# DETERMINANTS OF SMALLHOLDER FARMERS ACCESS TO FORMAL CREDIT IN RWANDA

**A Thesis Submitted to the to the School of Economics and Governance in Partial Fulfillment for the Award of a Master Degree of Sciences in Economics (Development Economics Option) of University of Rwanda**

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# UNIVERSITY OF RWANDA

## COLLEGE OF BUSINESS & ECONOMICS

Approval Sheet

This thesis entitled **DETERMINANTS OF SMALLHOLDER FARMERS ACCESS TO FORMAL CREDIT IN RWANDA.** Written and submitted by **KAJIGIJA Eugene** in partial fulfilment of the requirements for the degree of Master of ECONOMICS (Development Economics Option), is hereby accepted and approved. .

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## DECLARATION

I hereby certify that this thesis is my own original work and has not been submitted previously as part of the requirements of another degree in any other academic institution.


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# DEDICATION

I dedicate this thesis to my lovely family and nearest friends.

# ACKNOWLEDGEMENTS

## ABBREVIATIONS AND ACRONYMS

ADB             African Development Bank

BDF             Business Development Fund

BNR             Banque Nationale du Rwanda

BRD             Bank Rwandese de Developpement

CESS            Centre for Economic and Social Studies

EICV            Enquête Intégrée des Conditions de Vies des ménages

FMT             FinMark Trust

GDP             Gross Domestic Product

IFC             International Finance Corporation

MFI             Micro Finance Institutions

MINAGRI         Ministere d'Agriculture

MSE             Medium and Small Enterprises

NISR            National Institute of Statistics of Rwanda

ROSCA           Rotating Savings and Credit Agencies

SACCOS          Savings and Credit Cooperatives Societies

SACI            Specialized Agricultural Credit Institutions

UN              United Nations

VIF             Variation Inflation Factors

VUP             Vision Umurenge Program

# LIST OF TABLES

# LIST OF FIGURES

# TABLE OF CONTENTS

# ABSTRACT

While formal credit is believed to enhance productivity and promotes standard of living by breaking vicious cycle of poverty and also considered to be an essential input in increasing agricultural productivity it remains limited to many smallholder farmers in Rwanda. Despite this, there is still limited studies on the determinants of smallholder farmers' access to formal credit. The main focus is to determine factors that affect smallholder farmers accessing credit facilities, identify discrepancies between rural and urban areas in accessing formal credit and also determine whether there is a gender gap in accessing credit facilities as well as gaps between different wealth groups. The data used in this study was drawn from the FinScope Rwanda 2016 survey conducted in 2015/2016 by Centre for Economic and Social Studies (CESS) and approved by the National Institute of statistics of Rwanda (NISR). Standard binary logit technique was deployed to assess the factors determining smallholder farmers' access to formal credit. Among the findings is that households which are headed by male and female headed household are not statistically significant. However, the study revealed that there is discrepancies in smallholder farmers living in urban and rural areas in accessing formal credit and also the difference in wealth groups in accessing credit from the formal sources was statistically significant. The study recommends improving transportation infrastructures such as roads, telecommunication, and other infrastructures in different areas to make financial services providers more accessible across the provinces.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the study

In most low income countries agriculture is the backborne of their economy and employs the majority of the people. There are approximately about 450 million globally engaging in agriculture activities(IFC 2014). Smallholder farmers estimated to 500 million hold less than 2 hectares of farm land and it is estimated that about 2 billion to 2.5 billion people earn their living within these farmers (Hazell 2011 and Christen and Anderson 2013). Great number of rural poor feeds from these farms. In poor countries it has been identified that the largest share of food is coming from smallholder farmers (Carroll et al. 2012). Data form Findex(IFC 2014) revealed that agriculture remains a key economic activity in Africa and employes about 55% of the population, but only approximately 1% of bank lending goes to the agricultural sector. Furthermore, most of the population live in rural areas in developing countries and about 7.4 percent received credit from formal financial sources while about 5.9 percent opened an account with banks.

In order to break a persistent vicious cycle of poverty of small scale famers and promote standard of living, enhancement of agricultural credit is of a paramount importance. Adegeye and Dittoh (1985) described agricultural credit as the process of obtaining control over the use of money, good and services in the present in exchange for a promise to repay at a future date. Agricultural loan is a crucial input in small holder agriculture because it enables small scale farmers to establish and expand their farms as this would increase their income and ability to repay loan (Imoudu and Onaksapnome,1992). For the household who are smallholder farmers formal credits is needed to buy farm inputs for improving their farming technology, buying livestock especially goats, sheep and cattle to relive themselves from distress.

1

In Rwanda, small scale and large scale farming are the main contributors of the whole economy. In 2017, agriculture sector represented around 31% of Gross Domestic Product (NISR 2017), and employs the large part of Rwandan labor force participation with 66.0 percent in February 2018(NISR 2018).

Smallholder farmers tend to have little or no access to formal credit despite their socioeconomic importance. This has been a major obstacle for them to apply new farming technologies and it has been very difficult to raise the level of their income through farming activities. To this extent, hunger and poverty has been a persistent problem in their lives. In developing countries in general and Rwanda in particular natural resources such as land has not been exploited and farming technologies such as usage of improved seeds and fertilizer are not familiar to the large part of the population, it has been a big challenge to relieve households who are smallholder farmers from their poverty unless adequate and affordable financial services is well streamed into rural areas(Malimba and Ganesan, 2010).

The nature of financial system in Rwanda is of a dichotomous; formal and informal. These two has been serving as the main sources where borrowers seek agricultural credit and they co-exist together though their accessibility and proportion differs. Formal and informal credit have imperfect substitutability nature, whenever formal sector borrowing exist it has never been able to uproot informal sector but studies revealed that it attracts informal sources due to its rigidit requirements. This suggests that the two forms of credit fulfill different functions in the household's inter-temporal transfer of resources (Sisay Yehuala 2008).

Lending terms and conditions of the commercial banks and other formal institutions are the main hindrances for smallholder farmers to secure credit. Low income earners are considered uncreditworthy due to the fact that they have no security to give as collateral(Adera, 1995). In

developing countries, much efforts has been deployed to overcome poor and lack of fanancial services among rural poor population. However, despite the effort employed large part of the population still facing the problem of limited financial services and other financial facilities to support their financial liabilities (Braverman and Guasch, 1986).

It has been revealed that the borrowing of money in Rwanda stood at 72 percent. The study shows that among the population which borrow only 4 percent borrow from the banks and 13 percent borrow from other formal sources other than banks. The same study also revealed that 61 percent borrow from informal sources  while 32 percent obtained money from relatives and friends. (FinScope Rwanda survey 2016).

Different mechanisms was laid down to finance agricultural activities such as financing facilities, to adress  limited or lack of agricultural finance. Inspite of the mechanisms laid down, Muhongayire et al. (2013) concluded that, there is still limited funds directed to farming activities even if this sector remain the main contributor of the national economic growth for more than ten year.

*Table 1. Percentage shares of credit by activity sector*

| Activity sector | Percentage shares of credit by economic activities | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Non classified activities | 9.2 | 11.9 | 15.0 | 14.1 | 11.5 | 9.3 | 7.8 | 7.9 |
| Agricultural, fisheries& livestock | 2.9 | 3.4 | 3.2 | 3.0 | 2.8 | 2.5 | 2.1 | 1.5 |
| Mining activities | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 |
| Manufacturing activities | 10.2 | 6.7 | 5.8 | 7.8 | 10.2 | 8.6 | 10.0 | 10.1 |
| Water & energy activities | 0.8 | 0.6 | 1.2 | 1.8 | 2.9 | 2.4 | 2.4 | 2.7 |
| Mortgage industries | 28.3 | 29.7 | 34.1 | 33.1 | 31.3 | 35.7 | 33.9 | 37.2 |
| Commercial & hotel | 33.7 | 34.3 | 29.8 | 28.6 | 30.9 | 29.9 | 31.2 | 26.6 |
| Transport & warehousing | 9.6 | 7.9 | 6.5 | 6.3 | 5.8 | 6.4 | 7.2 | 9.0 |
| OFI &Insurance | 1.4 | 1.6 | 1.3 | 1.3 | 1.1 | 1.6 | 1.7 | 1.6 |
| Service sector | 4.0 | 3.9 | 3.1 | 3.8 | 3.5 | 3.6 | 3.6 | 3.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: BNR (2017), Financial Stability Directorate

In order to improve their agricultural technologies smallholder farmers require availability of whenever they need it. However, it has been noted that this cash is limited and not available where needed. Therefore, present research intend to assess what is defining smallholder farmers accessibility of farming loan from formal sources in Rwanda using FinScope Rwanda survey 2016 data.

**1.2 Problem Statement**

Access to formal credit by household who are smallholder farmers in Rwanda is the overall focus of this study. It has been revealed that the percentage share of credit that goes to the agriculture sector is the second lowest when considering the credit distribution between economic sectors. This was the motivation behind carrying this study.

Credit provision to the smallholder farmers is one of the principal component to revamp in a sustainable manner agricultural activities. As personal saving was proved not sufficient in

developing countries  smallholder farmers credit is used as the temporary substitute and it may catalyse the process of agricultural production and productivity. Improved agricultural technologies have to be used to boost agricultural production and productivity. However, smallholder can not employ improved agricultural technologies using their out of pocket money as normally these technologies are expensive compared to their standard of living. As its usage is limited it has been argued that this will be improved by the provision of agricultural credit to increase production and productivity (Briquette, 1999).

In Rwanda there are limited studies on the determinants of smallholder farmers access to formal credit. A study by Musabanganji et al (2015) identified that households' level of earnings and consumption, different levels of wealth groups such as Ubudehe, earnings from activities other than farming, holding of large plot of land, area of residence, transport availability, informal financial services available and education were the most important determinants of access to formal credit by smallholder farmers. However, this study was only carried out in a specific part of a country(i.e Huye and Nyamagabe in Southern province) and this might have biased the results. Another similar study by Wivine (2012), revealed that off farm income, participation in informal credit, agricultural extension services and education were the important determinants of access to formal credit by smallholder farmers. This study was also carried out in Rwamagana district of Eastern province and it might have the same defficiencies as the first study. In addition, all these studies considers formal financial sectors as banks, Micro Finance Institutions (MFIs) and Savings and Credit Cooperatives(SACCOs) which is by then was the only formal financial institutions regulated by the National Bank of Rwanda.This might have reduced the coverage of access to credit in one way or another.

As the good way of addressing the low level of access to formal credit is to understand its determinants, the present study builds on previous studies by analyzing the determinants of smallholder farmers access to formal credit by using more comprehensive data covering the whole country to improve the results of previous studies. Furthermore, in recent period the number of bodies regulated by the National Bank of Rwanda was expanded to include mobile money transactions and this study has taken it into account to bridge the gap of access to finance coverage.

## 1.3 Objectives of the Study

The general objective of the present study is to assess the factors that determining smallholder farmers' access to formal credit in Rwanda. However, this general objective was further divided into the following specific objectives:

1. Identify socio-economic factors affecting smallholder farmers access to formal credit in Rwanda.
2. Determine women and different wealth groups access to formal credit in Rwanda.
3. Analyse discrepancies between rural and urban smallholder farmers access to credit in Rwanda.

## 1.4 Hypotheses to be tested

1. Smallholder farmers access to credit is not determined by socio- economic and geographical factors.

2. There is no significant difference accross gender and wealth groups access to formal credit.

3. There is no significant discripancies between urban and rural smallholders famers access to formal credit.

**1.5 Organisation of the thesis**

This thesis will be introduced into five chapters. First chapter will describe the introduction which is mainly comprised of background of the study, problem statement of the study, general and specific objectives of the study and finally the hypotheses to be tested. Second chapter reviews the relevant literature. Third chapter discusses the methodology used. Fourth chapter discusses the results of the study. Lastly, the thesis will give a highlight of the main findings summary, conclusions and policy recommendations.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Smallholder Farmer Concept

Generally smallholder farmers are defined depending on the context, forexample ,country, region or even ecological zone. Limited resource endowment relative to other farmers in the sector can also be used to define smallholder farmers in general terms. (DCED 2012), defined smallholder farmers as those farmers holding small plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour.

Smallholder farmers can be defined in a number of way. Different literatures revealed that there is no one way of defining a smallholder farmer and its definition may depend on the objectives of the study. To quote Nagayates (2005), in his research trying to study smallholder definitions: "The sole consensus on small farms may be the lack of a sole definition." Different institutions tried various definition using set of characteristics and indicators.

*Table 2: List of indicators to define smallholder farmers*

| Market |
|---|
| Subsistence farming versus market oriented farming |
| **Size of landholding** |
| Surface of cultivated area (i.e a number in hectares (ha) or relative size in comparison to national average) |
| Location of the smallholders (i.e rural versus urban) |
| **Labor input** |
| Ratio family labor versus hired labor |
| Permanent employees or seasonal labor |
| Labor input amount |
| Distance between farm and dwelling |
| **Responsibility of farm management** |
| **Income** |
| Share of income from farming |
| Income from other sources (off-farm activities) |
| **System of farming** |
| Technology used in farming |
| Irrigation versus natural |

Source: Aidenvironment (2012).

As elsewhere there is no specific creteria of defining a smallholder farmer in Rwanda. Different institutions has tried to come up with different definitions depending on the objectives of their studies.Some tried to define them using land holding, type of farming technology the farmer is using and the purpose of farming be it for business or own consumption. The most known definition is the one used by the Ministry of Agriculture And Animal Resources(MINAGRI) in

1991 whereby the smallholder farmers were considered according to land holding; especially when he own minnor plot around his home which can not supply abundant food to satisfy his household living needs. Because this land is so small that it can't sustain his household family members he has to find another way of earning his living as participating in other activities like small trade and crafts works or sell his manpower labor to complement small output received from farming (Wivine 2012). However, for this study, a smallholder farmer has been defined as a farmer who is growing crops for his own consumption and sale only part of it and engaged in other activities to earn his living(NISR 2016).

## 2.2 Credit concept

Latin word "credito" is the origin of the word credit and this mean to trust or have faith. When goods, services or money is given and a promise is made to be paid later. When a transaction of money, goods, services or securities is made between two parties(i.e creditor or lender and debtor or borrower) in return for the promise of future payment this is referred to as credit. Futhermore, when a financial transaction takes place but the present value is to be paid in the future depending on the payment arrangment agreed and the attached cost which normally refered as interest then this is considered as credit ( SISAY YEHUALA, 2008).

Credit can be defined as transfering a control of money to other person who promised to pay it in the future according to defined repayment terms (Ellis 1992). When the money is obtained through borrowing and the borrower has the power and ability to borrow and pay in the future this is also defined as a credit (Beckman and Forster 1969).

So many authors defined the term credit in different ways, however for the purpose of this study the term credit will be defined using Ellis (1992) definition whereby it considered trust and ability of the debtor to make payment when due.

**2.3 Access to finance**

Broadly Access to finance can be defined as access to financial products (e.g. deposits and loans) and services (e.g. insurance and equity products) at a reasonable cost. Many countries have adopted the goal of universal financial access given the widely recognized link between access to finance, growth, income smoothing and poverty reduction. Central banks and countries were recently urged to add the goal of universal 'financial inclusion' to the two traditional goals of prudential regulation i.e. safety of depositors' funds and the stability of the financial system in order to build inclusive financial sector. Earlier financial inclusion was on 'micro credit only' but it has gone beyond that approach to include variety of products and services that poor and low income people need. Furthermore, it recognizes that these products and services could be cost effectively provided by a variety of financial service providers( SushmaNarain 2007).

One of the major constraints facing majority of Rwandan smallholder farmers is access to finance. It has prevented them from investing in agricultural technologies that can help them to achieve higher agricultural productivity and consequently limited their participation in markets. In addition, uncertainties in weather conditions, diseases, limited labour etc has reduce farmer's incentives to invest in agricultural production and commercialization.

In Rwanda relatively small number of population (i.e less than 30% are banked), while the rest are either using other formal non-bank and informal financial merchanism to manage their financial lives. Also it was revealed that 11% in Rwanda has never been participating in financial transactions whether in formal sources or informal sources (FinScope Rwanda Survey 2016).

**2.3.1 Saving**

Saving has proven to be the major force of financial inclusion in Rwanda. A culture of saving is very important for people make investment, buy different house equipment and furnitures and also

used as a security when securing credit from formal sources. In Rwanda, when consider all forms of savings about 86% of adults save, (around 5.1 million individuals). According to FinScope Rwanda survey 2016, saving through formal institutions stood at 49%. However, a slowdown in saving with banks was noticed from 2008. It was revealed that Saving and Credit Cooperatives (27%)and mobile money (17%) has been the main drivers of formal savings for the past seven years ( Finscope Rwanda survey,NISR, 2016).

From the financial access point of view the number of bank branches, sub branches and outlets reached 553 in year 2017. Five banks (Bank of Kigali, COGEBANQUE, Equity Bank, KCB Rwanda, and UOB) operate agency banking. With regard to geographic distribution of access points, Kigali City has the highest number of bank branches followed by Western Province and Northern Province holds the least. In microfinance sub-sector, southern province has the highest number of branches, while Kigali City has the lowest(BNR 2017).

*Table 3: Number of branches and bank agents by province*

| Sector | Kigali | North | East | West | South |
|---|---|---|---|---|---|
| Banks' branches | 196 | 68 | 96 | 109 | 84 |
| MFI branches | 113 | 143 | 172 | 139 | 168 |
| **Total** | **300** | **235** | **283** | **291** | **240** |
| Banks' agents | 1,075 | 805 | 626 | 481 | 560 |
| MFIs agents | 74 | 96 | 101 | 106 | 110 |
| **Total** | **1,149** | **901** | **727** | **587** | **670** |

**Source:** BNR (2017), Financial Stability Directorate

**2.3.2 Credit**

FinScope Rwanda survey 2016, examined the share of the population that make borrowing to buy different types of equipments, use the borrowed money to carter for their daily consumption or any other household expenditure needs as well as modernizing their farming practices. The borrowing population in Rwanda slightly stood above 70 percent. When classified according to the borrowing sources it was revealed that 4 percent borrow from commercial banks which is slightly higher compared to the result of the previous survey(i.e 3 percent of 2012 survey). Those who borrow from other formal financial institutions like MFIs stood at 13 percent. However, according to the results of the survey it was revealed that a large share of the population still borrow from informal facilities (i.e 61percent) while 32 percent neither borrow from formal financial facilities nor informal but borrows from relatives and friends.

Recent trends in number of deposit accounts suggest that savings increased in the year 2017. The increase of deposit accounts remains a key indicator or proxy for trends in usage of formal financial services. With regard to geographic distribution of access points, Kigali City has the highest number of deposit accounts followed by Eastern Province and Northern Province holds the least number of saving accounts.

*Table 4: Number of depositors and borrowers in banks by province*

| Sector | Kigali | North | East | West | South |
|---|---|---|---|---|---|
| **Number of deposit accounts** | 905,475 | 189,544 | 283,130 | 243,198 | 250,511 |
| **Number of borrowers** | 150,171 | 23,762 | 37,372 | 22,736 | 27,830 |

Source: BNR (2017), Financial Stability Directorate

According to Diagne et al., (2000), smallholder farmers can either be considered to have access to credit or be credit constrained. He stipulated that a household of the smallholder farmer is considered to have access to credit when one of its member has a positive limit to credit. However, when a household of the smallholder farmer can't access any type of credit then he is considered to be credit constrained person.

Aliou (1999), advocated that there is no demacation line that distinguishing smallholder farmers borrowing from formal source and his engagement in the programs provided by formal sources. According to him a person is considered having accessibility if he decides to borrow.However, he may decide not to borrow from any source due to variety of reasons. He may be hindered by requirements from lending institutions, be a risk averse or does not need the credit at that time. Also access to credit may be determined by how much money the smallholder farmer is determined to borrow and from which source is he eligible to borrow from. Then, when the amount he is determined to borrow is reasonable depending on the source the household is said to be a participants of the credit market. When a household cannot borrow as much as it needs then this household is said to be credit constrained and it lacks access to credit.

**2.4 Credit Access in Rural and Agricultural Development**

Majority of the world's poor live in rural areas, and about 80 percent directly or indirectly depend on agriculture as their main source of income and employment (IFC 2011). In poor countries smallholder farmers play a key role in increasing food supplies, more so than large farms. In ordre to reduce their hunger and poverty by increasing their yield and income these smallholder farmers need to invest in the new technologies and inputs. However, they tend to have little or no access to formal credit despite their socioeconomic importance.

In agricultural modernisation credit is a key element and essential for smallholder farmers development. It has proved to improve the standard of living of the rural household farmers by helping them to create offfarm activities in order to raise their income (Atieno, 1997; Duong & Izumida, 2002; Meyer & Nagarajan, 2000). Rural household are releaved from financial constraint by means of credit and they can improve their standard of living, finance more consumption and have surplus finance to invest and generate more income for the future (Rosenzweig, 2001; Zeller et al., 1997).

It has been questionable whether eliminating poverty and driving people toward further development can be achieved through issuing credit to smallholder farmers. This conflicting thoughts found its evidence from the results of different studies on how to financing rural development. Some are in favour of microfinance programs as the one which will bring immediate improvement of standard of living to rural population on one side (Kidane, 2003) and on the other side other group disfavour this program as it can be a source of rural living condition deterioration resulted from credit defaults if not efficiently managed. Those who disfavour microfinance program for rural development highlighted uncertainity condition from which the farmers are operating in as the main threat in rural areas.

Though there is a division in the views one can't deny the role of rural financing to achieve a sustainable economic growth and development. There are five most known agricultural modernization accelerators namely; education and skills development, credit directed for production activities, formation of farmers groups, sustainable planning for agricultural development and agricultual land agglomeration and expansion (Moshar,1966). To adopt and maintain innovation, credit found its role among essential factors. It was believed that when the provision of credit in rural areas is done in an efficient manner and is managed properly it can be

an accelerator of increasing farming production and productivity ( Briquette ,1999). In rural areas poor smallholder farmers accessibility to formal credit has proved to be important factor that significantly increases their chance to improve agricultural technologies (Aliou and Zeller,2001). Lack of working capital in other cases was revealed to be one of the major hindrances of the agriculture development in rural areas (Tefera, 2004). For rural living people to take advantage of different opportunities at their disposal credit is essential. They can use it to create new income generating activities, development of new businesses that will enable them to resist shocks. It is the role of the state to reduce the gap between rural and urban dwellers in terms of financial and insurance services (Straton 2007). To this regard, conditions of issuing credit facilities and their feasibility will always be a subject for discussion.

Furthermore, provision of loan facilities enable household to improve their farming technologies by employing mechanized agriculture, use of modern fertilizers, farming extension, usage of improved seeds and buying affordable irrigation equipments (Chowdhury & Garcia, 1993; Vicente & Vosti, 1995). Making rural household farmers' lives improved through agricultural production, rural credit has been primarily of paramount importance(Llanto, 1993;Panin et al., 1996).

## 2.5 Developing countries and problem associated with Access to credit

Establishing a sustainable system which will take a lead in the provision of agricultural credit in developing countries has not been easy. Some countries tried to develope institutions that specialized in the provision of agricultural credit but didn't work. Others tried to create institutions that will reach rural population but also the efforts was in vain. This existed for many years but all failed because they were founded based on political reasons (Adams, 1980; von Pischke, 1980; Yaron, 1992). There are main operational challenges were to provide the available resources to only small number of rich farmers while leaving the majority of rural dwellers who are small

farmers behind. Another challenge was to rely much on the donors assistance. The combination of all these reasons mentioned these institutions failed to survive and collapsed without achieving their objectives (Yaron, 1992). Their failure led the state to change the strategies and instead of focusing on agricultual credit it established rural financing system and from state owned banks to microfinance system which will be used to finance Small and Medium Enterprises and which will not be controled by the government (Yaron, 1992).

Even after the failure of the first strategies envoling agricultural development banks, later established institutions never solved the existed problem (Coffey, 1998; Klein et al., 1999). To this regard, a need to develop a new structure which will take care of demands from small farmers was inevitable. This system will ensure that the needs of small scale farmers are met and also try to smooth the constraints associated with agricultural credit (Kleinet al.,1999).

Robinson 2001 advocated that dividing the beneficiaries according to their wealth groups would make microfinance lending efficient. He advocated that microfinance should be directed to higher class as well as middle and lower classes as they are meant to target commercial activities. On the other hand those in lowest class who are uncreditworth should be funded through social protection programs (Robinson, 2001).

The design of these institutions' products should be based on clients' needs instead of being focused on products (Wright,2000). To avoid drop-outs, loan delinquency, and multiple membership of the microfinance customers, client-centered microfinance is important (Meyer, 2002). Clients' preference is very important and failing to consider it in some microfinance institutions led to their operational failures (Blackman,2001; Meyer & Nagarajan, 2000).

In developing countries About 90% of the people lack access to formal financial services (Robinson, 2001). Majority of rural population has limited information on credit services and this has led them to be denied credit when requested. If a small farmer is in need of credit but can not communicate his desire to the formal financial services providers he will be having no change to get the services (Robinson, 2001).

Sustainability of the credit providers are jeopardised by lack of financial services in rural areas. Subsidized credit directed to the poor population living in rural area don't reach them and they are taken by richer people thereby it has led to unefficient financial institutions (Robinson, 2001). In addition, when the focus is not directed to what people needs in terms of their preference even recovering rate of loans will be low (Meyer & Nagarajan, 2000).

## 2.6 Types of credit market in rural of developing countries

### 2.6.1 Informal and formal credit

Formal and informal credit are two different ways of credit that accessed by smallholder farmers. Government either own, control, license, register or regulate formal financial institutions in the rural areas. Martokoesoemo (1994 ) identified them as the commercial banks, state-owned banks, agricultural development banks and rural banks. It was noted that those commercial banks that are targeting business activities are concentrated in urban areas where as other financial institution meant to serve agricultural activities are concentrated in rural areas where most farmers stay.

The study revealed that in developing countries rural population who borrows from formal financial institutions are still very low (Chowdhury and Garcia ,1993). Normally to rural poor and uneducated population the loan requirements and procedures looks so complicated and was identified as the main reasons for low availment. Due to complicate requirements and long

procedures which resulted into slow release of funds led rural borrowers to obtaining loan from formal institutions (Chowdhury&Garcia, 1993). In addition to all these weakeness credit scope exists regardless of limited banking and other financial services facilities in remote rural areas. (Chowdhury & Garcia, 1993).

In developing countries informal financial institutions involve small loans and short-term transactions, operate without physical collateral and can be flexible to the borrowers (Adams & Fitchett, 1992; Ghate, 1988). It has been identified that there is no record of the activities done by informal financial services (Martokoesoemo, 1994). They operate at lower cost but in a specialized way as they are small scale operators (ADB, 1989).

As informal finance not regulated by state it is based on mutual trust. Borrowing from informal sources and being trusted depends attitude of the borrowers has a significant role to play (Tolentino, 1988).

As a result of collapsing of many formal credit programmes it was revealed that rural population take this advantage to establish other informal sources. This is attractive to rural population since these sources are the only way to provide financial services to the rural households located in remote areas, and record of their loan recovery proved to be better for many formal institutions (Kashuliza, 1993; Rajeev & Deb, 1998).

### 2.6.2 Financing rural population

It is believed that for changing human behaviors and practices in ways that will lead to the achievement of desired outcomes microfinance programme' interventions is of a paramount importance. Literature revealed that in order to have a change in household economic security,

improvement in their standard of living, provision of education to all and creation of future economic and social opportunities the provision financial literacy is inevitable (Green 2006).

Different authors has conflicting views on rural financing using microfinance facilities; some assert their impact on development while others advocate them to have no use. Whatever the case, in order to make job creation which is not based on farming and measures to alliviate poverty strategies work, the introduction of microfinance facilities in rural areas is of paramount importance (Green, 2006).

In Rwanda agriculture which is the country's largest sector is regarded as most risky by financial institutions. This has made access to financing a bit difficult. Bankers  say that agriculture is vulnerable  to climate changes such as drought and floods; this complicates assessment of borrower's ability to repay, thus requiring more  interventions. It is still a challenge not only to Rwanda alone but in the sub Saharan Africa.

However, Rwanda managed to find a number of agricultural financing models.So far BRD is leading in extending credit to the sector with 30% of its outstanding credit (worth Rwf 140 billion) to private sector  by end of 2015. The country also has put in place a guarantee fund, the Business Development Fund-BDF that provides guarantees and grants to farmers and other businesses. The fund goes up to 75% on loans by women and youth and 50% on other clients. Since its establishment in 2012, the fund gave out Rwf 31 billion worth of guarantee funds to 1,780 borrowers mainly smallholder farmers. A borrower was given Rwf 18 million on average(BDF 2016)

**2.7 Financial sector overview in Rwanda**

According to the law N° 47/2017 of 23/9/2017 governing the organisation of banking sector in Rwanda all formal financial institutions are under the supervision of National Bank of Rwanda. These includes commercial banks, Rwanda Development Bank (BRD), credit and savings cooperative, insurance companies and microfinance institutions (BNR, 2017).

Banking sector in Rwanda is made up of 11 commercial banks; namely Bank of Kigali Ltd, I&M Bank Ltd, COGEBANQUE Ltd, KCB Bank Rwanda Ltd, Ecobank Rwanda Ltd, Banque Populaire du Rwanda Ltd, Equity Bank Rwanda Ltd, Access Bank Rwanda Ltd, Guarant Trust Bank Rwanda Ltd, Commercial Bank of Africa Rwanda Ltd and, Bank of Africa Rwanda Ltd, 3 microfinance banks namely; Unguka bank Ltd, Urwego Bank Ltd and AB Bank Rwanda Ltd 1 development bank namely Rwanda Development Bank and 1 cooperative bank namely ZIGAMA CSS. These banks are spread across the country with a network of 553 branches, and 735 MFI branches (BNR 2018).

The opposite of formal financial sector is informal financial sector which comprises others source of financial services other than formal sector. Their activities does not need any legal framework and they are out of National Bank of Rwanda control. They mobilize savings through saving groups such as totine, family members, friends, students, colleagues at working place and members of the same dominion. Informal market is more represented than formal market.

As indicated by Fiscope Rwanda survey 2016, informal financial market is more dominant in rural areas with 61 percent of the rural credit market shares. This sector is so attractive due to its flexibility which favors poor households since no collateral requirements which is a common criteria in formal sector. Households normally use their credit from informal sector to carter for their daily living expenses.

## 2.8 Empirical Literature Review

Households' access to credit is often limited and there are numerous factors explain why. Doan et. al. (2010) found that marrital status is important factor that determine smallholder farmers access to formal credit in the sense that when married and living together the couple favours other sources other than informal source an they make decision together. Hussein (2007) revealed that informal sector is more flexible, thus smallholder farmers are more likely to borrow from informal financial sector rather than from formal financial sector.

Smallholder farmers access to formal credit constraints increases with distance to the nearest credit issuing institution (Doan et. al. 2010), this implies that policies directed to bring formal financial institutions nearer are needed and could ease this constraint. The study by Okurut 2001 and Komicha 2007, revealed that people may be discouraged from borrowing when the credit institution is located far away from their residence. To back their argument they stressed that when the lending institutions is located far away from the borrowers residence the borrower may incur extra cost on transport to and from lending institution. The issue of transaction cost was also supported by Sarap 2000. The issue of transaction cost can be overcome by formulating policies that are directed towards bringing closer credit facilities to small farmers.

A study by Amjad and Hasnu 2007, Oboh and Ekpebu 2010 revealed that employment status, size of the family members, education, income generated from other activities other than farm and possession of fixed assets and modernization of infrastructure as the most important determinant of credit accessibility by smallholder farmers. Holding of land was found to be the single most important variable determining credit status.

In developing countries large number of dependants per household has been a persistent problem. This is believed to negatively impact loan accessibility from formal sources as it may lead to loan

default. However, in contrary to this literature it was revealed that those household with so many dependants positively impacted the accessibility of loan from formal sources (Duy 2011& 2012).

Abdalla and Ebiadalla (2012) found that smallholder farmers access to the formal credit institution is positively influenced by family size, experience of the household head in formal credit use, ownership of collateral, and participation of the household head in training activities. They also found that age of household head; distance travelled by smallholder farmer to the lending institution; farm size; number of the household males who are less than 17 years old negatively affect the access to formal credit. When the household have large number of family members it may have greater chance of accessing credit as more members could earn more to be used as a security.

The category of financial institution with its regulation and policy may also determine accessibility of formal credit (Schmidt and Kropp 1987). Where loan repayment period, payment terms, loan security required and the provisions of supplementary services do not fit the needs of the beneficiaries, potential borrowers seize to apply for credit even where it exists and when they apply, their application will be rejected.

In developing countries asymmetric information is a big challenge to smallholder farmers access to formal credit. In rural households the borrowing cost may vary across different financial sources. These costs are associated with borrowing risks, lack of securities among the borrowers, the distance between the borrower and lending institution, asymmetric information as well as size and number of credit transaction (Bigsten et al. 2003, fliesig 1995).

Furthermore, how much the household earn in terms of income, how far the borrower need to travell to the nearest lending institution, historical background of the borrower and possession of

fixed assets was revealed to be a significant variables explaining the desire of the smallholder farmers to participate in credit market (Atieno 2001).

Other findings by Hussien, 2007 and Padmanabhan 1996) advocated the flexibility of informal credit markets compared to formal credit market in terms of loan payment modalities and favourable transaction costs. The existing literature on the determinants of smallholder farmers access to formal credit showed that different studies provided conflicting results and had never come to the same conclusion and this gap worth to be filled with further studies.

In Rwanda, there are limited studies on the determinant of smallholder farmers access to formal credit. The only studies known are Sebakambwe (2012), Wivine (2012) and Musabanganji et al (2015) which focused on particular part of the country and used primary data of small samples. However, for policies aiming at improving smallholder farmers' agricultural productivity to be effective there should be adequate evidence on the determinants of smallholder farmers' access to formal credit in Rwanda as a whole which is the gap the present study is aiming at filling.

Emperical studies show that the sample size, nature of outcome variable, nature of the predictor variables and the intended aim to be achieved determined the choice of the model. However, most researchers prefer logistic models be either binary or multinomial models. As logistic model has consistency in parameter estimation and their error term is assumed to have logistic distribution (Ravallion, 2001 and Baker, 2000) it is prefered by many researcher compared to its counterpart. Normally if the dependent variable is of binary nature it could take a value of one if the event happened or take a value of zero otherwise. The estimated parameters use maximum likelihood method. To this regard, the present study will employ logit model.

# CHAPTER THREE: METHODOLOGY

## 3.0 Introduction

Chapter three of this study comprised of four parts. The first part of this chapter describes conceptual frameworks. Part two empirical model is presented. Part three and four present methods, definition of variables, procedures and data analysis tools respectively.

## 3.1 Conceptual Framework

Conceptually, determinants of access to formal credit can be classified into four categories namely; Demographic factors, institutional factors, socio-economic factors and geographical factors (Figure 1). Demographic factors include; age, sex, education and marital status, socio-economic factors are the family labor, ubudehe category, livestock ownership, mobile phone ownership, and house ownership, institutional factors are Membership of saving group, Savings, VUP direct and Community Health Insurance and finally, the geographical factors include , location and distance of the lending institutions.

**Figure 1. Conceptual framework**
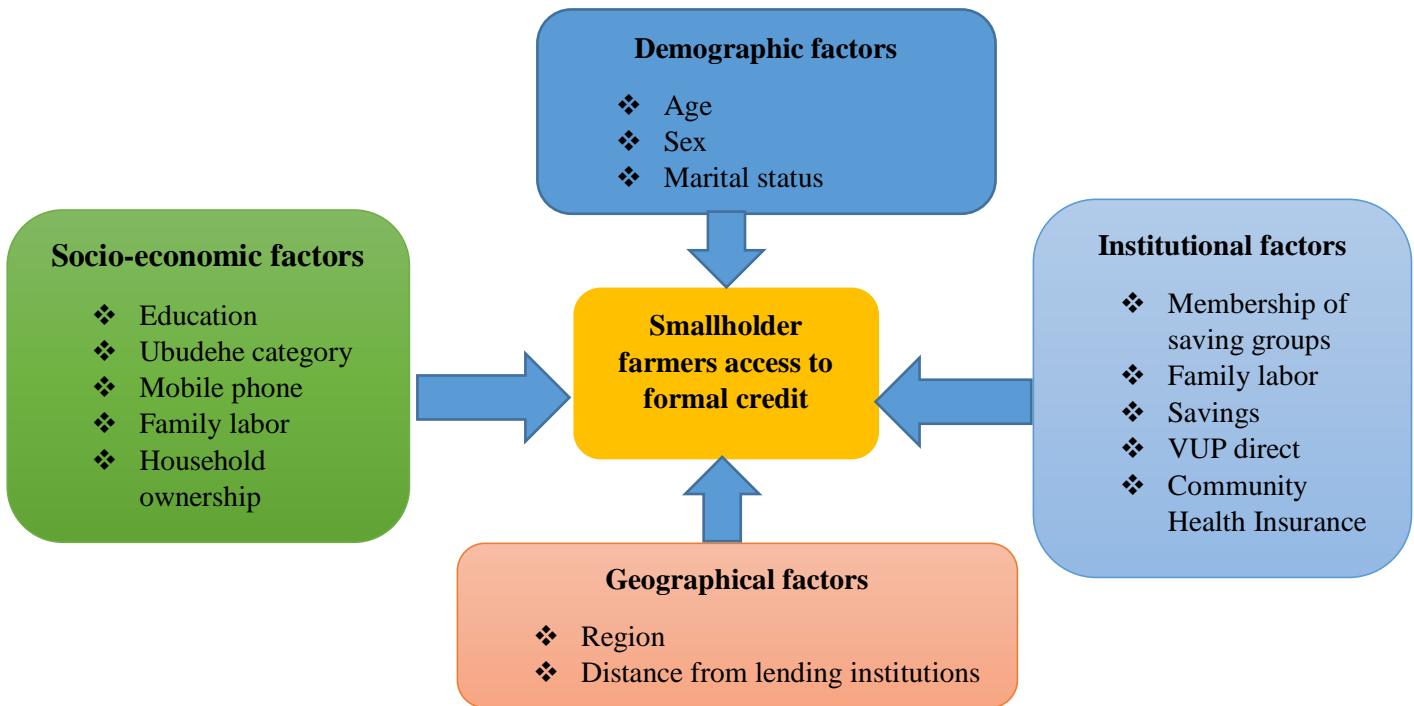


Source: Author's own construction

As show in Figure 1 above ; the study assumed that demographic, socio economic, institutional and geographic factors, together influence smallholder farmers access to formal credit. As a result, economic growth, market creation and equity on income distribution can be influenced by household access to formal credit. Difficulties in access to credit may limit other opportunities such as creation of emplyment and generating other source of income to smooth consumption. It may start with small group and spread to large part of population and definately affect the whole standard of living of entire nation.

**3.2 Financial inclusion Framework**

The concept 'financial inclusion' is of paramount importance when studying financial products services used by customers. The population which is eligible to use financial services can be classified into two categories; the 'financially excluded' and the 'financially included'.

Households considered to be financially excluded if they manage their financial lives without the use of any financial products or mechanisms external to their personal relationships. If they borrow, they rely on family or friends; and if they save, they save at home.

Households considered to be financially included if they do their saving or borrowing using formal or informal financial facilitiy sources. They may be using their own accounts or use other's accounts meaning that it doesn't matter whose accounts are they using. The same is applied to the insurance services; a person who is using someone else's insurance will be considered financially included.

Those who are financially included are further divided into formal financial institutions which comprised of population who borrow or save in regulated financial entities such as banks, MFIs and other regulated bodies and those who save and borrow from those entities that operate without any law governing them like money lenders, and relatives of the family members. There are also households or individuals who have or use both formal and informal products and services.

The Formal institutions are also divided into two categories; the population who do save or borrow from commercial banks and also from those formal institutions but which doesn't fall under the category of commercial banks. However, it is also possible for the customers to fall into these two categories.

**Figure 2: Financial inclusion framework**
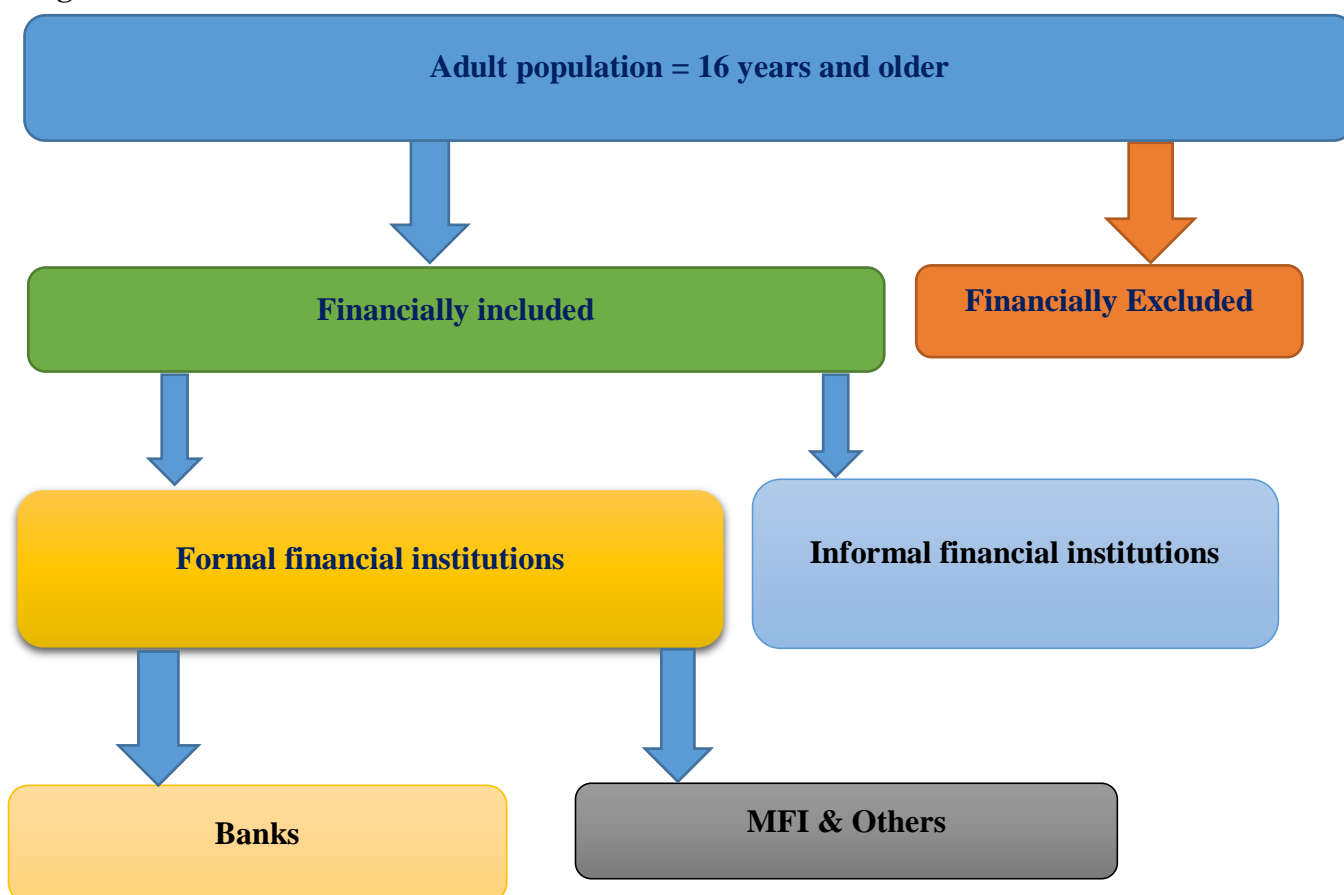


Source: Author's own construction

## 3.3 Data sources and Methods of data analysis

The data used in this thesis is drawn from the FinScope Rwanda 2016 survey conducted in 2015/2016 by Centre for Economic and Social Studies (CESS) under the supervision and technical support from FinMark Trust (FMT). This survey was approved by National Institute of statistics of Rwanda (NISR). Survey collected data from 12,480 households and is a nationally representative. Data was collected at the household and the individual level. The FinScope Rwanda 2016 survey aimed at describing the levels of financial inclusion (i.e. levels of access to financial products and services – both formal and informal), describing the landscape of access (i.e. the type of products and services used by financially included individuals), identify the drivers of, and

barriers to financial access and stimulate evidence-based dialogue that will ultimately lead to interventions by either public or private sector that will increase and deepen financial inclusion.

The survey covered rural and urban areas, provinces  and all districts of the country and collected data on a wide spectrum of socioeconomic indicators, labour, housing, health, agriculture, debt, livestock, expenditure and income.

Various analytical techniques such as descriptive statistics such as tabulation and frequency distribution were used. In addition, the study used Chi-square statistics to measure the association among smallholder farmers formal credit accessibility and vice versa. In this thesis, smallholder farmers access to formal credit was conceptualized to involve either access to formal credit or no-access to credit.  The outcome variable is smallholder farmer's access to formal credit. All of those who borrowed atleast from one of the formal credit sources were considered as credit users while those who did not borrow were all classified as non-users. Normally the model that fits the analysis of accessibility of formal credit to smallholder farmers is preferred. To this regard, this present study used binary logit model.

### 3.4 Logit Model specification

The main focus of this research to make analysis of how much the hypothesized predictors are related to accessibility of credit by the small holder farmers. Outcome variable will be a dummy, implying that it will take a value of 1 or 0 depending on whether or not smallholder farmers use formal credit or not. Independent variables on the other hand were both continuous and discrete.

Usually a choice has to be made between logit and probit models in the analysis of studies involving qualitative choices. It has been challenging to make a choice between logit and probit models considering they are more or less the same (Amemiya 1981). However, simplicity of logit

model justifies its use. Moreover, as the value of explanatory variable gets smaller and smaller its probability approaches zero at a slower rate, and as the value of the explanatory variable gets larger and larger the probability approaches 1 at a slower and slower rate (Gujarati, 1995).

Though the two models are more or less the same but inorder to analyse binary outcome variable logistic model is prefered due to its easiness and flexibility that make their results to yield a meaningful interpretation (Hosmer and Lemeshew 1989). Hence, this study will employ logistic mode for analysis.

Therefore, econometrically it is defined as follows:

$$P_i = F(Z_i) = F(\alpha + \sum \beta_i X_i) = \frac{1}{1+e^{-Zi}}$$ .......................................................................(1)

Where, Pi is the probability that an event will happen or not given Xi;

$e$ denotes the base of natural logarithms,

$X_i$ represents the ith explanatory variables; and $\alpha$ and $\beta i$ are parameters to be estimated 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 is the ratio of the probability (Pi) that an individual would choose an alternative to the probability (1-Pi) that he/she would not choose it.

$$(1\text{-}P_i) = \frac{1}{1+e^{Zi}}$$ .......................................................................(2)

Therefore,

$$\left(\frac{p_i}{1-p_i}\right) = \left(\frac{1+e^{z_i}}{1+e^{z_i}}\right)$$.......................................................................(3)

Or,

Taking the natural logarithm of the equation of equation (3)

$$Z_i = Ln\frac{P_i}{1-P_i} = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots\ldots \beta_k X_k + \mu_k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

If the disturbance term is taken into accounts, the logistic model becomes,

$$Z_i = \alpha + \sum \beta_i X_i + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

## 3.5 Variables

### 3.5.1 Outcome variable

The outcome variable that define the event to happen is of binary nature representing smallholder farmer's access to formal credit. This is to distinguish or discriminate between those users or non-users of formal credit. Household uses credit from formal sources during the year (CREDITACCESS): This is the outcome variable. It takes value of "1" for users "0" for non-users to formal credit.

### 3.5.2. Explanatory variables

Past research findings has been explored to come out with the establishment of hypothesis to be tested in this study. Categorically, demographic, socio-economic, geographic and institutional factors were hypothesized to explain the outcome variable.

**1. Sex of Household Head (HHHSEX):** This is a dummy variable that assumes a value of "1" if the head of the household is male and "0" otherwise. In Africa gender is the important factor when considering its role in economic development (McSweeney, 1979 and Dey, 1980). Ther are different views on whether there is a discrimination between male and female in terms of access to credit. Some advocated that women are discriminated while Zeller (1994) asserted to have no

impact. Therefore, in this study, gender in terms of male is important determinant and it is expected to have a positive impact.

**2. Age of Household Head (HHHAGE):** Age of smallholder farmers household head is measured in number of years. There are conflicting views on this determinant. Some believed that as age of household head increases it raises his chance of securing credit from formal financial institutions while others argue that as the head of household becomes older he tend to develop risk averse attitude hence shone away from applying for credit. Therefore, we expect the sign to be either positive or negative.

**3. AGE$^2$ :** Many literature review and research findings concluded that head of household chance of accessing credit from formal financial institutions increases with increase in his age. However, as the age increases the head of household become less productive and hence minimize the chance of securing credit. Therefore, the expected sign of the effect of age square on the probability of access to formal credit is negative.

**4. Literacy level(HHHLiteracy):** This is defined as literate if household head can read and write or illiterate, and it is a dummy variable. Those who are able to read and write accumulated knowledge that give him better insight og financial environment. They can analyze different opportunities. Educated household is in better position to read and understand loan requirement thus has a better chance of securing credit.

**5. Marital Status:** It is believed that marital status of the respondents is also an important factor that determine access to formal credit by smallholder farmers. The assumption is that couples can make decision on consumption, savings and investment together. Therefore, it was expected that

those farmers who is married and living together have better chance of accessing and use of formal credit hence positive sign.

**6. Family labor:** This refers to the household size in terms of total number of family members who can work for the household to  support other family members. If the household is large enough to provide all the necessities for the family members then this will reduce the desire to borrow from  lending sources. On the other hand, it is believed that the large size of the family always need to expand their activities which will require loan from financial facilities (Marge 2003). Therefore, either positive or negative sign is expected.

**7. Physical distance of farmers from lending institutions (Distance):** Living far away from lending institutions impacting accessibility to credit negatively compared to living in a near distance from lending institution. Thus, the near the distance is assumed to increase credit accessibility.

**8. Location:** Living in other provinces in relation with living in Kigali is expected to have negative signs as living in Kigali open different opportunities of accessing credit due to the fact that most of formal financial institutions are located in Kigali. Therefore living in other provinces are hypothesized to have a negative signs in relation to living in Kigali.

**9. Savings:** Having a saving account is hypothesised to influence credit access and size. This is because savings is an indicator of wealth, hence smallholder farmer households with saving accounts are more likely to receive access to credit as well as more loans compared to households without saving accounts because they are perceived to be creditworthy.Thus, positive sign is expected.

**10. Mobile Ownership (Mobile):** This refers to the household ownership of mobile phone. Households with mobile phone are assumed to have information regarding the credit providers This is hypothesized to positively influence farmer's access to use of formal credit.

**11. VUPDirect:** Some of the households receive cash transfer under local government program according to Ubudehe category the household is falling within. Those in lower category receive what is known as VUP direct. In this study it is hypothesized that the household in higher category may have more access to credit than those in lower category as the cash received may be used as a collateral hence positive signs.

**12. Ubudehe:** Ubudehe socio-economic category is one of the households socio- economic characteristics in this study. The empirical study revealed that moving from lower ubudehe category to the upper level rises the chance of borrowing from formal facilities (MUSABANGANJI etal 2015). Its sign is expected to be positive.

**13. Collat:** This refers to whether a smallholder farmer is owning the house he is living in and he/she can use it as a security or collateral when borrowing from formal financial institutions. This is a dummy variable that assumes a value of "1" if smallholder farmer own a house and "0" otherwise. Its sign is positive as the possession of collateral is one of the requirement of the lending institutions to provide credit.

**14. Ins (Community Health Insurance):** Having a health insurance is hypothesised to influence credit access positively. This is because smallholder farmer is covered from the risk of sickness and is perceived to service his loan, hence is more likely to have access to credit compared to households without health insurance because they are not covered from sickness.

**15. Livestock:** This refers to whether the household own livestock or not. Household who own livestock can use them as a security when requesting for credit. On the other hand, those who own livestock may use them when he is in needs of cash and doesn't need credit. Therefore the expected sign is either positive or negative.

**16. Coopfin:** This predictor variable is whether the smallholder farmer is a member of informal sector group. Loans from informal financial services intend to smooth consumption are likely to be of short-term and small. The borrowers from unregulated facilities normally don't partcipate in the regulated facilities. It is due to the fact that by borrowing from informal sources the risk is shared among the group.

*Table 5: List of variables and their expected signs*

| Variable Name | Description | Unit | Expected signs |
|---|---|---|---|
| | | | |
| HHHSEX | Sex of Household Head | Male = 1, Female = 0 | + |
| HHHAGE | Age of Household Head | Number | + |
| $AGE^2$ | Age Square | Number | - |
| HHHLITE | Literacy level | Educated = 1, No Education = 0 | + |
| Maritalstatus | Marital Status | Married = 1, Otherwise = 0 | + |
| Familylabor | Family labor | Number | +/- |
| Distance | Physical distance | Number | - |
| Location | Household's Region | Kigali = 1, Otherwise = 0 | - |
| Savings | Savings | Having account = 1, Otherwise = 0 | +/- |
| Mobile | Mobile Ownership | Having mobile = 1, Otherwise = 0 | + |
| VUPDirect | VUP direct | Receiving VUP =1, Otherwise = 0 | + |
| Ubudehe | Ubudehe category | First category =1, Otherwise =0 | + |
| Collat | House ownership | Own a house = 1, Otherwise = 0 | + |
| Ins | Community Health Insurance | Insured = 1, Otherwise = 0 | + |
| Livestock | Livestock ownership | Number | +/- |
| Coopfin | Savings groups | Participation = 1, Otherwise = 0 | - |

Source: Researcher's own construction

**3.6 Econometric Models Diagnostic Tests**

Normally the data to be used in the analysis are not always in conformity to the theory underlying the model (Green, 1993). To this regard, before proceeding with the estimation, it is important to started the process with testing the degree of correlation (multicollinearity) among the predictor variables, and the viability of specified model itself (fitness of the model).

**3.6.1 Multicollineality test**

Multicollinearity refers to the presence of linear relationships (or near linear relationships) among the explanatory variables (Koustoyiannis, 1973). To solve this issue, multicollineality test is inevitable to check the correlation among the predictor variables. The rule is matching or excluding the variables that are found to be highly correlated. Therefore, Variation Inflation Factors (VIF ) techinique were used to test for multicollineality.

# CHAPTER FOUR: RESULTS AND DISCUSSIONS

## 4.1 Introduction

This chapter discusses and presents results of the analysis which address specific objectives of this research. It is comprised of two main parts. The first part is the summary results of descriptive analysis of smallholders farmers, while the second part shows the result of econometric analysis from the model deployed.

## 4.2 Descriptive statistics

Formal credit services accessibility is influenced by demographic, socio-economic characteristics of households, geographical as well as institutional factors. This section report descriptive statistics of smallholder farmers formal credit users and non-users for predictor variables studied in this thesis. For this study having access or not is measured in terms of borrowing or not borrowing from atleast one source of formal lending institutions.

### 4.2.1 Households socio-economic characteristics

The descriptive statistics shows that 82.1% of male head households and 17.9% of female head households (Table 6). Most African household are headed by male farmers and these are owners of farms when analysing farms by sex in african context. The intuition is that being a male gives more chance of credity accessibility than being a female.

*Table 6: Head of household by gender group*

| Gender status | Head of Household | Percentage |
|---------------|-------------------|------------|
| MALE | 4,927 | 82.12 |
| FEMALE | 1,073 | 17.88 |
| TOTAL | 6000 | 100.00 |

Source: Researcher's own construction

In this study the smallholder farmer average age was 46.6 years while the minimum and maximum ages were 16 and 98 years respectively. The survey data shows that the number of young people with access to formal credit is small than number of adult people with access to formal credit. The implication is that being older or having higher age is assumed to be associated with having farming experience and knowledge of credit requirements. This is assumed to increase the farmers ability and power to source credit from lending institutions. However as they become older the chance of having access to formal credit keep reducing due to the fact that they stop engage in farming actvities at their older ages.

*Table 7: Household credit access by age group*

| Household age group | Formal Credit Users | | Formal credit non- Users | | TOTAL | | Pearson chi2(2) = 41.0229  Pr = 0.000 |
|---|---|---|---|---|---|---|---|
| | Nbr | % | Nbr | % | Nbr | % | |
| Youth | 486 | 16.48 | 397 | 13.02 | 883 | 14.72 | |
| Adult | 2,227 | 75.52 | 2,274 | 74.56 | 4,501 | 75.03 | |
| Old | 236 | 8.00 | 379 | 12.43 | 615 | 10.25 | |
| TOTAL | 2,949 | 100.00 | 3,050 | 100.00 | 5,999 | 100.00 | |

Source: Researcher's own construction

Household family members on average was found to be 5 persons. The large household has 15 persons while the small household has only 1 person. From the survey data, 58.73% of smallholder farmers with access to formal credit and 60.31% of smallholder farmers with no access to formal credit had a family size of 1 – 5 persons respectively. From table 8  below the bigger families tend not to participate in formal credit as they have enough labor to generate income to relieve consumption burdens of the household.

Table 8: Household size by credit access

| Household Size | Formal Credit Users | | Formal credit non- Users | | TOTAL | | Pearson chi2(2) = 3.7053 Pr = 0.157 |
|---|---|---|---|---|---|---|---|
| | Nbr | % | Nbr | % | Nbr | % | |
| 1-5 | 1,732 | 58.73 | 1,840 | 60.31 | 3,572 | 59.53 | |
| 6-10 | 1,193 | 40.45 | 1,176 | 38.54 | 2,369 | 39.48 | |
| >10 | 24 | 0.81 | 35 | 1.15 | 59 | 0.98 | |
| TOTAL | 2,949 | 100.00 | 3,051 | 100.00 | 6,000 | 100.00 | |

Source: Researcher's own construction

Table 9 below revealed that among the smallholder farmer formal credit users, female headed households was inferior to male headed households. Gender differences is statistically significant at 1 percent level.

*Table 9: Gender status by credit access*

| Gender Status | Formal Credit Users | | Formal credit non- Users | | TOTAL | | Pearson chi2(1) = 119.8672 Pr = 0.000 |
|---|---|---|---|---|---|---|---|
| | Nbr | % | Nbr | % | Nbr | % | |
| MALE | 2,584 | 87.62 | 2,342 | 76.79 | 4,926 | 82.11 | |
| FEMALE | 365 | 12.38 | 708 | 23.21 | 1,073 | 17.89 | |
| TOTAL | 2,949 | 100.00 | 3,050 | 100.00 | 5,999 | 100.00 | |

Source: Researcher's own construction

Table 10 indicate that smallholder farmers who had no education have less chance of accessing formal credit compared to their counterparts who have attended education. Those who attended atleast primary education had more chance of accessing formal credit compared to those who did

not go to school. It is believed that educated person can make reasonable decision when a need of investing in farming opportunities arises. A study by Odulaja and Kiros (1996) identified the relationship between literacy level and market of farming produce. They stressed that educated person can easily explore new market opportunities hence they can increase their production and sales.

*Table 10: Literacy status by access to credit*

| Literacy status | Formal Credit Users | | Formal credit non- Users | | TOTAL | | Pearson chi2(3) = 42.7361  Pr = 0.000 |
|---|---|---|---|---|---|---|---|
| | Nbr | % | Nbr | % | Nbr | % | |
| No education | 818 | 27.74 | 1,016 | 33.31 | 1,834 | 30.57 | |
| Primary Education | 1,689 | 57.27 | 1,490 | 48.85 | 3,179 | 52.99 | |
| Secondary Education | 342 | 11.60 | 418 | 13.70 | 760 | 12.67 | |
| Higher Education | 100 | 3.39 | 126 | 4.13 | 226 | 3.77 | |
| TOTAL | 2,949 | 100.00 | 3,050 | 100.00 | 5,999 | 100.00 | |

Source: Researcher's own construction

### 4.2.2 Multicollinearity diagnosis

This study used data from FinScope Rwanda survey 2016. STATA 14 version software was employed to analyze the data. The first step was to check for multicollineality problem where by one independent variable can be a combination of others. This could lead to wrong conclusions.

As shown in chapter 3, Variance Inflation Factor (VIF) is used. The decision rule is that VIF should not go beyond 10, if it goes beyond then there is a multi-collinearity problem. The result of the check shown in Table 11 below indicated that no serious multi-collinearity problem.

*Table 11: Variance Inflation Factors*

| Variables | VIF | 1/VIF |
|---|---|---|
| HHHliteracy | 4.20 | 0.237875 |
| Maritalstatus | 2.96 | 0.337542 |
| Familylabour | 7.47 | 0.133844 |
| Distance | 8.10 | 0.123498 |
| VUPDirect | 1.08 | 0.924477 |
| **Ubudehe:** | | |
| Second category | 4.87 | 0.205221 |
| Third category | 3.59 | 0.278736 |
| fourth category | 1.08 | 0.922773 |
| **Location:** | | |
| Southern Province | 2.90 | 0.344427 |
| Western Province | 2.74 | 0.365040 |
| Northern Province | 2.69 | 0.372139 |
| Eastern Province | 2.47 | 0.405668 |
| **Other factors** | | |
| Savings | 1.09 | 0.916516 |
| Mobile | 7.44 | 0.134432 |
| Collateral | 5.07 | 0.197056 |
| Insurance | 8.92 | 0.112153 |
| Livestock | 1.90 | 0.525503 |
| Coop_finance | 1.07 | 0.930375 |
| **Mean VIF** | **3.87** | |

Source: Researcher's own construction

**4.3 Discussion of emperical results**

In the preceding section, variables characterizing the smallholder farmers access to formal credit were identified. Sixteen variables were hypothesized to explain factors affecting smallholder farmer's access to formal credit. Out of these eleven of the variables were found to be significant, while the remaining five were less significant in explaining the variations in the dependent variable.

The maximum likelihood estimates of the logistic regression model show that number of years of head of household in terms of age (HHHage), level of education of head of household (HHHliteracy), marital status of the head of household (maritalstatus), distance from the lending institution (distance), location of the head of household (Location), head of household savings (savings), mobile ownership by head of household(mobile), government program like VUP direct (VUPDirect), wealth status category (Ubudehe) pocession of collateral by head of household (collat ) were statistically significant (Table 12).

Other variables such as sex, family labour, livestock ownership, possession of community based health insurance, and being a member of informal sector lending groups were not significant .

In the table 12 below Chi-square test statistic  and log likelihood are 167.83 with 21 degrees of freedom and -504.17. Therefore, the null hypothesis that the parameter estimates for the model are equal to zero is rejected.

*Table 12: Maximum likelihood estimates*

| Variables | Maximum likelihood estimates | | | |
|---|---|---|---|---|
| | Coef. | Std. Err | z-stat. | P-Value |
| **Socio economic factors** | | | | |
| HHHsex | 0.3531485 | 0.3555698 | 0.99 | 0.321 |
| HHHage | 0.1046482 | 0.0502885 | 2.08 | 0.037 |
| $age^2$ | -0.001081 | 0.000521 | -2.07 | 0.038 |
| HHHliteracy | 1.348319 | 0.4017163 | 3.36 | 0.001 |
| maritalstatus | 1.251703 | 0.2944151 | 4.25 | 0.000 |
| familylabour | 0.0158585 | 0.0509101 | 0.31 | 0.755 |
| distance | -0.450581 | 0.2308456 | -1.95 | 0.051 |
| VUPDirect | 0.8564052 | 0.4043236 | 2.12 | 0.034 |
| **Other factors** | | | | |
| Savings | 0.6256501 | 0.2742621 | 2.28 | 0.023 |
| Mobile | 1.832718 | 0.7207661 | 2.54 | 0.011 |
| Collateral | -0.1757669 | 0.0920917 | -1.91 | 0.056 |
| Insurance(MUSA) | -0.2193289 | 0.2119917 | -1.03 | 0.301 |
| Livestock | -0.0401525 | 0.2081996 | -0.19 | 0.847 |
| Coopfin | -0.3974327 | 0.4765097 | -0.83 | 0.404 |
| **Ubudehe:** | | | | |
| Second category | 1.264658 | 0.6029935 | 2.10 | 0.036 |
| Third category | 1.782528 | 0.6034917 | 2.95 | 0.003 |
| fourth category | 2.668622 | 0.7969655 | 3.35 | 0.001 |
| **Location:** | | | | |
| Southern Province | -0.7261067 | 0.2745298 | -2.64 | 0.008 |
| Western Province | -0.9472936 | 0.3026471 | -3.13 | 0.002 |
| Northern Province | -0.865783 | 0.3087672 | -2.80 | 0.005 |
| Eastern Province | -0.7994695 | 0.2960963 | -2.70 | 0.007 |
| _cons | -9.744385 | 1.700101 | -5.73 | 0.000 |

Number of obs     =     3,507

LR chi2 (21)     =     167.83

Prob > chi2     =     0.0000

Pseudo R2     =     0.1427

Log likelihood = -504.17443

Source: Researcher's own construction

The coefficient on gender(HHHSEX) is positive but statistically not significant. Households who are headed by male are assumed to have advantage over female farmers headed household. However, the result of the study shows that though gender may have positive influence on formal credit access but it is not statistically significant. Similarly, a study conducted in Rwamagana (Wivine 2012), shows the positive influence but also not statistically significant. Other studies such as Musabanganji et al (2015) and Lighton et tal (2015) identified a negative influence but also statistically not significant. This may be because in Rwanda being a male or female is not a criteria considered by formal financial institution when giving credit facilities.

The age of household head (HHHAGE) in this study positively impact the accessibility of loan by smallholder farmers. Its coefficient is positive and significant at 5 percent level. Many studies assumed that more year accumulated by head of family members equal to the experience he has acquired in farming thus the better position of credit acquisition compared to those with less age. The hypothesis in this study also follow the same line of the previous studies. The findings of this study produced the same results as those revealed by Faturoti et al. 2006 whose findings indicated that at higher age is a better period when smallholder farmers have accumulated a lot of assets which may enable him to have credit access for improving his farming activities.

The age squared ($AGE^2$) was included to capture nonlinearities. Its coefficient was negative and significant at the 5 percent level. The result implies that as household heads ages they are assumed to have acquired more farming experiences but as age continues to increase, access to credit falls. The possible explanation for this behavior is related to the life stage of an individual whereby he works more at adult stage and then falls when an individual gets retired with age.

Being literate (HHHLiteracy) is impacting positively accessibility of the loan from formal credit institution. This depict the fact that one more year addition in education lead to 1.348 increase of

the odds of credit accessibility. It is believed that education open doors of different opportunities with respect to market information, educated person is in a good position to understand the procedures and what is required to acquire a loan. Furthermore, educated person is believed to have ability to create off farm activities which will earn him addition income that make him considered as credit worth by credit issuing institutions.

Furthermore, the findings of this study concur with the findings of Hussein (2007) who concluded that higher literacy level is associated with the ability to access and comprehend information on credit issuing requirements and conditions, and ability to complete credit application forms properly.

The study reveals that being married (maritalstatus) increases the probability of having access to formal credit and it is statistically significant at 1 percent level. The intuition is that couples can make decision on consumption, savings and investment together .This results is in contradiction with studies by Wivine (2012) and Musabanganji et al (2015) whose findings indicated that marital status was not a significant factor affecting access to credit among smallholder farmers in their study areas. This may be due to sample size used in their studies.

Number of family members in the same house in this study was termed as household size (familylabour) and it could have either positive or negative impact on farmers' access to formal credit. Positive relationship due to the fact that when the household is large it could decide to apply for more credit to expand farming activities (Schreiner and Colombet, 2001). On the other hand, it was hypothesized that it has a negative relationship because greater household size represents a bigger demand for consumption and less ability to repay the debt. So, they have less credit access from lenders. However, it is found that household size (familylabour) is not a significant factor

influencing smallholder farmers' access to credit. This may be because size of household is not one of the criteria used by lending institutions when offering loans.

Living far away from lending institutions is significant and it impacted negatively smallholder farming access to formal credit in Rwanda. The results implies that, the probability of accessing credit facilities increase with the kilometers the borrower is living from credit providing facilities. A study by Hussein 2007 revealed that living far away from lending institution increases borrowing cost hence negatively impacted the borrowers. On the other hand, another study by Johnson and Morduch (2007) indicated the positive impact for those who stay near to the credit facilities.

The results show that there are provincial differences in access to credit by smallholder farmers. Kigali city is more economically developed and is the comparison province. For instance, the coefficient on the Southern province is negative and significant at 1 percent level implying that staying in the Southern province as compared to Kigali city decreases the log odds by 0.72. It is due to the fact that Kigali city act as the hub of most of financial institutions.

Smallholder farmers having savings had a positive sign on the coefficient and statistically significant at 5 percent level. The result implies that smallholder farmer with savings are more likely to access formal credit relative to those who don't have saving as credit provider considered him creditworthy and savings may be used as a loan security. It was revealed that possession of savings account is one of indicator that the person has the ability to save and invest. He can increase his income from investment made and also his expenditure. Saving and investment can boost the confidence of the borrower to apply for a credit which is within his payment ability (Dupas and Robinson 2010). Thus, by looking at his banking historical background credit providers may consider him credit worth.

The coefficient on extension contact proxied by the household ownership of mobile phone (Mobile) was found to be positive and statistically significant. Mobile phone is used in exchange of information between credit seekers and providers. So it can be used to share information on which lending institution is giving loan at better terms. Lack of means of sharing information can lead to adverse selection and moral hazard phenomena (Besley 1994).

Being under social protection program like VUP direct cash assumed to have a better chance of borrowing from formal financial facilities compared to being in another forms of VUP program and the coefficient was significant at 5 percent level and positive. The intuition of this is that smallholder farmers who are under VUP direct cash could be using his cash as the collateral when applying for formal credit.

Regarding wealth groups as it has been categorized into four Ubudehe categories (NISR, EICV 2013/2014), first category (very poor people) is the comparison category. The study results indicated that being in upper level of Ubudehe socio-economic increases the chance of the smallholder farmer to borrow from formal financial sources, and this is consistent with the findings of Musabanganji et al (2015).

House ownership (COLLAT), this refers to whether a smallholder farmer is owning the house he is living in with other members of the household and he/she can use it as a security when borrowing from formal financial institutions. It was hypothesized that smallholder farmers who own a house are privileged to the accessibility of credit more than smallholder farmers who doesn't. The expectation was the positive impact for those who own a house which can be used as a collateral. However, the result shows the negative impact which is contrary to expected results. The level of significance is at 10 percent which depict the fact that other members of the household could deny him to use the dwelling as a collateral fearing losing it in case of default happened.

## 4.4 Marginal effects

Table 13 below shows the marginal effects for variables shown in Table 5. A marginal effect measures the percentage change in the probability of access to formal credit due to a unit change in independent variable. The results show that Age, literacy, marital status, savings, mobile ownership and Ubudehe category are shown to increase the probability of access to formal credit by the smallholder farmers. On the other hand, Age square, distance, location and collateral are shown to decrease the smallholder farmers' probability of access to formal credit.

*Table 13: Marginal effects*

| | Marginal effects | | | |
|---|---|---|---|---|
| **Variable** | **Coef.(dy/dx)** | **Std. Err** | **z-stat.** | **P-Value** |
| **Socio-economic factors** | | | | |
| HHHsex | 0.0126695 | 0.0127772 | 0.99 | 0.321 |
| HHHage | 0.0037544 | 0.0018172 | 2.07 | 0.039 |
| age$^2$ | -0.0000388 | 0.0000188 | -2.06 | 0.039 |
| HHHliteracy | 0.0483722 | 0.0147616 | 3.28 | 0.001 |
| Maritalstatus | 0.044906 | 0.0108828 | 4.13 | 0.000 |
| Familylabour | 0.0005689 | 0.0018266 | 0.31 | 0.755 |
| Distance | -0.016165 | 0.0083231 | -1.94 | 0.052 |
| VUPDirect | 0.0307244 | 0.0145921 | 2.11 | 0.035 |
| **Other factors** | | | | |
| Savings | 0.0224458 | 0.0098899 | 2.27 | 0.023 |
| Mobile | 0.0657505 | 0.0262434 | 2.51 | 0.012 |
| Collateral | -0.0063058 | 0.0033206 | -1.90 | 0.058 |
| Insurance | -0.0078686 | 0.0076126 | -1.03 | 0.301 |
| Livestock | -0.0014405 | 0.0074699 | -0.19 | 0.847 |
| Coopfin | -0.0142583 | 0.0171143 | -0.83 | 0.405 |
| **Ubudehe:** | | | | |

| | | | | |
|---|---|---|---|---|
| Second category | 0.0232092 | 0.0070543 | 3.29 | 0.001 |
| Third category | 0.0431904 | 0.0083668 | 5.16 | 0.000 |
| fourth category | 0.1027477 | 0.0484786 | 2.12 | 0.034 |
| **Location:** | | | | |
| Southern Province | -0.0337429 | 0.0136843 | -2.47 | 0.014 |
| Western Province | -0.0406227 | 0.0135724 | -2.99 | 0.003 |
| Northern Province | -0.0382382 | 0.0142043 | -2.69 | 0.007 |
| Eastern Province | -0.0361707 | 0.013869 | -2.61 | 0.009 |

Source: Researcher's own construction

In the table 13 the number of years of the household in terms of age positively impacted the opportunity of smallholders' accessibility of credit and it is significant at 5 percent. Being older by one more year increases the chance of credit accessibility by 0.0037544. However, Age$^2$ negatively affects the farmer's chance of credit accessibility and it is significant at 5 percent. Being one year older reduces the chance to access credit by -0.0000388. The results revealed that aged male or female are given less chance of accessibility from formal credit sources. When a smallholder farmer ages is expected not to be involved in farming works as he may be in retirement. To this regard most person decide not to take loan at their late age.

Being literate which in this study is measured in terms of the level of education (literacy) has positive impact and is significant at 10 percent. Being literate as measured in terms of education level give 0.0483722 increases in the opportunity of accessing loan from formal sources.

Marital status is a major determinant of access to formal credit by smallholder farmers and it is significant at 1 percent level. Being married and living together rise the chance of access to formal credit by 0.044906.

Distance to formal credit source was also significant at 5 percent level with negative marginal effects on the smallholder farming household access to formal credit. As the distance to the formal credit source from household increases by 1 kilometer, the probability of accessing formal credit reduces by -0.016165.

In terms of location, staying in other provinces other than Kigali City reduces the likelihood of access to formal credit by smallholder famers. For instance, staying in the Southern or Western provinces as compared to staying in Kigali City reduces the probability of accessing credit by -0.0337429 and -0.0406227 respectively. This is because Kigali city is a financial hub for most of the formal financial institutions.

Smallholder farmers having savings was also significant with positive marginal effects and statistically significant at 5 percent level. The results show that having a voluntary saving increases the probability of having access to formal credit by 0.0224458. This is because a smallholder farmer with saving account is considered as creditworthy by the lending institutions.

Ownership of mobile phone which is used in this study to proxy sharing of information by household is statistically significant at 5 percent level and increases the probability of access to formal credit by 0.0657505. Furthermore, receiving a VUP direct cash increases the probability of accessing formal credit by 0.0307244.

Regarding Ubudehe socio-economic categories, first category is the comparison category. Thus, being in second category (poor people), third category (food rich people) and fourth category (money rich people) increases the probability of access to credit by 0.0232092, 0.0431904 and 0.1027477 respectively in comparison to first category (very poor people).

The results show that using own house as a collateral reduces the probability of accessing formal credit by -0.0063058. This could be because other family members could deny him/her to use own house as collateral due to fear a risk of default.

**4.5 Smallholder farmers access to formal credit in Urban versus Rural**

Table 14 below shows that education, VUP direct, Ubudehe category and owning a mobile phone are the important predictors of access to formal credit in rural areas versus urban. It is aligned to prior expectation as the program for all in education as well as social protection programs are meant to reach rural population. Being educated, receiving VUP direct cash and being in upper level of Ubudehe category increases the log odd of accessing formal credit from formal financial institutions. However, savings is a significant factor that affect formal credit access in urban area while it is not significant in rural areas. This could be because urban population earn more income and are richer compared to rural population.

*Table 14: Rural versus Urban estimates*

| Maximum likelihood estimates | | | |
|---|---|---|---|
| **Variables** | **Rwanda** | **Urban** | **Rural** |
| **Socio-economic factors** | | | |
| HHHsex | 0.3531485 | 0.7253903 | -0.1522265 |
| HHHage | 0.1046482** | 0.1575642* | 0.0628807 |
| age$^2$ | -0.001081** | -0.0015041* | -0.0007176 |
| HHHliteracy | 1.348319*** | 0.8354309 | 1.387194** |
| maritalstatus | 1.251703*** | 1.655619*** | 0.9784065*** |
| familylabour | 0.0158585 | -0.0255249 | 0.0606559 |
| Distance | -0.450581* | -0.0254215 | -0.4545316 |
| VUPDirect | 0.8564052** | 0.6486934 | 0.9985456** |
| **Other factors** | | | |

| | | | |
|---|---|---|---|
| Savings | 0.6256501** | 0.8933855** | 0.4913842 |
| Mobile | 1.832718** | | 0.7254283** |
| Collateral | -0.1757669* | -0.189904 | 0.137431 |
| Insurance | -0.2193289 | 0.0326151 | 0.2868986 |
| Livestock | -0.0401525 | 0.3485414 | 0.2514893 |
| Coopfin | -0.3974327 | | 0.4845294 |
| **Ubudehe:** | | | |
| Second category | 1.264658** | 0.2192842 | 2.060702** |
| Third category | 1.782528*** | 0.9235838 | 2.472719** |
| fourth category | 2.668622*** | 1.29014 | 4.015402*** |
| **Location:** | | | |
| Southern Province | -0.7261067*** | 0.0945018 | -0.4921164 |
| Western Province | -0.9472936*** | -0.3575326 | -0.6768334 |
| Northern Province | -0.865783*** | -1.09237 | -0.3229102 |
| Eastern Province | -0.7994695*** | -0.4244824 | -0.3268896 |
| Constant | -9.744385 | -8.870375 | 2.254864 |
| | | | |
| Number of obs | 3,507 | 604 | 2,863 |
| LR chi2 (21) | 167.83 | 55.49 | 88.86 |
| Prob > chi2 | 0.0000 | 0.0000 | 0.0000 |
| Pseudo R2 | 0.1427 | 0.1419 | 0.1217 |
| Log likelihood | -504.17443 | -167.72448 | -320.64876 |

Source: Researcher's own construction

***, ** and * represent level of significant at 1%, 5% and 10% respectively.

## 4.6 Marginal effects for smallholder farmers access to credit in Urban versus Rural

Table 15 presents the marginal effects of the smallholder farmers' access to formal credit in urban versus rural areas. Living in rural areas while educated have more chance of accessing formal credit from formal financial institutions compared to living in urban areas and it increases the

probability of accessing formal credit by 0.0362596. The table also shows that being married and living in urban areas stand more chance of accessing formal credit and increases the probability of accessing formal credit by 0.1321709. In addition, the results shows that being in social protection programs (i.e. VUP direct and Ubudehe category) are the important factors that increases the probability of accessing credit for smallholder farmers in rural areas.

*Table 15: Marginal effects of Rural versus Urban*

| | Marginal effects | | |
|---|---|---|---|
| | Rwanda | Urban | Rural |
| **Variable** | **Coef.(dy/dx)** | **Coef.(dy/dx)** | **Coef.(dy/dx)** |
| **Socio-economic factors** | | | |
| HHHsex | 0.0126695 | 0.0579091 | -0.003979 |
| HHHage | 0.0037544** | 0.0125786* | 0.0016436 |
| age$^2$ | -0.0000388** | -0.0001201* | -0.0000188 |
| HHHliteracy | 0.0483722*** | 0.0666939 | 0.0362596*** |
| maritalstatus | 0.044906*** | 0.1321709*** | 0.0255744** |
| familylabour | 0.0005689 | -0.0020377 | 0.0015855 |
| distance | -0.016165* | -0.0020294 | -0.0118809 |
| VUPDirect | 0.0307244** | 0.0517863 | 0.0261008** |
| **Other factors** | | | |
| savings | 0.0224458** | 0.0713205** | -0.002206 |
| mobile | 0.0657505** | | 0.0410575** |
| collateral | -0.0063058* | -0.0151604 | -0.0052405 |
| Insurance | -0.0078686 | 0.0026037 | 0.0093541 |
| Livestock | -0.0014405 | 0.0278246 | -0.0002716 |
| Coopfin | -0.0142583 | | -0.0014851 |
| **Ubudehe:** | | | |
| Second category | 0.0232092*** | 0.0123636 | 0.0220144*** |
| Third category | 0.0431904*** | 0.0682936 | 0.0340349*** |

| fourth category | 0.1027477** | 0.1088533 | 0.1377678 |
|---|---|---|---|
| **Location:** | | | |
| Southern Province | -0.0337429** | 0.0083505 | -0.0151222 |
| Western Province | -0.0406227*** | -0.0273032 | -0.0193152 |
| Northern Province | -0.0382382*** | -0.0654341* | -0.0106292 |
| Eastern Province | -0.0361707*** | -0.0317103 | -0.0107427 |
| Constant | 0.0224458 | | |

Source: Researcher's own construction

***, ** and * represent level of significant at 1%, 5% and 10% respectively.

## 4.7 Smallholder farmers access to formal credit by ubudehe groups

Table 16 below show the marginal effects of the smallholder farmers' access to formal credit according to their wealth groups (i.e. Ubudehe category). The study revealed that age, being educated, married and living together positively impacted the magnitude of securing formal credit from formal lending facilities when smallholder farmer is in third category of Ubudehe in comparison to being in the lower level of Ubudehe category. It was found that being literate increases the chance of accessing formal credit by 0.1371966 when a smallholder farmer is in third Ubudehe category.

*Table 16: Marginal effects of Ubudehe wealth groups*

| | Marginal effects | | |
|---|---|---|---|
| | **Rwanda** | **Ubudehe second category** | **Ubudehe third category** |
| **Variable** | **Coef.(dy/dx)** | **Coef.(dy/dx)** | **Coef.(dy/dx)** |
| **Socio-economic factors** | | | |
| HHHsex | 0.0126695 | 0.023658* | -0.0094727 |
| HHHage | 0.0037544** | 0.0003884 | 0.0128502** |
| $age^2$ | -0.0000388** | -2.580600 | -0.0001424** |
| HHHliteracy | 0.0483722*** | 0.0335774** | 0.1371966** |
| maritalstatus | 0.044906*** | 0.0314823** | 0.0608118*** |
| familylabour | 0.0005689 | 0.004952** | -0.0062897 |
| distance | -0.016165* | -0.0046152 | -0.0306215* |
| VUPDirect | 0.0307244** | 0.025909 | 0.0737476** |
| **Other factors** | | | |
| savings | 0.0224458** | 0.0347968*** | 0.0137165 |
| mobile | 0.0657505** | 0.0350568 | |
| collateral | -0.0063058* | -0.008514* | -0.0050382 |
| Insurance | -0.0078686 | -0.0004676 | 0.026039* |
| Livestock | -0.0014405 | 0.0028456 | -0.010012 |
| Coopfin | -0.0142583 | -0.0191437 | -0.015668 |
| **Location:** | | | |
| Southern Province | -0.0337429** | -0.0344735 | -0.0507273** |
| Western Province | -0.0406227*** | -0.0439249** | -0.0434834 |
| Northern Province | -0.0382382*** | -0.0454783** | -0.0328964 |
| Eastern Province | -0.0361707*** | -0.0401482** | -0.0405992 |
| Constant | 0.0224458 | | |

Source: Researcher's own construction

***, ** and * represent level of significant at 1%, 5% and 10% respectively.

# CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.1 Introduction

The conclusion of this study is presented in four sections. Section 5.2 is devoted to a summary and conclusion while section 5.3 presents policy recommendations based on the key findings and Section 5.4 presents the limitations of the study and suggests some areas for future research.

## 5.2 Summary and Conclusion

The overall objective of this study was to assess the determinants of smallholder farmers' access to formal credit in Rwanda. The study was motivated by the fact that agriculture remains the backbone and the most important sector of the Rwandan economy. However, according to FinScope Rwanda survey 2016, there is enough evidence that limited access to finance is a persistent problem to smallholder farmers in Rwanda. To this regard, a clear understanding of the determinants of smallholder farmers' access to formal credit in Rwanda is of a paramount importance to guide the policy makers in Rwanda.

Secondary data from FinScope Rwanda survey 2016 were used. Data was analyzed using STATA 14 software. The study used Chi-square test statistics to measure association between formal credit user and non-credit user with regard to the explanatory variables hypothesized to influence access to formal credit. The study used binary logit model to estimate factors which influenced smallholder farmers' when accessing formal financial credit.

These explanatory variables; head of household age (HHHage), head of household education (HHHliteracy), marital status of the head of household (maritalstatus), distance from the lending institution (distance), location of the head of household (Location), head of household savings (savings), mobile ownership by head of household(mobile), government program like VUP direct

(VUPDirect), wealth status category (Ubudehe) possession of collateral by head of household (collat ) shown a significant impact to smallholder farmers chance of acquiring formal credit.

Other variables such as sex, family labor, livestock ownership, possession of community based health insurance, and being a member of informal sector lending groups were not significant.

**5.3 Policy Recommendations**

Taking into account the findings of the present study  policies that focuses on educating people on the requirements and regulation governing provision of credit facilities should be established. This should be introduced in the financial literacy programs. Under this program borrowers will be able to understand their limitation as well as their advantages with regard to  farming credit.This is because being literate positively influenced access to formal credit by the smallholder farmers.

As descrepancies between urban and rural was identified to have a negative impact on smallholder farmers access to formal credit it is important to establish credit offices which will bring credit providers close to rural population and help them to form saving groups to mobilize savings which later will be used as a security to secure small credit.

In addition, since the ownership of mobile phone and location are important determinants of access to formal credit by smallholder farmers, government should also expand or improve transportation infrastructures such as roads, telecommunication, and other infrastructures in different areas to make financial services providers more accessible accross the provinces.

**5.4 Study Limitations and Areas for Further Research**

Cross-sectional data to analyze the determinants of access to formal credit by smallholder farmers in Rwanda was used. The study only focus on what is determining a smallholder farmers ability to have formal credit when he needs it. However, there are some areas which the study didn't cover

like risk attitute of the smallholder farmers towards taking credit. Some farmers are risk averse and they may decide not to borrow from formal financial institutions due to fear of default. This is considered as a limitation of the present study which needs to be adressed in the future studies. There is a need for further research in the determinants of the choice of financial service providers by smallholder farmers such as the different types of banks, micro finance institutions and Sacco$_s$ and farmers perception on formal financial institutions . These are possible areas which was not covered by need further investigation in future.

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