but the coefficient was negative and highly significant (at one percent). Therefore, participating in informal credit was found positively associated to formal credit use. This indicates that the probability of participating in formal credit is affected by participating or not in informal credit. In particular, the results show that households which participated in informal credit had a higher probability of participating also in formal credit than their counterparts. The result also indicates that a household which does not use informal credit have a lower likelihood of accessing formal credit by 29.2 percent. The finding may be due to the purpose that the two different credit sources fulfill and or complement each other. It means that the policy of transforming systematically informal finance organization to formal may increase access to formal credit use.

Just as expected education level has a positive sign and is significant at 1 percent, implying that a higher educated farmer is associated with a significantly higher chance of accessing a formal credit. The result of marginal effect indicates that farmers with higher levels of education have higher likelihood of accessing formal credit by 14.9 percent. This finding are supported by Nguyen (2003) who holds that education is the most important factor affecting households' credit activities. This may be due to the fact that educated farmers have a better understanding of banking procedures and rules for acquiring and using formal banking financial product and services.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary and Conclusion

The purpose of this study was to provide an economic assessment of factors influencing household access to credit in Rwamagana district, Rwanda. Secondary and primary data were used. A total of 185 households were interviewed in May 2011. Primary data were collected using structured questionnaires that were administered to the sample of households' heads via person-interviews. Data was analyzed using STATA 10 program and SPSS (Statistical program for Social Sciences). The t-test and Chi-square test statistics were employed to compare credit user as participant and non credit user as non participant farmer group with respect to the explanatory variables hypothesized to influence access to credit. The binary logit model was used to estimate factors which influenced household access to credit were discussed.

Out of 185 households interviewed households 64 (33 percent) of the sampled farm households were credit users, whereas the remaining 121 (67 percent) were non-users. The logistic regression analysis results show that among nine explanatory variables which were included in the model namely off-farm income, agricultural extension service, education, Participating in informal credit, gender of household, size of the household, size of the landholdings, age of household and keeping farm records, only four variables (off-farm income, agricultural extension service and education, Participating in informal credit) were statistically significant. The remaining five variables (gender of household, size of the household ,size of the landholdings, age of household and keeping farm records) was less powerful in explaining the variation.

The maximum likelihood estimates of logistic regression model showed that off-farm income, agricultural extension service, education and participating in informal credit were important factors influencing smallholder farmers' access to formal credit in the study area.

It was observed that household's credit users and non users were significantly different. The households' formal credit users were mainly male headed than their counterparty. Users credit (66 percent) received agriculture extension service more than non users credit (39 percent). The majority (58%) of sampled household did not used credit at all, either formal or informal. About 73 percent among formal credit users participated also in informal. The household which participated in formal credit were earning more off-farm income than their counterparts. The average off-farm incomes were 427,703 Rwandan francs (713 US $) and 176,008 Rwandan francs (293 US $) for participants and no-participant respectively and the two categories were significantly different. Average household size was higher among the credit users compare to the non credit users. The two groups were found significant different. The average household sizes were 6.45 and 5.76 members for formal credit participants and no-participants respectively.

Binary Logit model was used to assess the factors influencing household participating in formal credit use with the dependent variable taking the value of 1 for participant and 0 for no-participant. From this study earning more off-farm income increased about 4.6 percent likelihood of participating in formal credit. The results confirmed the Bradley (2005) finding; that households experiencing an increase in income were more likely to use formal credit.

It was found that participating in informal credit increased the likelihood of participating in formal credit. This indicates that there is compatibility between informal credit and formal credit use since the participation in the first increased the probability to use the second. Therefore, the

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hypothesis that the informal credit participation has the negative relationship with formal credit use, the hypothesis was rejected.

The results of the logit model show that participating in agricultural extension services affect positively and significantly to access to formal credit at one percent. The farmers who use modern agricultural technologies are those who got more access to credit facility than does who do not participate in agricultural extension services.

In addition it was found that education level of household affects access to formal credit positively and it was significant at one percent probability level. It was observed that farmers educated have more facilities accessing that formal credit. This result differs with Shah *et al* (2008) who found that education level has a negative effect on credit participation which also similar to Nguyen, (2007). Households heads possessing higher degrees were showing almost no participation, because higher education may help head of households to easily find a paid job.

The hypothesis that the informal credit participation is negatively associated with formal credit use was rejected since those farmers who participated in informal were also found to use formal credit. Similarly, the hypothesis that access to credit is not determined mostly by household socio-economic and institutional factors was also rejected for some variables (off-farm income, agricultural extension service, participating in informal credit and education level of household) which were significant in the logit model.

5.2 Major findings

Out of 185 samples of households interview, the study concluded that a total of 33 per cent of the surveyed households were found to be users credit and 67 per cent were non users credit. In

addition, the descriptive statistics results showed that there were statistically significant differences between users and non-users in Rwamagana District with respect to agricultural extension service, education, gender, participating in informal credit and keeping farm records.

On the other hand, using Logit model the study shows that off-farm income, agricultural extension service, participating in informal credit and education level of household were statistically significant, that means they have influence on smallholder farmers access to credit. Whereas gender of household, size of the household ,size of the landholdings, age of household and keeping farm records were not statistically significant, that means they don't have influence on smallholder farmers access to credit .

5.3 Recommendations

The study recommends the following policies aimed at improving farmers' access to formal credit.

- Off –farm income was found to be one of important factors, which increase access to credit use maybe because those Farmers who engage in off-farm activities earn more income and are able to get formal credit. Hence, other than focusing on increasing agricultural production only, the government should also emphasize on policies aimed at increasing opportunities for off-farm activities. This can be enhanced through creation of jobs and motivating self employment.

- Empirical results show that educated farmers have a higher likelihood of accessing credit. The government and other development agencies should redouble efforts to improve education levels at Rwamagana District since education enhances people to arrive at

more informed decisions about loans. Hence, the government and development agencies need to invest more in educational efforts.

- Farmers who participate in agricultural extension services were found to be more likely to access credit. This might be because of the fact that those farmers who have received the extension service have developed the skills of using new agricultural technologies that would increase access to credit use. In other words, encouraging farmers to participate in the uptake of new technologies on regular basis would improve the availability of loan to the farmers. Hence, the government agencies should promote agricultural extension services geared towards increasing training to the farmers in Rwamagana District.

- In addition, informal credit was more preferable and its use was found positively associated to formal credit participation. This may be due to traditional functionality of formal finance institutions which is not friendly to the current business environment. Therefore, the policies in place regulating formal finance sector should be revised and be made more appropriate for the smallholder farmers in Rwamagana District of Rwanda.

5.4 Future research

This study was limited to factors that determine smallholder farmer access to formal credit and didn't include the effect of risk attitude of the farmers on access to credit. It would be expected that farmers who are risk averse are likely to shun from credit due to the fear of default. The study combining formal and informal finance sector in their all aspects should establish the exhaustive information on rural finance sector development need. These is a possible research gap that may bridged by future researchers.

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7. APPENDICES

Appendix I: Continuous Variables used

	No user				User			
	Min	**Max**	**Mean**	**Std. Deviation**	**Min**	**Max**	**Mean**	**Std. Deviation**
Land size	0	60	3.428	7.674	0	41	2.615	5.589
LnOffarm income	-4.61	14.03	4.948	8.507	-4.61	14.96	8.072	7.896
Hhd age	21	66	41.78	10.301	25	73	43.48	10.651
Hhd size	1	14	5.7	2.25	3	15	6.39	2.41

Appendix II: HOUSEHOLD SURVEY QUESTIONNAIRE

A. SURVEY QUALITY CONTROL

A.1.QUESTIONNAIRE CODE _____

A.2.SECTOR _____

A.3.CELL _____

A.4.DATE OF INTERVIEW: DAY_____ MONTH _____

A.5.ENUMERATOR_____

A.6.FAMILLY NAME OF THE RESPONDENT_____

B. SITE IDENTIFICATION

B1. TYPE OF LOCATION (Habitat): …………   (1. Open settlement   2. Umudugudu   3. Rural town)

B2. ELECTRICITY AND TELECOMMUNICATION INFRASTRUCTURE: **B2A.** ELECTRICITY PROVIDED IN THE HOMESTEAD :………………. (0. NO   1. YES)
                                                                                                            B2B. MOBILE TELEPHONE NETWORK AVAIALABLE:………… ……... (0. NO   1. YES)

B3. FINANCIAL SYSTEM :   B3A. NUMBER OF SACCO BRANCHES IN THE SECTOR:…….   AVERAGE INTEREST RATE CHARGED: ………%
                                          B3B. NUMBER OF BPR   IN THE SECTOR: ………….   AVERAGE INTEREST RATE CHARGED: ………%
                                          B3C. NUMBER OF (NGO) MICROFINANCE PROGRAMES IN THE SECTOR:.. AVERAGE INTEREST RATE CHARGED: ………%
                                          B3D: NUMBER OF INFORMAL MICROFINANCES IN THE SECTOR:…….   AVERAGE INTEREST RATE CHARGED:..……..%
                                          B3E: NUMBER OF COMMERCIAL BANK IN THE SECTOR: …… AVERAGE INTEREST RATE CHARGED: ………%
                                          B3F: NUMBER OF COOPEC BRANCHES IN THE SECTOR: …………   AVERAGE INTEREST RATE CHARGED: ………%

	B3A. Distance in walking hours	**B3B.** Distance in kilometers	**B3C.** Minimum round trip/transport cost per person (in Rwf)
1. Nearest shopping centre			
2. Nearest market			
3. Nearest major/district road			
4. Nearest primary school			
5. Nearest formal financial organization			

6. Nearest informal microfinance institution			
7. Nearest hospital			
8. Nearest bus stop			
9. Nearest water well/pipe			
10. Nearest extension officer			

C. CURRENT HOUSEHOLD COMPOSITION, INDIVIDUAL CHARACTERISTICS AND HUMAN CAPITAL

C1A. Number of persons living in the household _____

(including those who are **temporarily** away in other parts of the country or abroad)

C1B. Out of which elder (65 years old or more) _____

C1C. Out of which pre-school children (under 6 years old)_____

C1D. Out of which currently attending full-time primary school _____

C1E. Out of which currently attending full-time secondary school _____

C1F. Out of which currently attending full-time college _____

C1G. Out of which currently employed/income earners _____

C1H. Out of which currently unemployed/looking for jobs _____

Name	**C2A.** Sex 1. male 0. female	**C2B.** Age (in years)	**C2C.** Marital Status	**C2D.** Formal education	**C2E.** No. of professional or/and vocational training received	**C2F.** Number of recurring diseases
1. Respondent (Household head)						

Field codes for C2C:	1. Married living with wife/husband	2. Married but wife/husband away	3. Divorced/separated	4. Widow/widower
	5. Never married - with children	6. Never married – without children	7. Other, (specify)	

Field codes for C2D:	1. Never went to school	2. Not finished primary school	3. Finished primary school	
	5. Not finished high school	6. Finished secondary school	7. Not finished university	
	8. Finished university			

C3. Do you support financially and continuously on your relatives, friends or neighbor welfare like school fees, health care and so on?(1.yes ,0.no)

C4.How much do you contribute?

C5.Do you think there is negative effect on credit access? (1.yes, 0.no)

D. EMPLOYMENT AND INCOMES

[Record only for the last 12 months, i.e. from April 2010 to April 2011]

D1. Main job (In terms of revenue)					D2. Secondary job (In terms of revenue)				
D1A. sector of activity	**D1B.** Employment status	**D1C.** Experience in this job? Years	**D1D.** Net income from this job? Rwf	**D1E.** Distance to this work place. km	**D2A..** Sector of activity	**D2B.** Employment status	**D2C.** Experience in this job? Years	**D2D.** Net income from this job? Rwf	**D2E.** Distance to this work place. km

Field codes for D1A and D2A:	1. Agriculture (1)	2. Non-agriculture (including processing of agricultural products) (2)

Field codes for D1B and D2B:	1. Self Employment	2. Wage Employment

D3. Other sources of incomes (unearned incomes) *[Record only for the last 12 months, i.e. from April 2010 to April 2011]*

D3A. Do you have any other source of income? 0. No 1. Yes	**D3B.** Rented out land and/or other properties	**D3C.** Relief (from government or NGOs programs)	**D3D.** Pension income	**D3E.** Remittances (sent from friends and relatives living elsewhere)	**D3F.** Others (Specify…………………..)

D4. Income volumes

D4A. Total farm incomes (from D1D or D2D)	**D4B.** Did the household earn off-farm income? 1. Yes 0. No	**D4C.** Total nonfarm income Frw	**D4D.** Did the household receive unearned incomes? 1. Yes 0. No	**D4E.** Total unearned incomes Frw	**D4F.** Total household income	**D4G.** Did the HHH earn wage incomes? 1. Yes 0. No

D5. Total savings by end April 2011: ……………………. Frw

D6. Saving behavior

D6A1. Current savings balances as cash in hand: ……… … (1. Yes, 0. No) **D6A2.** Amount allocated: Frw ………………….
D6B1. Current savings balances in form of livestock: ……..... … (1. Yes, 0. No) **D6B2.** Amount allocated: Frw ………………….
D6C1. Current savings balances in form acquired durable goods: …. (1. Yes, 0. No) **D6C2.** Amount allocated: Frw ………………….
D6D1. Current savings balances in precious metals and liquid goods: … (1. Yes, 0. No) **D6D2.** Amount allocated: Frw ………………….
D6E1. Current savings balances in MFIs (deposit/savings account): .. (1. Yes, 0. No) **D6E2.** Amount allocated: Frw ………………….
D6F1. Current savings balances in informal MFIs: ………… (1. Yes, 0. No) **D6F2.** Amount allocated: Frw ………………….
D6G1. Current savings balances with friends/relatives ……..… (1. Yes, 0. No) **D6G2.** Amount allocated: Frw ………………….
D6H1. Current savings balances as contributions in cooperatives ……… (1. Yes, 0. No) **D6H2.** Amount allocated: Frw: ………………….

E. HOUSEHOLD'S SOCIAL CAPITAL

E1. Networks *[Record only for the last 12 months, i.e. from April 2010 to April 2011]*

	E1A. Type of association?	**E1B.** How actively do they participate in group decision making? 0. Don't participate 1. Somewhat active 2. Very Active	**E1C..** Cash contribution in the association Frw	**E1D.** Labor contribution in the association (hours)	**E1E.** Do all members have mostly the same income level? 0. no 1. yes	**E1F..** Do all members have mostly the same sex? 0. no 1. yes	**E1G.** How are leaders elected?	**E1H.** Generally, leaders are corrupt.	**E1I.** Generally, members trust each others

Field codes for E1A:	1. Farmer/Cattle breeder/Fisherman group or cooperative	9. Cultural group or association (e.g. arts, music, theater, film)

2. Other production group	10. Finance, credit or savings group
3. Traders or Business Association (including marketing club)	11. Local administration
4. Professional Association (doctors, teachers, veterans)	12. Education group (e.g. parent-teacher association, school committee)
5. Trade Union or Labor Union	13. NGO or civic group (e.g. Rotary Club, Red Cross)
6. youth organization	14. Other (Specify)……………
7. Women organization	
8. Religious or spiritual group (e.g. church, mosque, religious study group)	

Field codes for E1G:	1. By an outside person	3. By a small group of members	2. Each leader chooses his/her successor	4. By decision/vote of all members

Field codes for E1H and E1I:	0. Strongly disagree	1. Disagree somewhat	2. Neither agree nor disagree	3. Agree somewhat	4. Agree strongly

F. HOUSEHOLD'S ASSETS

F1A. Are you the owner of the buildings/houses in this homestead? ……   (1.Yes, 0. No)

F1B. If no, what is its rental rate? ………………… Frw

F2. Household assets

Asset name	1. Number of	2. Total forced/selling value of
F2A. Houses (developed land)		
F2B. Mall/Permanent stall		
F2C. Land parcels		
F2D. Motorized vehicles		
F2E. Financial assets (shares)		
F2F. Power Generator		
F2G. Grain mill		
F2H. Milk processing device		
F2I. Bicycle		
F2J. Television set and accessories		
F2K. Radio		
F2L. Fridges		

F2M. Cup boards and chairs		
F2N. Lounge/couch		
F2O. Total assets value		

G. HOUSEHOLD'S FARM BUSINESS

G1. Which major type of agriculture do you practice? (circle appropriate answer)
1. Mainly food crop   2. Mainly cash crop   3. Mainly horticultural crop   4. Mainly forestry

G2. Landholding and its use and*[Record only for the last 12 months, i.e. from April 2010 to April 2011] [Record only for the last major season]*

	G2A. Plot size Ha	**G2B.** Title deed? 1. Yes 0. No	**G2C.** Rented in? 1. Yes 0. No	**G2D.** Rented out? 1. Yes 0. No	**G2E.** Major crops	**G2F.** Unit of measurement	**G2G.** Qtty harvested	**G2H.** Per unit Price Frw	**G2I.** Total farm revenue Frw	**G2J.** Seed cost Frw	**G2K.** Fertilizers, pesticides and manure cost Frw	**G2L.** Labor cost Frw	**G2M.** Net farm income Frw
1.					A.								
					B.								
					C.								
2					A.								
					B.								
					C.								
3					A.								
					B.								
					C.								
4					A.								
					B.								
					C.								

G3. Livestock and poultry production output *[Record only for the last 12 months, i.e. from April 2010 to April 2011]*

Animal Type	**G3A.** Actual Stock	**G3B.** Current market value of actual stock Frw	**G3C.** Local breed? 1. Yes / 0. No	**G3D.** Total Milk (litres)/ eggs produced	**G3E.** Price per litres/egg Frw	**G3F.** Sold stock	**G3G.** Total revenue Frw
1. Cattle							
2. Goats							
3. Sheep							
4. Rabbit							
5. Chicken							
6. Duck							
7. Turkey							
8. Rat							
9. Pig							

H. Extension contact

H1A. Do you get extension service on form credit? 1) Yes   2) No

H1B. If yes, for how long have you been getting the service? _____Years

H1C. Who provides the extension service? 1) Development agents   2) NGOs   3) Banker officers   4) Microfinance staff   5)Others, specify_

H1D. How frequently were you visited by development agents in the last 12 months? Days /3 months_____

H1E. If no, why didn't you get? 1) No time   2) Not interested   3) Bad experience from previous ones   4) Already known the subject   5)Distance too far
                              6) Others (specify)

I. Participation of households in extension package program

I1A. Did you participate in agricultural extension package program in the last 12 months?   1. Yes   2.No

I1B. If yes, what was the type of the package you used? 1. Crop production   2. Animal rearing   3. Animal fattening 4.Small-scale irrigation
                                       5. Others specify_____

I1C. How did they provide you the technology? 1. In cash   2. On credit   3.In kind(Seed, kutererwa intanga mu matungo.)

I1D. If on credit, who was the source? 1. SACCOs   2. Cooperatives   3. NGOs   4. Bank   5. Private moneylenders
                               6. Microfinance   7.Others specify_____

J. Access to credit

J1A. Do you have a bank (lending institution) account? 1. Yes   2.No   In 1. MFI(COOPEC,etc) 2. BANK   3.Informal MFI(Ibimina)
4.NGO credit programs 5. Local money lender/friend/relative   6.Others (specify)

J1B. Who have more responsibility to make decision on the credit taken?

        1. Husband   2. Wife   3. Both

J1C. Have you or your spouse ever applied for loan from any source? 1. Yes   2.No

     If got it, fill out the table below

N0	**J1D**. Source of credit	**J1E.** Loan amount		**J1F.** Type of collateral required	**J1G**. Purpose of the loan	**J1H.** Rate of interest	**J1I**. Who borrowed(husband or wife)	**J1J** Loan period in months	**J1K.** If repaid (Yes, No)	**J1L.** Repayment installment	**J1M.** Number of loans applied for.	**J1N.** Number of loans obtains	**J1O.** Number of years credit used
		1. Cash	2. Kind										
1.	Local money lender/friend/relative												
2.	Informal MFIs												

	(Ikimina,…)												
3.	NGOs or Govt												
4.	Bank												
5.	Formal MFI (COOPEC,…)												
6.	Others specify												

Field codes for J1H: Purpose can be,	0.Payment for hired labor	1.Purchase of fertilizer & seeds	2. Purchase of farm implements	3. Payment for rented oxen
	4. Purchase of food	5.Purchase of livestock	6.Purchase of household goods	7. To start business (off or on farm)
	8. Payment of taxes	9. Debt repayment	10.Health expenses	11. Social ceremonies
	12. Education expenses	13. Others (specify)		
Field codes for J1G: Type of collateral required	0.none	1. Land	2. Animal	3. A permanent house
	4. Proof of job	5.Share certificate	6.Household valuables(bicycles,TV,radio etc)	7. Group signature
	8. A vehicle	9. Agriculture produce	10.Co-signature(guarantor)	11. Forest
	12. Field	11.Other specify		

J1P. If no, why did you not get (or borrow) any credit?

1. Interest too high   2. No need   3.Prefer to use own funds or little fund   4. Don't like to have debts 5. Too much requirements 6. Insufficient

income

7. Lack of guarantees (Individual Collateral, Group lending) 8. High cost of credit 9. Don't have a job   10.I have no knowledge where to start and

preparing an application letter and filling different formats 11. Repayment time 12. Non-membership of farmers cooperatives 13.Other, specify

J1Q. Do you think Formal credit is your first choice? 1. Yes   0.Non

J1R.A business by which are you applied for credit, was it successful? 1. Yes   0.Non

K. Financial management skills   **K1A**. Have you received trainings in financial management?   …… (1. Yes   0. No) **K1B**.How many……
                    K1C. Do you keep books of accounts (incomes and expenses records?   ………….. (1. Yes   0. No)

L. Lending procedure
L1A. What is your opinion in the lending procedures of formal financial institutions?

1. Preparing an application letter and filling different formats
……………………………………………………………………………….
2. Working time for the clients
………
3. Working ethics and efficiency of the officials of the institutions
…………………………………………………………………………………..
L1B. Transaction cost
     1.Preparing an application letter and meet them(Time)…………………………….....Cost………………………
     2.Fill the different formats(Time)…………………………………………..Cost…………….................
     3.Preparing the business plan(Time)…………………………………………..Cost……………………....
     4. Take measurement of collateral (Time)………………………………………… .Cost………………………
     5. Walking distance to lender's premises (Time)..Cost.................................

L1C. Do you think there are people who fail to get credit because of long and hard procedure? 1. Yes 2. No

LID. Is loan period offered by the formal finance institution approriete? 1.Yes 2.No

M. Perceived "major" constraint to borrowing (answer with 1. Yes or 0. No)

Loan details: / Credit source:	M1A. Insufficient loan size	M1B. Group lending	M1C. High interest rate charged	M1D. Long walking distance to the nearest lender's premises	M1E. High borrower's transacting cost	M1F. Unmet credit security condition – Group membership	M1G. Unmet credit security condition – Collateral	M1H. Unmet credit condition – entrepreneurship (Business plan/Business Development Service)	M1I. Unmet credit condition – Savings/Deposits)	M1J. Short /inflexible repayment period	M1K. Lack of transparency/corruption in credit practices	M1L. Lack of credit extension Service	M1M. Lack of opportunity to take a second loan	M1N. Working time of the institutions
1. Local money lender/friend/relative														
2. Informal MFIs (Ikimina,…)														
3. Formal MFI (COOPEC,…)														
4. Bank														
5.NGO or Govt credit program														

N. Attitude towards risk and perception about formal financial institutions

N1A. Is staff of loan administration accessible? 1. Yes 2. No

N1B. Do found credit useful for your farming? 1.Agree   2.Neutral   3.Disagree

N1C. If disagree, what is your bad experience on credit? ....

N1D. How do you get information from lending institution?…………………………………………………………