THE INFLUENCE OF CREDIT ACCESSIBILITY ON SMALLHOLDER RICE FARMERS' PERFORMANCE IN TANZANIA:

A CASE OF MBARALI DISTRICT

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A CASE OF MBARALI DISTRICT

By

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A Dissertation Submitted in Partial/ Fulfillment of the Requirements for the Master of Science in Accounting and Finance of Mzumbe University

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CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by Mzumbe University, a dissertation titled **the Influence of Credit Accessibility on Smallholder Rice Farmers' Performance in Tanzania: The Case of Mbarali District** in partial/ fulfillment of the requirements for the award of Master of Science in Accounting and Finance of Mzumbe University.

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I, Mbonaga, Richard A, hereby declare that this dissertation is my own work that it has not been presented and submitted to any other university or institution for similar or any other degree award.

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I dedicate this research report to my parents Mr. and Mrs. Angelo Mbonaga who laid a strong foundation of my education up to this level and my family for their encouragement, support, love and prayers.

ABBREVIATION AND ACRONYMS

URT	United Republic of Tanzania
ASDP	Agriculture Sector Development Programme
NSGRP	National Strategy for Growth and Reduction of Poverty
AGITF	Agriculture Inputs Trust Funds
TADB	Tanzania Agriculture Development Bank
AISP	Agriculture Input Subsidy Programme
MFI	Microfinance Institutions
NGO-MFIs	Non-Governmental Organization Based Microfinance Institutions
MB-MFIs	Member Based Microfinance Institutions
SACCOs	Savings and Credit Cooperatives
SACCAs	Savings and Credit Associations
CGS	Credit Guarantee Scheme
SAGF	Sustainable Agriculture Guarantee Fund
ECGS	Export Credit Guarantee Scheme
PASS	Private Agricultural Sector Support
WAF	Women Access to Fund,
AGF	African Guarantee Fund
CRDB	Credit for Rural Development Bank
NMB	National Microfinance Bank
MUCOBA	Mufindi Community Bank
KCB	Kilimanjaro community bank
TIB	Tanzania Investment Bank

BOT	Bank of Tanzania
BRAC	Bangladesh Rural Advanced Committee
SEDA	Small Enterprise Development Agency
FINCA	Foundation for International Community Assistance
MEDA	Micro Enterprises Development Agency
PRIDE	Promotion of Rural Initiative and Development Enterprise
ROSCAs	Rotating, Savings and Credit Associations
VICOBA	Village Community Banks
NEDF	National Entrepreneurship Development Fund
PTF	Presidential Trust Fund
NMP	National Microfinance Plan
MSc A&F	Master of Science in Accounting and Finance

ABSTRACT

The problem of access to credit facilities is very critical to smallholder rice farmers specifically in rural areas. Several studies have been conducted to address the issue of poor access to credit facing smallholder rice farmers. However, no such study has been conducted in Tanzania, specifically in Mbarali District, where there are a good number of smallholder rice farmers. Moreover no study has attempted to assess the influence of access to credit facilities on performance of smallholder rice farmers. This study was intended to bridge this knowledge gap.

The study used quantitative analysis approach to establish cause and effect relationship between variables. The study employed survey research design and three years data were collected from 300 respondents in Mbarali District. Poison Regression Model was used to estimate the factors affecting access to formal credit facilities while factors influencing production performance of smallholder rice farmers in Mbarali District, were estimated using OLS regression model. The findings revealed that collateral value, credit size, interest rate, transaction costs and savings are the main factors affecting access to credit facilities by smallholder rice farmers. Access to formal credit facilities, credit size and farm size are the factors influencing production performance of smallholder rice farmers.

The study makes contribution to the knowledge on factors affecting factors affecting credit accessibility of smallholder rice farmers in Tanzania. Furthermore the study offers empirical evidence that access to formal credit facilities improves the performance of the smallholder rice farmers in Tanzania.

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CHAPTER ONE

1.0 Introduction

This chapter covers the background of the problem, statement of the problem, objective of the study, research questions, and significance of the research.

1.1 The Background of the Study

The development of small scale farming has been providing significant contribution to the economic growth and sustainable development among different countries in the world (Sebopetji & Belete, 2009). Small scale farming plays a vital role to the generation of household income, source of employment to the majority in the rural areas (Ibrahim & Aliero, 2012)**.** Different countries have focused on improving small scale farming to achieve sustainable economic development by enhancing advanced production methods to increase productivity. The development of small scale farming especially in the developing countries is a key tool for poverty alleviation (Mpuga, 2010).

The production performance of smallholder rice farmers in developing countries is affected by several factors but one among crucial factor is stable source of finance (Sanusi & Adedeji, 2010). Due to poor source of finance, smallholder rice farmers have failed to adopt advanced farming technologies which are expensive to acquire, and income generated from farming is insufficient to cover the whole production costs and to advance agriculture (Hazarika & Alwang, 2003; Mwang'onda, Mwatawala, & Hyera, 2016). Thus the need of credit facilities from financial institutions become inevitable.

Provision of credit facilities to smallholder rice farmers is one of the key instrument for rural development, which facilitate to attain sustainability of the small scale farming (Freeman, Ehui, & Jabbar, 1998). This results into improvement on agriculture production and productivity. Enhanced provision of credit facilities to smallholder famers would speedup sustainable development on the small scale farming (Chisasa & Makina, 2012; Chongela, 2015). A number of literatures found that access to credit has a positive impacts on the production performance of the

smallholder rice farmers (Chongela, 2015; Kipesha & Zhang, 2013; Singogo, Zachary, & Tinali, 2017)

According to Hazarika & Alwang (2003), the smallholder rice farmers in the developing countries are isolated from accessing credit facilities due to several reasons such as unstable source of income, lack of collaterals, poor knowledge on monitoring farming activities and inadequate keeping of accounting records. All these are described as among the factors limiting access to formal credit facilities by smallholder rice farmers.

Tanzania is one of the least developed country in the world (Nyamsogoro, 2010), where the majority of its people live in rural areas and are employed in agricultural activities. In Tanzania the smallholder rice farmers dominate the agriculture sector in which they contribute more than 75% of the total agriculture products (FAO, 2015). However the production capacity of smallholder rice farmers is lower similarly to other underdeveloped countries. The smallholder rice farmers in Tanzania are facing the challenge on poor access to credit facilities which is affecting the production performance (Mwang'onda et al., 2016).

The government of Tanzania has attempted to solve the problem of poor access to credit facilities by establishing several programs and policies to support the smallholder rice farmers (URT, 2001) These programs and policies includes Agriculture Sector Development Strategy (2001), Agriculture Sector Development Programme (2005), Agriculture Input Subsidy Programme (2008) and Kilimo Kwanza (2009), Agriculture Sector Development Programme II (ASDP II) together with the national strategy for growth and reduction of poverty (NSGRP). Also the government has established The Tanzania Agriculture Development Bank in 2015 to support the provision of credit facilities to farmers (URT 2016).

Furthermore the government in partnership with the private sector is aiding the provision of agricultural loans to input distributors through Agriculture Inputs Trust Funds (AGITF). Through (AGTIF) the government has established partnership with financial institutions including; commercial banks, community banks, saving and credit societies and local government input funds to extend the network for

distribution of agricultural loan inputs. The target of all these initiatives are aimed to improve the production and productivity of the producers including smallholder rice farmers in rural areas through provision of credit facilities (URT, 2016).

Despite all these efforts of both government and private sector, still the majority smallholder rice farmers in rural areas have poor access to banking services (Kipesha & Zhang, 2013; Nyamsogoro, 2010), thus the problem of poor access to credit facilities has been dominant.

1.2 Statement of the Research Problem

The production performance of the smallholder rice farmers has not been pleasing (Hussain & Thapa, 2012). This is due to a number of factors, but one among essential factor is poor access to credit facilities. The problem of access to credit facilities is very critical to smallholder rice farmers specifically in developing countries (Sanusi & Adedeji, 2010). The issue of poor access to credit facilities by smallholder rice farmers recently has attracted attention of several researchers and policy makers, thus lead to establishment of different measures to solve the problem of poor access to credit facilities (Chongela, 2015; Mpuga, 2010).

In Tanzania under the current regime, the government is striving to implement the agriculture policies and programs to support industrialization. In order to be successful, the implementation demands deliberate efforts to increase the production capacity of raw materials so as to meet the demand of the industries. This has accelerated the smallholder rice farmers who are dominating the agriculture sector of the country to consider employing advanced farming technologies which needs stable source of finance to increase production and productivity (URT, 2016).

Despite the measures to solve the problem of poor access to credit facilities particularly among smallholder rice farmers in rural areas, the magnitude of the problem is still high. This is due to the fact that the majority smallholder rice farmers have poor access to credit to support remote initiatives (Mwang'onda et al., 2016). The smallholder rice farmers needs to purchase sufficient agricultural inputs, thus there is a need of enough money which is not easily accessible (Girabi & Mwakaje, 2013).

Several studies have been conducted around the world to address the issue of poor access to credit facing smallholder rice farmers (Fan & Chan-Kang, 2005; Hussain & Thapa, 2012; Ibrahim & Aliero, 2012). However, no such study that has been conducted in Tanzania, specifically Mbarali District, where there are a good number of smallholder rice farmers. Moreover no study has attempted to assess the influence of access to credit facilities on performance of smallholder rice farmers. Therefore this study intended to bridge this knowledge gap on the problem of poor access to credit facilities facing the smallholder rice farmers and to assess the influence of access to credit facilities on performance of smallholder rice farmers.

1.3 Research Objective of the Study

The main objective of this study was to examine the influence of credit accessibility on the performance of smallholder rice farmers in Tanzania.

1.3.1 Specific objectives of the study

The following were the specific objective of the study

I. To identify factors affecting credit accessibility of smallholder rice farmers in Tanzania.
II. To determine the influence of access to credit facilities on the performance of the smallholder rice farmers in Tanzania.

1.4 Research Questions

1.4.1 General question

The general research question of the study was: what is the influence of credit accessibility on smallholder rice farmers' performance in Tanzania?

1.4.2 Specific questions

I. What are the factors affecting credit accessibility of smallholder rice farmers in Tanzania?
II. What is the influence of access to credit facilities on performance of smallholder rice farmers in Tanzania?

1.5 Significance of the Study

The studies contribute to knowledge to the impact on the access to credit to smallholder rice farmers. Thus, the study sheds light and bridge the existing knowledge gap on the influence of credit accessibility on the smallholder rice farmers' performance in Tanzania.

Additionally, the findings provide understanding to credit providers and policy makers in agriculture sector of the developing countries on the best ways to improve lending environment in rural areas for the development of smallholder rice farmers for the sustainable economic development.

1.6 Organization of the study

The study is organized into five chapters. Chapter one comprises introduction of the study, background, research problem, the general research objective, specific objectives, research questions and the significance of the study. The second chapter presents literature review from relevant theories, empirical reviews and the conceptual framework adopted. Chapter three comprises methodology used in the study. Chapter four comprises the analysis, discussion and presentation of data used in the study. Chapter five presents conclusions, practical implications, recommendations, limitations and areas for future studies

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter provides the literature review of various literatures. The chapter in broken into four major parts namely the theoretical literature review, empirical review, conceptual framework and research model and hypotheses to be used in the study

2.1 Theoretical Review

2.1.1 An Overview of Smallholder rice farmers Financing in Tanzania

The smallholder rice farmers can be defined as farmers with small – sized land who are growing basically subsistence crops/ products by using local farming technologies mostly depends on family labour. Yehuala (2008) defined smallholder rice farmers as those sub marginal farm households who owns and cultivate small pieces of land plots mainly for subsistence crops by using family labour. The concept of smallholder farming sector equate to family farming or small scale farming. Small scale farming sector has significant contribution to the economic growth of the country, employment and income to the households hence contribute significantly to the poverty alleviation among the societies in rural areas.

Credit can be defined as the transaction made between two parties namely lender and borrower in which the lender provide money/ supply/ goods or securities which attract return for the future payment. Sy (2007) Defined credit as transaction on which the borrower purchase the present use of money from the lender/ financial institution with an agreement to make future payment at a specific interest charge. Furthermore Oboh & Ekpebu (2011) defined credit as the contractual agreement on which one party presently receive money or valued items with an agreement to make payment to the provider in the future date together with an agreed interest charge.

Agricultural credit can be defined as the form of financing which deals with funding different farming activities Chenaa, Maria, & Nkiemboupoh (2018). It plays a significant role to facilitate farming commercial activities which involves all steps

from production state to the distribution of agriculture products (Boucher, Guirkinger, & Trivelli, 2009).

Majority of rural farmers in Tanzania have low income and savings capacity. This makes it tough for maximum of them to adopt modern farming technologies that would have led to growth in their farm earning. Farm credit is widely identified as one in all substantial factors among adoptions of farm technologies and growth farm earning among rural farmers in Tanzania. It is one of the essential ingredients of sustainable agricultural production.

2.1.2 Microfinance Institutions in Tanzania.

Microfinance institutions are the organization which provide financial services to low income communities (Kipesha & Zhang, 2013; Nyamsogoro, 2010). These institutions are regarded as the main provider of different forms of micro financial services to the majority of small and medium enterprises including smallholder rice farmers in rural areas of Tanzania (Nyamsogoro, 2010). Microfinance institutions are divided into several forms which includes; formal financial institutions (commercial banks, specialized banks and community banks), Non-Governmental Organization Based Microfinance Institutions (NGO-MFIs), Member Based Microfinance Institutions (Savings and Credit Cooperatives (SACCOs), Savings and Credit Associations (SACCAs)), credit unions and non – bank financial institutions (Kipesha & Zhang, 2013; Nyamsogoro, 2010).

(a) Formal Lending Institutions in Tanzania.

This is the form of credit which is provided by the formal lending institutions which are operating under the given laws and regulations in a given country or territory (Duy, D'Haese, Lemba, & D'Haese, 2012). Additionally Kashuliza & Kydd (1996) defined formal credit as the form of credit which are provided by the registered financial institutions in a given place. It includes all formal financial institutions such as commercial banks, specialized banks, community based financial institutions registered and operating under the established laws and regulations (Nyamsogoro, 2010; Simtowe & Zeller, 2006).

Despite the significance of credit facilities in agriculture sector, the commercial banks in Tanzania are still isolating in terms of financing the sector. The agriculture sector is exposed to susceptible risks such as volatile prices of products and weather changes thus makes difficulties for the banks to assess the risks associated with the borrowers (Chongela, 2015; Kashuliza & Kydd, 1996; Mwang'onda et al., 2016). Also the agriculture sector is characterized by small scale and unsophisticated farming which results in poor yields and therefore potential transactions are small and not profitable for the banks (Mwang'onda et al., 2016). Furthermore most farmers are located in rural areas where the financial institutions incurs high costs on conveying the financial services due to poor infrastructures such as poor road network (Nouman, Siddiqi, Asim, & Hussain, 2013). The agriculture sector have been ignored by the financial institutions due to insight of high risks and lower profitability to the financial institutions (Oladeebo & Oladeebo, 2008).

Recently the literature shows that the presence of the Credit Guarantee Scheme (Sustainable Agriculture Guarantee Fund (SAGF), Export Credit Guarantee Scheme (ECGS), PASS, Women Access to Fund, African Guarantee Fund (AGF)) has been providing significant contribution because it guarantee compensation in the event of default of credit by the borrower to the financial institutions. This process of risks sharing has led to the increase of the flow of credit facilities in agriculture sector from financial institutions in Tanzania (Girabi & Mwakaje, 2013; Singogo et al., 2017).

In Tanzania there are formal financial institutions which provide financial services in agriculture sector (Chongela, 2015). The financial services provided includes micro savings and micro credits to both small and medium farmers in rural areas (Kashuliza & Kydd, 1996). These financial institutions includes Credit for Rural Development Bank (CRDB), National Microfinance Bank (NMB), Tanzania Agriculture Bank (TADB), and community banks which includes like Mufindi Community Bank (MUCOBA), Kilimanjaro community bank (KCB), Tanzania Investment Bank (TIB) and Equity Bank (BOT, 2017). All these formal financial institutions promote the rural development through provision of different financial services which plays a significant role on improving the life of the rural communities in Tanzania.

(b) Non-Governmental Organization Based Microfinance Institutions.

These are non-governmental organization which deals with the provision of micro financial services to the low income earners (Kipesha, 2013). NGO-MFIs offer lending services to both group based borrowers and individual borrowers. Most of NGO-MFIs needs their borrowers to deposits a certain amount of money which act as an insurance to the loan applied for (Nyamsogoro, 2010).

Examples of NGO-MFIs are; Bangladesh Rural Advanced Committee (BRAC), Small Enterprise Development Agency (SEDA), Foundation for International Community Assistance (FINCA), Micro Enterprises Development Agency (MEDA), Promotion of Rural Initiative and Development Enterprise (PRIDE) and Victoria Finance PLC.

However most of NGO-MFIs offers financial services such as load advancement to the small and medium enterprises hence they are urban centralized, therefore the poor households in rural areas who are basically dealing with small scale farming activities fails to access the financial services offered (Isaga, 2018).

(c) Member Based Microfinance Institutions

Member Based Microfinance Institutions are financial organizations which are owned by the community members with the main objective of generating savings and provision of different forms of credits to its members at reasonable interest rate (Kipesha & Zhang, 2013; Lopez & Saidenberg, 2000b; Msangya & Yihuan, 2016). The duty of running the organization lies on the hands of its members who have an ability to elect the board members who are responsible on supervising management of the organization (Nyamsogoro, 2010). However the management of the organization is formed by the people with education and skills hence the member board act as the supervisor to the management staffs employed by the organization (Kipesha & Zhang, 2013). Member based microfinance institutions includes Savings and Credit Cooperatives (SACCOs), Savings and Credit Associations (SACCAs), Rotating, Savings and Credit Associations (ROSCAs) and Village Community Banks (VICOBA).

Member Based Microfinance Institutions provides various forms of credits to its member who are basically low income population in both urban and rural areas (Sanusi & Adedeji, 2010). MB-MFIs provide different services such as business loans, emergence/urgent loans, loan for education purpose and agriculture loans to the members based on the nature and location of the organization (Nyamsogoro, 2010). In rural areas where the majority members deals with farming activities, the MB-MFIs play a vital role on provision of farm credits to its members which enhance the productivity among the farmers.

(d) Informal Lending in Tanzania.

This is the form of credit which is provided informally by unauthorized/ unregistered entities or individuals such as friends, family members, traders, moneylenders and landlords (Mwang'onda et al., 2016). It operates under informal market which plays a vital role on channeling credit facilities to poor households in urban and rural areas. In rural areas where large number of households are dealing with small scale farming activities, informal credit sector play a significant role on channeling credit facilities hence is accessible by large number of households compared to formal credit facilities (Msangya & Yihuan, 2016). Under this form of credit, the credit providers (lenders) need little or sometimes no collateral required to set against the debt as security. In rural areas where people have assets with no formal title deeds find informal credit sector suitable source of finance which can be easily affordable and accessible compared to the formal credit which involves complex and complicated requirements which cannot be simply attained by the poor households in rural areas (Singogo et al., 2017)

Additionally informal credit facilities are characterized by flexible interest rates which varies from very high to no interest rates based on the nature of relationship and agreement between the lender and borrower (Yehuala, 2008). Furthermore informal credit is characterized by lower transaction costs and lower number of procedure days to be accessed compared to formal credit thus influence large number of households who are in needs of credit facilities to prefer using this form of credit.

2.1.3 The Government Role on Smallholder rice farmers Financing

In Tanzania, the governments had identified the significance of credit access to farming groups and have formulated and carried out agricultural credit regulations, programmes and created institutions. The establishment of AGTIF is unarguably, certainly one of such coverage interventions in agricultural financing within Tanzania. These interventions of government were visible as palliative measures to facilitate formal financial institutions to supply credit facilities inside the agricultural sector. Several studies have shown that a large number of farmers in developing countries are faced with credit access constraints and production inefficiencies.

The government of Tanzania also has introduced credit schemes to solve the challenge of credit access faced by low income communities in both rural and urban areas (URT, 2016). Some of the government initiatives includes; Agriculture Sector Development Strategy (2001), Agriculture Sector Development Programme (2005), Agriculture Input Subsidy Programme (2008) and Kilimo Kwanza (2009), Agriculture Sector Development Programme II (ASDP II) together with the National Strategy for Growth and Reduction of Poverty (NSGRP). Also through Youth and Women Development Funds, National Entrepreneurship Development Fund (NEDF), Mwananchi Empowerment Fund, Presidential Trust Fund (PTF) and Export Credit Guarantee Scheme (ECGS). All these government initiatives has built entrepreneurial capacity and provided micro loans to the large group of low income earners (NMP, 2017). The government in collaboration with social security fund issued tshs 105 billion for on lending to the group of 256,602 entrepreneurs (NMP, 2017). Also the government has established The Tanzania Agriculture Development Bank in 2015 to support the provision of credit facilities to farmers (URT, 2016).

2.1.4 The Need of Smallholder rice farmers Financing

The smallholder famers needs stable source of credit to purchase new inputs which facilitates the production process and enhance production capacity (Sebopetji & Belete, 2009). These inputs includes improved modern seeds, pesticides, fertilizers and modern farming technologies (Mpuga, 2010). Following this line of argument, Ololade & Olagunju (2013) analyses that to improve productivity, farmers needs stable source of credits to cover the costs of all needed farm implements which are

very expensive hence hard to be covered by farmers due to low saving capacity. This also was built by Adebayo & Adeola (2008) who expressed that formal credit is needed by smallholder rice farmers for the procurement of sufficient improved farm implements which are crucial towards improving not only production capacity but also the living standards. Moreover Kashuliza & Kydd (1996) in their study found that farmers who had access to formal credit had better use of improved farm implements compared to noncredit beneficiaries. Also Smallholder rice farmers needs formal credits for marketing, storage, transportation and processing their products

The use of modernized agricultural equipment among poor households in rural areas is still lower compared to the contribution of the sector in the economy and welfare (Rahji & Fakayode, 2009; Reardon, Barrett, Kelly, & Savadogo, 1999). This is the results of insufficient capital finance experienced by farmers in rural areas which has raised the need of reliable and stable source of finance from the external stakeholders (Ololade & Olagunju, 2013). For insistence, the empirical findings of Msangya & Yihuan (2016) found that only 25% of small holder farmers used tractors to cultivate their land on which was very low compared to the total area cultivated. Also 33% of smallholder rice farmers used hand hoe to cultivate their land which affect negatively the productivity. Credit is needed by the farmers especially in developing countries like Tanzania for the purpose of purchasing threshers, tractors and harvesters hence the use of these modern machineries results to the increase of production capacity at the same farm size which could have lower production capacity if poor farming equipment could be used (Girabi & Mwakaje, 2013).

Farming credit enable the farmers to survive during uncertainties which could result into losses thus the farmer have an ability to manage different risks such as the risk of price fall and the risk of bad weather changes (Dzadze, Aidoo, & Nurah, 2012). During the time of such environmental risks farmers needs proper strategies to disentangle the negative outcome hence relatively cost, sufficient and timely source of finance is needed to manage the conditions (Boucher et al., 2009; Chenaa et al., 2018). From this aspect the farmer can access credit during riskier moments and

payback the credit given during the favorable seasons of crops produced (Ibrahim & Aliero, 2012).

Farmers especially in rural areas face the problem of price fall during harvesting period (Mwang'onda et al., 2016). The buyers of those products offer small prices which are generally not favorable to the farmers but they are only forced to sell their products because of the need of money to cover different costs incurred during the production process (Dzadze et al., 2012). In order to solve this challenge, farmers can use credit during the harvest period because at this period buyers offer low prices for the commodities and make repayment at the time when the prices are favorable (Adebayo & Adeola, 2008).

Farmers needs timely improvement of the cultivated areas so as to increase efficiency and productivity so as to attain sustainable development. This needs more stable source of finance which is hardly to be covered by farmers' own savings due to low saving nature of the farmers (Anyiro & Oriaku, 2011). Through the use of credit facilities it helps the farmers to improve land used. These land improvements includes land reclamation, horticulture and crops rotation (Atieno, 2001; Buyinza & Bbaale, 2013).

2.1.5 Challenges on Smallholder rice farmers Financing

People in rural areas especially in developing countries have limited access to credit from formal financial institutions due to poor knowledge and capabilities on financial matters. This hinder the credit providers to guarantee credit to the community with lack of knowledge have poor households remain unfavorable (Oladeebo & Oladeebo, 2008). As supported by Girabi & Mwakaje (2013) said that limited knowledge of financial issues hinder the poor agriculture based community to access credit.

Poor households in rural areas are not document keepers, hence they lack proper information asked by financial institutions concerning their economic activities (Ng'eno Vincent, Nyangweso, Langat, & Kipsat, 2011). In their study Nouman et al. (2013) found that smallholder rice farmers in rural areas lack valid documents to support the requirements from the financial institutions. In addition agriculture communities in rural areas have no behavior of keeping proper records concerning

their farming activities which results into difficulties on assessing the costs and revenue, hence the financial institutions fails to assess on whether the applicants have an ability to repay the credit or not (Chisasa & Makina, 2012).

As explained by Atieno (2001) who assessed the SMEs attitude toward risks associated with formal credit from financial institutions. It was found that the SMEs in rural areas have poor attitude towards risks associated with the credits. This was supported by Duy et al. (2012) who found that, poor households in rural areas were not able to take credit due to fear of losing their assets such as houses and plots of lands pegged as collaterals.

Based on the conditions of financial institutions, the borrower must put the valuable asset/s as security against the credit requested. In case the borrower fails to repay the credit granted (credit defaults), the financial institution will have an authority to sell the valuable asset/ security to recover their amount of money they have a loan from the borrower.

Poor household communities in rural areas especially in developing countries face the challenge of higher transaction costs incurred during the period of application and processing credits from the financial institutions (Hussain & Thapa, 2012). The need of savings a certain amount in order to be given a credit facility. This is the requirement especially in member based institutions (SACCOs) once the applicants fails to meet the minimum requirement as saving, will lack an access to credit facility hence is underqualified base on qualifications inserted (Isaga, 2018). Also an applicant incurs other costs during follow ups which also takes long time, this results into difficulties on accessing credit facilities in rural areas (Siwar, Idris, Yasar, & Morshed, 2014).

In order to be given formal credit, the applicant must have enough valuable and trusted collateral to be pegged as security against the credit facility applied from the financial institution (Mpuga, 2010; Ng'eno Vincent et al., 2011; Nouman et al., 2013). However large number of smallholder rice farmers in developing countries have limited assets to be used as collaterals. In their study Sanusi & Adedeji (2010) found that large number of poor households in rural areas are denied to access formal

credit from financial institutions due to lack of enough collateral. Moreover in other circumstances Oboh & Kushwaha (2009) observed that there were poor households with collaterals which had no ownership title deeds thus hindered them to access formal credit facilities from the financial institutions.

Most of financial institutions providing credit facilities are located in urban areas Isaga (2018). Poor households living in rural areas are not faced with the challenge of travelling far away to find the financial services. The centralization of financial institutions in urban areas results into difficulties to the poor households to access financial services due to costs implication and sometimes lack of proper information about these financial services provided which affect the possibilities of poor communities regarding the issue of access to credit facilities (Chisasa & Makina, 2012; Chongela, 2015; Nouman et al., 2013; Sebopetji & Belete, 2009).

2.1.6 Credit Lending Theories

(a) Transaction cost theory.

This theory was first developed by Schwartz (1974) and suggests that suppliers can have an advantage over rival lenders in verifying their customers ' real financial situation or creditworthiness. Suppliers are also able to monitor and force credit debt payments (Ahtiala, 2005). All these superiorities can bring a competitive advantage to suppliers especially when compared to financial institutions. Three cost advantage sources were classified as follows: the acquisition of information, the control of the purchaser and the recovery from existing assets. The very first source of competitive advantage can be attributed to the fact that sellers can gather information about buyers more quickly and at a cheaper cost, because it has been acquired in common business conditions. This means that the intensity and the number of orders placed by the buyer give suppliers an idea of what is happening of the customer, rejecting early redemption rebates by the buyer may alert the supplier to a deterioration in the buyer's creditworthiness, and sellers usually attend clients far more often than banks do (Sy, 2007).

(b) Information asymmetry theory

The theory explain the relationship between the lender and borrower of the financial resources. During assessment of the borrower, lenders face challenges on evaluating due to limited information provided by the credit applicant (Lopez & Saidenberg, 2000a). Information asymmetry in credit market exists when the credit applicants have sufficient information about returns and potential risks related to projects invested on which the financial resources is allocated (Werner, 2016). While on the other hand the credit provider lack sufficient data regarding the credit applicant. Information asymmetry is associated with two challenges which includes moral hazards and adverse selection (Yehuala, 2008). Financial institutions face challenges to solve those problems especially when issuing credits to poor households who usually borrow small amounts, hence it is not economically to dedicate financial resources during monitoring and evaluation creditworthiness of the credit applicants (Werner, 2016).

2.2 Empirical Review

2.2.1 Determinants of Access to Credit Facilities

Access to formal credit sources in small scale farming sector has been studied extensively worldwide (Isaga, 2018; Kashuliza & Kydd, 1996; Nouman et al., 2013). Unquestionably there several empirical studies which has been established to explore the factors affecting access to credit facilities by poor households in rural areas in the developing countries (Adebayo & Adeola, 2008; Assogba et al., 2017; Boucher et al., 2009; Duy et al., 2012). Those factors includes which include the following;

(a) Age

The access of credit facilities is affected by age of the credit applicant. This is due to the fact that the financial institution providing credit services to smallholder rice farmers provides to the Middle Ages groups who are still energetic and productive (Akudugu, 2012). The middle ages groups are believed that they can establish strong discipline in allocation of the credit to the planned farming activities therefore easy for them to access credit compared to the younger and old aged groups (Anyiro & Oriaku, 2011; Sebopetji & Belete, 2009). furthermore different researchers reveals

that credit providers are more concerned in provision of credit facilities to energetic farmers who are more likely to be faster in adoption of new farming technologies and innovation than the old farmers who seems to be less active (Henri-Ukoha et al., 2011).

(b) Gender

Gender have direct influence to the microcredit accessibility of smallholder rice farmers in rural areas. Ng'eno Vincent et al. (2011) found that women had a lower access to credit facilities compared to men which was due to the fact that most of productive assets are owned by men and therefore formal financial institutions in rural areas prefer to offer credit to men since women are considered to be more risky. On the other hand, (Akpan, Patrick, Udoka, Offiong, & Okon, 2013) found gender of credit applicants negatively and statistically significant related towards access to credits which means the probability to have access to credit sources decreases among male smallholder rice farmers due to multifunction roles of males in Africa. This agrees with the empirical findings of Isaga, (2018) that small scale farming activities are most carried by males hence in their study 86.5% of credit beneficiaries were male and only 13.5% of credit beneficiaries were female.

(c) Education level

Literacy is among of the influential factor to the smallholder rice farmers' access to credit facilities in rural areas. This includes farmers with technical knowledge and farming skills are more familiar with credit markets and facilities (Sanusi & Adedeji, 2010). Literatures shows that the smallholder rice farmers with formal secondary and higher education level have more access to formal credit facilities than the smallholder rice farmers with lower education level (Dzadze et al., 2012; Henri-Ukoha et al., 2011; Isaga 2018). In the study of Akudugu (2012) found that the supply of credit services from rural financial institutions was significant positively influenced by the level of formal education of the credit applicants. Also education level accomplished by a smallholder farmer does not only increase farm productivity but also enriches the capability in evaluation and adoption of the new farming and production technologies Akpan et al., (2013). Additionally the possession of higher education level is one of the criteria for obtaining formal credit from the formal

financial institutions providing microcredit to smallholder rice farmers (Anyiro & Oriaku, 2011)

(d) Marital status

This is another factor which affect the access to credit facilities by the poor households in rural areas. The empirical results of Ololade, Olagunju, Adejumo, & Okegbade (2018), found that unmarried people reduce the probability of access to formal credit by 86.3%. This was due to the fact that the married people have larger family size which indicate the manpower availability hence makes easy for them accessing credit which is allocated to the farming activities hence easy in managing the flows. Married people are also trusted with the financial institutions due to establishment of permanent settlement hence the possibility of default is at minimum level compared to individuals with no family.

(e) Farming experience

Farming experience is one among the factors influencing access to credit facilities by smallholder rice farmers in rural areas. Experience has become as an essential factor contributing to assets accumulation and adoption of new technologies (Sebopetji & Belete, 2009). As it is believed that people who works in areas which they are well experienced have better chance of being successful in the given area of concern. Similarly this is applicable to the micro finance institutions where the household farmers with higher experience are prioritized in accessing microcredit compared to the households without or with little experience (Hazarika & Alwang, 2003). This is consistent with Akpan et al. (2013) who argued that people with experience in a given industry always has more information about the business than their counterpart on how to meet the market expectation, business network and managerial abilities which help them to influence the microcredit providers hence increase the chance to access the credit facilities offered. In the findings of Sebopetji & Belete (2009) revealed that farming experience had a positive relationship with access to agricultural credit facilities hence as the farming experience increases it went together with an increase of farmers' access to credit facilities. (Rahji & Fakayode, 2009) revealed that smallholder rice farmers with more experience had a better relationship with the money lenders and traders hence it was easy to establish a

commercial relationship among lenders and borrowers thus the long term relationship increased the possibility of accessing credit facilities compared to relatively new smallholder rice farmers especially in rural areas.

(f) Farm size

Farm size include the size of area cultivated by the poor households. This is another factor which affect the access to credit facilities by the smallholder farmer in rural areas. The empirical results of Henri-Ukoha et al. (2011) showed a positive significant relationship between the farm size and the smallholder rice farmers' access to agricultural microcredit from formal micro credit financial institutions in rural areas. However in some circumstances landholding is observed as the symbol of social status thus the farmers with large farm sizes are more likely to have advantage on accessing loans from both informal and formal sources. This is similar with the findings of Mpuga (2010) in their study found that smallholder rice farmers with land size ranging from 2.5 acres to 5 acres have greater possibilities of accessing credit facilities to formal sources compared to those with landholding size lower than 2.5 acres. These results also uphold the empirical findings of a good number of studies that revealed a significant positive relationship between land size cultivated and access to formal credit facilities in rural areas (Akpan et al., 2013; Oboh & Ekpebu, 2011; Oboh & Kushwaha, 2009). However this is contrary to the study of Dzadze et al. (2012) who found that there were no relationship between landholding size and access to formal credit by smallholder rice farmers.

(g) Amount of savings

This is the other determinant of access to formal credit by smallholder rice farmers in rural areas. Savings made by the applicants determine the amount of credit supplied by the microcredit financial institutions (Dzadze et al., 2012). In their study savings by credit applicant was found significantly positive related to the amount of loan that the rural formal financial institutions are ready and willing to supply to the smallholder rice farmers. In this manner smallholders farmers with higher amounts of savings are supplied with higher amounts of credits than the farmers who were not able to make savings. Additionally the empirical results of Akudugu (2012) showed that savings forms the crucial obligation of accessing credit services from rural

banks. Correspondingly, rise in the level of smallholder rice farmers' saving with formal microfinance institutions increases the probability of access to formal credit (Ololade & Olagunju, 2013)

(h) Collaterals

This is among the factors influencing access to credit facilities by smallholder rice farmers. The large number of smallholder rice farmers fail to access credit facilities from formal financial institutions due to lack of collateral security (Isitor, Babalola, & Obaniyi, 2014; Yehuala, 2008). In the study of (Ololade & Olagunju, 2013) it was found that lack of collateral security was the main reason for smallholder rice farmers' ability to benefit from loan scheme. In most cases smallholder rice farmers can only apply for limited amount of credit to purchase farm implements, but cannot apply for big credits to purchase machines, tractors and advanced farming equipment due to lack of enough collateral security (Hussain & Thapa, 2012). This agrees with the fact that lack of collateral has resulted into large number of smallholder rice farmers from accessing formal credit sources (Mpuga, 2010; Nouman et al., 2013; Oladeebo & Oladeebo, 2008). In the same way Ng'eno Vincent et al. (2011) found that lacking collateral securities limits large number of poor households from participating in the credit markets. Moreover land is shown as the most acceptable form of collateral security thus people with land tittle deeds have more chance to access formal credit facilities compared to landless tenants (Henri-Ukoha et al., 2011).

(i) Proximity

The distance from the farmers' residence to the financial institutions has a contribution to the supply of credit facilities especially in rural areas. In the study of Akudugu (2012) found that distance affect negatively the farmers' access to credit facilities hence farmers needed to travel far distance from rural areas to urban areas where most of the financial institutions are located. This was in consistent with the finding of Akpan et al., (2013) who found that the probability of the need of credit facilities is catalyzed with the proximity between lenders and borrowers hence the closer the credit source, the higher the possibility of access and vice versa. Furthermore the farmers who lives close to the financial institutions providing micro

credit tends to have more information about the microcredit services rendered and are mostly like to access than the smallholder rice farmers living in distant areas from the microcredit providers (Anyiro & Oriaku, 2011; Chauke, Motlhatlhana, Pfumayaramba, & Anim, 2013). Similarly Hussain & Thapa (2012) asserted that smallholder rice farmers were dejected to borrow when the credit providing institutions are located far away from the farms.

(j) Loan size

The formal financial institutions consider size of credit applied by the applicant during the whole process. Financial institutions always have to examine credit history of the applicant so as to assess the loan size that can be offered. There are usually credit limit established by financial institutions to the small businesses which depends on credit officers' evaluation with consideration to the borrower' prior credit repayment history. Isitor et al. (2014) in their study found that farmers were not given the amount of loan applied for. The average loan size granted were 70% of the total loan size applied by smallholder rice farmers, hence agriculture was termed as time sensitive sector due to the risky associated with the business. On the same line Samson & Obademi, (2018) found that large number of credit beneficiaries were granted small amount of credits because they were not able to offer valuable acceptable collateral security. Also the study of Anyiro & Oriaku (2011) argued that farmers' demand for credit is greater than the supply, because in their study it was found that only 12.50% who applied for credit were granted full amount hence the others applicants received an average of 48.97% of credit applied for.

(k) Loan interest rate

Credit facility is accompanied with interest charges on which the lenders charge borrowers for the use of given amount of credit. Lenders describe the interest rate to be charged on which the borrower is required to bear before entering into credit contract (Ibrahim & Aliero, 2012). However most of credit facilities provided in agriculture sector especially to the poor households are charged with higher interest rates (Mpuga, 2010). This is due to the perception of credit providers on agriculture sector as highly risky venture (Rahji & Fakayode, 2009). On the same Mpuga (2010) line found demonstrated high interest rates imposed to farmers constitute difficulties

to credit access. This was built due to the nature of farming credit, which are short term with limited repayment periods which does not outfit with the farming duration. In the study of Ololade et al. (2018) deprived that higher interest rate influence the possibility of access to credit by 51.9%.

(l) Transaction costs

Access to bank credit by smallholder rice farmers in rural areas is. It involves transaction costs which the farmers must incur in order to succeed accessing formal credit. These costs includes processing fees, legal fees and other costs incurred by smallholder rice farmers in rural areas directly during the application and follow ups of the credit transactions as required by these formal financial institutions providing microcredit services (Ibrahim & Aliero, 2012). In the study of Chenaa et al., (2018) revealed that transaction costs incurred by smallholder rice farmers has significant influence on access to formal credit. This was similar with the findings of Gichuki, Njeru, & Tirimba (2014) which found that, poor households faced challenges towards accessing formal credit due to higher transaction costs required during the whole processes of acquiring bank credit.

(m) Extension services

Advancement of smallholders farming is dormant without availability of professional support services. The foregoing literatures shows that farmers' needs of credit facility and extension contact with credit officers have significant positive relationship (Sanusi & Adedeji, 2010). This was similarly with the findings of Anyiro & Oriaku (2011) who sound that extension contact plays a vital role on empowering smallholder rice farmers with advanced farming technologies together with farming management skills. Furthermore it provides influential information to smallholder rice farmers on new agricultural innovations, advanced processing equipment and marketing techniques (Akpan et al., 2013; Oboh & Ekpebu, 2011; Oboh & Kushwaha, 2009).

(n) Lending procedure/maturity

Another important factor influencing access to formal credit by smallholder rice farmers is term to maturity. The perception of smallholder rice farmers on number of

days form application to receipt of the credit influence positively the probabilities of the need for formal credit facilities from the formal microcredit financial institutions (Akudugu, 2012; Gichuki et al., 2014). This is consistent with the findings of Chauke et al., (2013) that the longer repayment period attract farmers to access bank loan hence easy to access better market for produces.

2.2.2 Smallholder farmer performance

The production performance of smallholder rice farmers in rural areas is contributed by several factors. Access to formal credit, farm size and loan size are among the significant factors influencing production performance of smallholder rice farmers. This has been revealed by large number of researches where in different aspects have shown the importance of these factors.

In the study of Mpuga (2010) empirical results revealed that access to credit have positive significance on the performance of smallholder rice farmers in rural areas, hence farmers with access to formal credit experienced higher productivity because they were much better in accessing farming inputs and adoption of new technologies compared to farmers with no access. On the same direction the study conducted by Girabi & Mwakaje (2013) on examining the effects of microcredit on smallholder rice farmers' productivity in Iramba district, Tanzania, empirical results found that farmers with access to credit facilities (credit beneficiaries) had higher productivity than farmers with no access to credit facilities (non-credit beneficiaries). The researcher found that credit beneficiaries were much better on the adoption of advanced farming technologies, better use of farm inputs and advantage on access of markets for the products produced. Awotide, Abdoulaye, Alene, & Manyong (2015) following this line of argument found that formal credit has significant positive influence on productivity test of mean difference between formal credit beneficiaries and non-formal credit beneficiaries was significantly different hence credit beneficiaries scored higher mean than their counterparts. On contrary Hazarika & Alwang (2003) found that there were no relationship between access to credit and smallholder rice farmers' production efficiency. The authors found that access to credit had no contribution towards productivity other that it increases costs of production hence inefficiency.

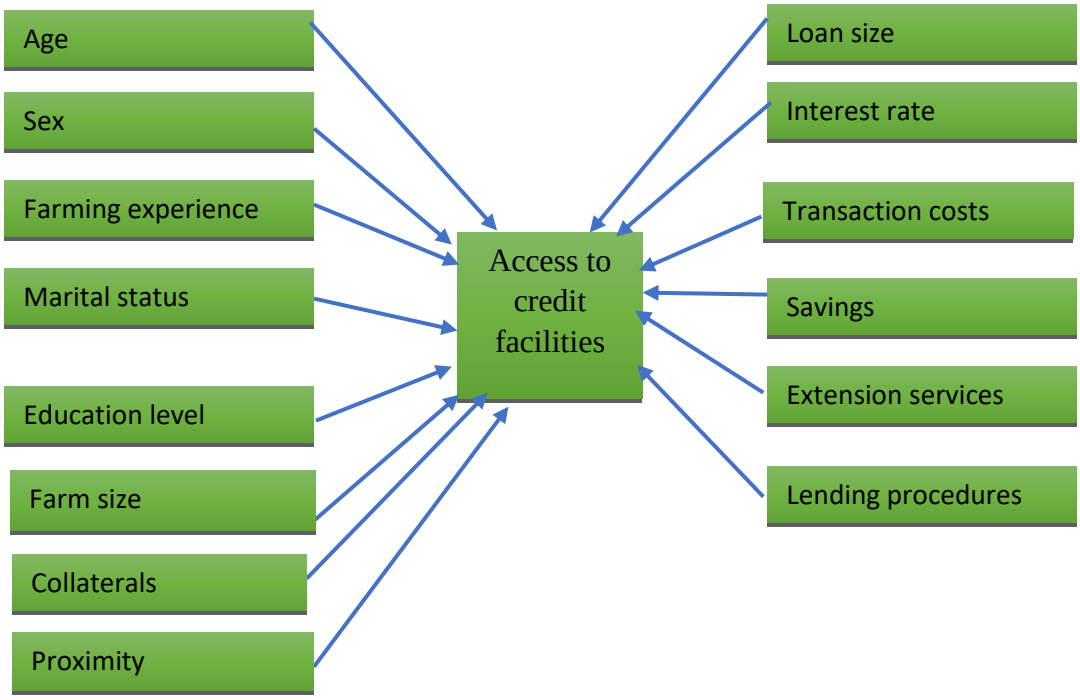
The doubtful question is not only access to formal credit lather than the size of credit facility. In their study they found that the productivity of farmers were affected by the size of credit given by formal financial institutions (Oboh & Kushwaha, 2009). They discussed that low loan size was insufficient for advanced farming investment hence farmers used the amount of money to solve non farming needs refuting the primary objective for credit accessed. Additionally insufficient formal credit to the rural farmers might distress the farming income of the poor households negatively because of the burden of repayment hence increasing their poverty condition. Also the amount of loan size accessed open the doors of accessing large farm size which finally bring higher productivity among farmers (Samson & Obademi, 2018).

Farm size is one among the important factor affecting the production performance of the smallholder rice farmers in rural areas. Literatures shows that farm size plays a vital role not only on accessing credit but also productivity of farmers (Oboh & Kushwaha, 2009). The farmers with large farm size experience higher production performance than the farmers with small farm size (Dzadze et al., 2012). However most of the smallholder rice farmers in rural areas owns small farm size which results into lower production capacity thus turn into low earnings due to the use of poor farming technologies (Hazarika & Alwang, 2003).

2.3 Conceptual framework

Conceptual framework is a grouping set of research concepts, variables together with their logical relationships often represented in the form of diagrams, charts, graphs, pictographs, flowcharts, organ gram or mathematical equations (Ghauri & Grönhaug, 2010; Kothari, 2004). Since conceptual framework focuses on the concepts, variables and their relationships, it is useful for formulating specific research questions of the study (Collis & Hussey, 2013). The conceptual framework shows the variables and their relationship. In the objective of examining the factors influencing access to credit facilities by smallholder rice farmers in Tanzania, consider figure 2.1

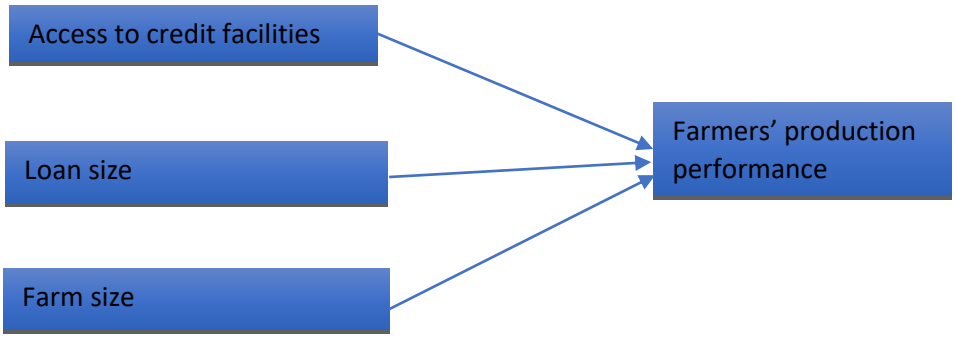
Figure 2.1 conceptual framework



Source: researcher's design (2018).

Also on the second objective which was to determine the influence of access to credit facilities on the performance of the smallholder rice farmers in Tanzania. Figure 2.2 presents the conceptual framework which shows the relationship between variables.

Figure 2.2 conceptual framework



Source: researchers' design (2018)

2.4 Variables and Hypotheses

(a) Smallholder farmer performance

This measured by the production capacity (in kilograms) produced by smallholder rice farmers. We expected that smallholder rice farmers with access to credit facilities had higher production capacity per acre than those with no access to credit facilities from financial institutions.

(b) Access to credit facilities

This was dependent variable which was affected by independent variables which includes; Age, Sex, Farming experience, marital status, Education level, Farm size, Collaterals, Proximity, Loan size, Interest, Transaction costs, Savings, Extension services, Lending procedures, Number of instalments.

(c) Age

This variable measured years of a smallholder farmer. The aim was to measure the ability to manage and allocate credit facility provided by the financial institution. There were three groups (younger farmers, middle aged farmers and older farmers). We expected that the middle aged smallholder rice farmers had more access to credit facilities from financial institutions compared to the younger and aged farmers. This was because the middle aged farmers have an ability to work in dynamic environment compared to the other two groups.

(d) Gender

This variable will be measured in terms of male and female aspects. Based on literatures reviewed we expected that male will have more access to credit facilities from financial institutions because it is believed that male have more capabilities in controlling funds than female. Therefore we expect that male had more access to credit facilities than female.

(e) Education level

This variable intends to measure the influence of educational level on access to credit facilities to financial institutions by smallholder rice farmers. We expected that the smallholder rice farmers with high level of education had more access to credit facilities compared to those with no or lower educational level. Hence having higher

level of education increase skills and knowledge on proper management of credit facility given.

(f) Marital status

This variable was established to measure the influence of marital status on access to credit facilities from formal financial institutions by smallholder rice farmers in rural areas. It was expected that married couples had more access to credit facilities than those who are not married.

(g) Farming experience

This was measured in terms of years on which the smallholder rice farmer have been involving in rice farming activities. We hypothesized that the credit access to financial institutions was influenced by farming experience of an applicant. The smallholder farmer with large number of farming experience was expected to have more chances of access to credit facilities from financial institutions than those with smaller farming experience.

(h) Farm size

This was measured by the number of acres cultivated by the smallholder farmer. We expected that the smallholder with big farm size had more access to credit facilities from the financial institutions compared to the smallholder farmer with small farm size. The financial institutions believe that they might be in good position to recover the value of credit facility given if the smallholder farmer defaults the credit facility. Also it was believed that the farmer with big farm size had more production capacity hence increase the ability to repay the credit facility.

(i) Amount of savings

This was measured by the amount of savings saved by the smallholder rice farmers to the financial institutions. We expected that amount of savings by smallholder farmer especially to member based financial institutions and community banks had positive influence on access to credit from financial institutions.

(j) Collaterals

This was measured by the value of collateral owned by smallholder farmer paged as security against the credit facility applied. We expected that the smallholder farmer with high valued collaterals had more chance to access credit facility from financial institutions compared to the smallholder farmer with no/ less value collaterals. Collateral increase the confidence to the financial institutions towards provision of credit facility. Hence it provide assurance of recovering the credit facility if the smallholder farmer default the credit facility given.

(k) Proximity

This was used to measure the distance between the borrowers and lenders in term of kilometers. We expected that the smallholder rice farmers located nearby the financial institutions had more access to credit facilities compared to the smallholder rice farmers located far from financial intuitions.

(l) Loan size

This factor measure the amount of loan/ credit facility applied to the financial institutions by the smallholder farmer. We expected that the size of loan/credit facility applied had influence on the access to credit facilities by smallholder rice farmers. Hence applicants applied for a big size of loan/ credit facility had less chance to access compared with those applied for small loan/ credit facility size.

(m) Loan interest rate

This was measured by the amount of interest paid against the credit facilities. It was used to explain the costs of the credit facility charged by the financial institutions. We expected that the amount of interest had negative influence on the access to credit facility by smallholder rice farmers. As the amount of interest increases inversely affect the smallholder rice farmers' access to credit facilities from the financial institutions.

(n) Transaction costs

This is measured by the costs incurred by the smallholder farmer during processing the credit facility from the financial institutions. We expect that the transactions costs incurred by the smallholder rice farmers have negative influence on credit

accessibility from the financial institutions. The higher transaction costs affect negatively the access to credit facility because people are cost conscious hence give up on applying credit facility.

(o) Extension services

Extension service by credit officers have influence on the smallholder rice farmers' access to credit facilities from financial institutions. This was measured by the number of visits paid by the credit officers from the financial institutions to the smallholder rice farmers. We expected that the smallholders visited regular by the credit officers had more access to credit facilities compared to those who are not visited.

(p) Lending procedure

This was measured by the number of days form application to receipt of credit facility from the financial institutions. We hypothesized that term to maturity affect positively the access to credit facilities to the formal financial institutions by the smallholder rice farmers, hence the farming activities needs proper time management in order to be efficient and productive.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

This chapter introduces the type of the study design, study area, study population, unit of analysis, variables and their measurement, sample size, sampling technique, types and source of data, data collection methods, validity issues and data analysis method.

3.1 Research design

The study was aimed to determine the influence of credit accessibility on the performance of smallholder rice farmers' in Tanzania. The study also wanted to examine the factors affecting credit accessibility to smallholder rice farmers in Tanzania. The study used quantitative analysis approach to establish cause effect relationship between variables.

The study employed survey research design hence panel data (900 observations) of three years (2016, 2017 and 2018) were collected from 300 respondents in Mbarali District. Survey research design allows the collection of data in larger quantity (Isaga, 2012). Also it is easy to have high representative hence larger number of representativeness where attributes of larger population can be extracted during the study (Remenyi, Williams, Money, & Swartz, 1998). Additionally, multiple variables can be analyzed to find statistically influential results than using other research designs (Saunders, Lewis, & Thornhill, 2009).

3.2 Study area

The research conducted at Mbarali District, Mbeya Tanzania. The researcher focused on smallholder rice farmers in the district. The selection of smallholder rice farmers in Mbarali District was due to the fact that it was among the district dealing with rice production in Tanzania therefore easy to collect relevant information concerning the study. Additionally, the smallholder rice farmers are dominating the rice production industry.

3.3 Study population

Generally, the population included smallholder rice farmer in Tanzania. It is not easy to conduct a survey to all smallholder rice farmers in the country, hence in this study the targeted population was smallholder rice farmers in Mbarali District on which generalization of the whole population can be done.

3.4 Unit of analysis

In this study the unit of analysis includes the smallholder rice farmers in Mbarali District. In conducting a research the researcher should identify the objects that conclusion can be drawn from (Malhotra, Kim, & Patil, 2006). Also unit analysis represents the objects that are observed and about on which desired information is systematically collected, analyzed and presented to solve a research problem (Ghauri & Grönhaug, 2010).

It is necessary to provide the description on the unit of analysis use in the study so as to make easy review and focus on the targeted respondents. These can be individuals, companies, geographical locations or place depending on the nature of the study and the methodological approach used (Saunders et al., 2009).

3.5 Sampling technique

In this study we employed Purposive or judgmental sampling technique to select the representative sample of the targeted population. The Purposive or judgmental sampling technique gives freedom to the researcher to pick accurate representative from the targeted population based on a number of attributes (Kothari, 2004; Saunders et al., 2009).

However in research it is not possible to survey the whole population especially when the population of the study is very big (Malhotra et al., 2006). To go with budget and limited time framework on may be forced to use sample which will enable to quickly collection of data which can be used to generalize the whole studied population (Collis & Hussey, 2013; Isaga, 2012). Additionally the credibility of the data obtained depends not only on the accuracy of analysis and presentation of the data collected but also on the size of the sample.

3.6 Sample size

In this study the sample of smallholder rice farmers was selected from the total smallholder rice farmers so as conclusion can be drawn basing on the inferential for the whole population, basing on the study, the sample size comprised 300 respondents with 900 observations. The selection of the sample size depended on several factors which includes; the purpose of the study, population size confidence level and the allowable sampling error/ level of precision (Collis & Hussey, 2013). Literatures suggest that a ratio of 15 observations for each independent variable can be used in selection of the sample size (Baker & Foy, 2003; Ghauri & Grönhaug, 2010; Saunders et al., 2009). Additionally, in logistic regression analysis or multi varieties regression you need at least 100 sample size (Baker & Foy, 2003).

3.7 Types and sources of data.

The study used primary data from the smallholder rice farmer in Mbarali District. The primary data collection refers to the data collected direct from the field (Collis & Hussey, 2013). The primary data enable the researcher to get the first handed data. The researcher relied on this type of data because it was the easy way to get information directly from those concerned with the problem under study. The use of primary data facilitated the researcher to generate basic and specified data basing on the study hence unnecessary data cannot be collected (Ghauri & Grönhaug, 2010; Saunders et al., 2009). Accurate information were collected directly from the targeted respondents, hence the data were collected on the first hand. Additionally Remenyi et al., 1998 argued that through primary data the researcher collects the latest and up to date information from the respondents thus allow the researcher to collect fresh information about the phenomenon.

3.8 Data collection methods

The data were collected through administered questionnaires hence relevant information from the respondents in the study. This allowed the researcher to collect detailed information concerning the credit facilities access and its impacts to the production performance.

The number of structured questionnaires was prepared as the main tool for data collection through administered questionnaires. The questionnaires were prepared basing on the objectives of the study and the research questions in a manner that each respondent could easily understand. Moreover, the questions were set to get answers relevant to the study and to simplify the process of analysis and presentation.

3.9 Reliability of Data

Source of data used were reliable and collected from the smallholder rice farmers. It is important to measure the reliability of data collected in the study (Baker & Foy, 2003; Isaga, 2012; Yehuala, 2008). Therefore data collected were measured to assess the reliability so that to meet the requirements in conducting business researches.

3.10 Validity of Data

The data collected were actual from the field where the researcher conducted the study. The data collection instruments were designed in such a way that they measured information provided by respondents towards the influence of credit accessibility to the performance of smallholder rice farmers. The researcher taken into consideration the issue of validity especially during selection of population and area of study. These aspects reflected the true picture of what the study intended to achieve. The researcher selected Mbarali District on which the population includes smallholder rice farmers.

3.11 Variables and its Measurements

In the process of conducting a research the researcher must identify the variables used in the study and their measurements (Baker & Foy, 2003). This helps the researcher to maintain objectivity during study (Baker & Foy, 2003). This study included the following variables and their measurement units;

Table 3.1 Variables description

VARIABLES DESRIPTION				
S/NO	**Name of Variable**	**Name used in Regression model**	**Unit of measurement**	**Expected effects**
1	Age	*Age*	Years	-
2	Sex	*Sex*	1 = male, 0 = female	+/-
3	Marital status	*Mstat*	1 = married, 0 = otherwise	+
4	Education level	*Edulev*	Education level	+
5	Farming experience	*Farmexp*	Years	+
6	farm size	*Farmsize*	Number of acres	+
7	Collateral value	*Collval*	Tanzania shillings	+
8	Loan size	*Loansize*	Tanzania shillings	-
9	Interest rate	*Interrate*	Percent of interest rate	-
10	Transaction costs	*Transctcost*	Tanzania shillings	-
11	Savings	*Savings*	Tanzania shillings	
12	proximity	*Proximity*	Kilometers	-
13	Lending procedure	*Maturity*	Number of days	-
14	Extension services	*Extesev*	Number of visits	+
15	Access to credit	*Acctofina*	1 = yes, 0 = no	
16	Production performance	*Producap*	production capacity (kilograms)	

3.12 Data Analysis

Data collected from the smallholder rice farmers rearranged in a specific format and entered them in the spreadsheet before analyzing them using STATA econometric software. The researcher analyzed data obtained basing on the objectives of the study. The panel data collected were arranged in a manner that made easy analysis and interpretation without affecting the quality of information obtained from respondents. The proper arrangement of data simplify tracing of required information during analysis and interpretation (Nyamsogoro, 2010). Moreover data collected form the study must be analyzed hence meaning of information should be provided to make sure that they provide what was meant by the researcher during the study (Collis & Hussey, 2013; Ghauri & Grönhaug, 2010)

The researcher selected STATA econometric software because it has variety of tools which are useful in analyzing different types of research data (Nyamsogoro, 2010). Additionally the researcher found that it was easy to use STATA econometric software hence it was convenient and recommended software in business researches.

3.12.1 The Model

During data analysis the following were the econometric analysis approaches that was used to analyze the relationship between variables on each research objectives. On the first objective we used Poisson regression model to determine factors influencing smallholder rice farmers' access to formal credit in rural areas. The operational model used was:

$$Yi = \alpha + B_1(Age) + B_2(Sex) + B_3(Farmex) + B_4(Maristat) + B_5(Edulev) + B_6(Farmsize) + B_7(Coll) + B_8(Proxim) + B_9(Lonsize) + B_{10}(Intrst) + B_{11}(Transcost) + B_{12}(Extsev) + B_{13}(Matur) + B_{14}(Savings) + e$$

On the second objective we used OLS regression model to determine the influence of access to credit facilities on the performance of the smallholder rice farmers.

3.12.2 Model Diagnostics

Before conducting regression analysis data set were subjected to several tests for results reliability. These tests included correlation analysis, tests for multicollinearity, normality, and homoskedasticity of variance.

Correlation analysis conducted to assess on whether variables were correlated to each other. This helped to determine on whether and to what extent a relationship exists between two or more explanatory variables. The results of analysis indicates that there is strong correlation between variables. Farm size and production capacity have the highest correlation coefficients of 0.9332, and also access to formal credit and credit size have correlation coefficient of 0.71. This is an indication that multicollinearity problem might exist in our data hence correlation coefficients above 0.7 are highly enough alert for extra examinations as in (Nyamsogoro, 2010). Furthermore Variance Inflation Factor (VIF) was computed for each coefficient as a diagnostic statistical test to show the extent of multicollinearity problem in the model. The results indicates that formal credit size (*loansize*) have the highest

Variance Inflation Factor (VIF) of 2.14 and the mean of all variables was 1.77, which indicated that there was no multicollinearity problem since the mean VIF was below 5. The detailed pairwise correlation and VIF outputs are included in appendix (3.1 & 3.2)

Data set was subjected to statistical tests to examine on whether the models were properly specified which means all relevant variables are included and irrelevant variables are excluded. In order to bring meaningful statistical results, regression analysis is characterized by several assumptions which needs to be evaluated before regression analysis. These assumptions includes normality which tests the distribution of data, homoskedasticity which tests homogeneity of variance, autocorrelation which tests whether the errors associated with one observation are correlated with errors of any other observation or not.

In terms of normality, we introduced visual plot which shows the distribution of each data variable. From the visual plots, we found that variables including farm size and production capacity did not meet the basic assumptions of normality and linearity. We adopted variable transformation as solution to solve the problem by using log transformation. The distribution of these variables are attached in appendix (3.3). Data were also subjected to test for homoskedasticity which tests homogeneity of variance. We employed Breusch-Pagan / Cook-Weisberg test for heteroscedasticity, which test the null hypothesis that there is constant variance across on the independent variables as attached in appendix 3.4. The test was statistically significant thus we rejected the null hypothesis that there is constant variance. We ran the model with robust standard errors as a remedy to both heteroskedasticity and autocorrelation as suggested by Nyamsogoro, (2010).

CHAPTER FOUR
DATA ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter presents the analysis, discussion and presentation of the findings on the influence of credit accessibility on smallholder rice farmers' performance. The study was guided by two specific objectives. First was to examine the factors affecting access to formal credit facilities by smallholder rice farmers in rural areas and second was to examine the influence of credit access on smallholder rice farmers' performance. The analysis is divided into three major parts. The first part presents the results using descriptive statistics. The second part present the econometric results on the determinants of access to formal credit by smallholder rice farmers. The third part presents the econometric results on the influence of access to formal credit towards smallholder rice farmers' performance.

4.1 Descriptive Results

In this part we present the descriptive statistical results for variables which include, need of credit, access to formal credit, source of formal credit, gender, age, marital status, education level, farming experience, farm size, collateral value, proximity, savings, transaction costs, maturity, loan size, interest rates charged, extension services and production capacity. The table 4.1 shows the descriptive statistics of variables.

Three years data were collected from a sample of 300 smallholder rice farmers. The data collected indicates that large number of smallholder rice farmers needed formal credit sources to finance farming activities. The statistical results of the population sample indicated that 576 observations (64%) needed formal credit, while 324 observations (36%) had no need of formal credit to finance farming activities. It was found that 9% (54 observations) have an access to formal credit while 91% (522 observations) had no access to formal credit provided by financial institutions in Mbarali District. Furthermore the results show that; 32 observations (59.25%) had an access to banks, 21 observations (38.89%) had access to Microfinance Institutions

while 1 observation (1.85%) had access to SACCOS. Table 4.1 indicates the descriptive statistics for variables used in the study.

Table 4.1 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
sex	900	.7066667	.455543	0	1
age	900	37.14444	10.2373	20	69
mstat	900	.7377778	.4400874	0	1
edulev	900	2.283333	.8228859	1	4
farmexp	900	10.87611	5.896299	1	35
farmsize	900	4.572222	2.579936	1	17.5
acctofina	900	.06	.2376189	0	1
collval	900	842222.2	3724613	0	3.00e+07
proximity	900	1.851111	11.52258	0	80
maturity	900	2.112222	9.023617	0	60
saving	900	15294.44	86604.45	0	1000000
transctcost	900	5634.767	32814.44	0	324000
lonsize	900	167507.2	933540.6	0	1.20e+07
interrate	900	.0154308	.06488	0	.4
extesev	900	.0788889	.5007213	0	4
prodcap	900	10995.57	7433.547	1320	60000

The descriptive statistics indicate that small farming activities are highly dominated by male than female. Male are 70.67 percent while the female are 29.34 percent. Also we observe that out of 54 observations of these with access to formal credit facilities males are 88.89 percent while female comprise only 11.11 percent.. The results support our expectation that males have more access to formal credit facility than females. These results supports the findings of Isaga (2018) that males have better chance to access formal credit facilities than females.

With regards to the marital status the majority of respondent 73.78 percent are married while 26.22 are not married. Furthermore, the statistical results shows that majority of the married smallholder rice farmers (90.74%) have access to formal credit facilities. This implies that married smallholder rice farmers have more access to formal credit than their counterpart. The results are in line with the findings of Ololade et al. (2018)

Majority of the respondents were middle aged, hence the results shows that 48.67% were aged between 30 – 40 years, 22.33% were aged between 20 – 30 years while 29% of respondents were above 40 years. The mean of age size were 37.14 and the

standard deviation of 10.237. However the results shows that scores were highly deviated from the central tendency. The minimum age was 20 years while the maximum age of respondent was 69 years.

The respondent also were examined in terms of their educational level achieved. This variable were divided into four categories and it was found that 16.67% did not attended school, 43.33% had attended primary education, 31% attended secondary education while only 7% attended university education. However, the chi square results indicates that the mean difference between education level of smallholder rice farmers and access to formal credit is not significant (Appendix 4.3). This means that the groups in between variables are not statistically significant even at 10 percent significant level.

With regards to farming experience, the minimum farming experience was 1 year while the maximum of farming experience were 35 years. The average experience of smallholder rice farmers experience were 10.876 years and the standard deviation was 5.896. Also the results of independent t test shows that there is a significant deference on farming experience for formal credit beneficiaries and non-beneficiaries. Hence the mean difference between groups are statistically significant at 1 percent significance level (appendix 4.4). This mean scores smallholder rice farmers with access to formal credit facilities differs significantly with the mean scores of smallholder rice farmers with no access to formal credit facilities.

On the aspect of the farm size cultivated by smallholder rice farmers, the minimum farm size was 1 acre while the maximum farm size were 17.5 acres. The average farm size were 4.57 acres and the standard deviation were 2.26 acres. The test for the mean difference between credit beneficiaries and non-beneficiaries indicated that the mean difference for two groups was statistically significant (appendix 4.5). This show that credit beneficiaries have higher mean scores on farm size than their counterparts. The results are in line with the findings of Yehuala (2008), that smallholder rice farmers with access to formal credit facilities have the chances to cultivate large farm size due to availability of reliable finance compared to the non-credit beneficiaries.

The smallholder rice farmers were assessed based on the collaterals owned. The average collateral value was 842,222.2 Tanzania shillings. Moreover the scores of collateral value owned were highly deviated from the mean hence Standard deviation was 3,724,613 Tanzania shillings. Maximum collateral value were 30,000,000 Tanzania shillings. The mean savings of a smallholder farmer was 15294.44 and standard deviation was 86604.45 maximum savings by smallholder farmer was 1,000,000

The average size of credit applied 167,507.2 Tanzania shillings. However the results shows that scores were highly deviated from the central tendency. The minimum loan size was 167597.2 and maximum credit applied was 12,000,000 Tanzania shillings. Standard deviation was 933,540.6 Tanzania shillings. These were the costs involved during application and processing fees incurred by smallholder rice farmers. The average costs were 5624 Tanzania shillings and the maximum transaction costs were 324,000 Tanzania shillings while the standard deviation was 32814.44. The average interest rate charged to credit applicants were 0.015 while the maximum interest rate charge were 0.4 per annum. The maximum number of term to maturity days were 60 days, while the maximum distance between smallholder rice farmers and financial institutions were 80 kilometers. The smallholder rice farmers in Mbarali District were visited by credit officers not more than 4 times per annum.

Finally Production capacity was measured in terms of the quantity produced by the smallholder rice farmers. The average production capacity was 10995.57 kilograms. Minimum production capacity was 1320 kilograms while maximum production capacity was 60000 kilograms. The standard deviation was 7433.547 kilograms which is highly deviated from the central tendency.

4.2 Econometric Results

In this part we present econometric results on the factors affecting access to formal credit by smallholder rice farmers in rural areas. Also we present the empirical results on the influence of access to credit on the performance of smallholder rice farmers in rural areas.

4.2.1 Factors affecting access to formal credit by smallholder rice farmers in rural areas

The data were analyzed using Poisson regression on 900 observations. Fourteen (14) independent variables were used. These are: gender, age, marital status, education level, farming experience, farm size, collateral value, proximity, savings, transaction costs, maturity, loan size, interest, extension services, while access to formal credit was a dependent variable. The r-squared value shows that explanatory variables explain the dependent variable by 68.70 percent (detailed Stata output is in Appendix 4.6). Econometric results indicate that five variables namely collateral, proximity, transaction costs, loan size and interest rate charged are statistically significantly influencing access to formal credit by smallholder rice farmers in Mbarali District. The results and interpretation for each explanatory variables are presented here below.

Table 4.2 Factors Influencing Access to Formal Credit

p	Coef.	Std. Err.	z	P>z
sex	-.9772493	.7376228	-1.32	0.185
age	.0052813	.0311075	0.17	0.865
mstat	.1204415	.4872548	0.25	0.805
edulev	-.2085013	.2774932	-0.75	0.452
farmexp	-.0291321	.0329047	-0.89	0.376
farmsize	.0531875	.068918	0.77	0.440
collval	-6.91e-08	3.07e-08	-2.25	0.025**
proximity	.0202213	.0076619	2.64	0.008***
saving	-1.39e-07	1.00e-06	-0.14	0.889
transctcost	4.77e-06	2.78e-06	1.72	0.086*
maturity	.0124487	.0129371	0.96	0.336
lonsize	2.38e-07	9.74e-08	2.44	0.015**
interrate	18.6052	3.138138	5.93	.000***
extesev	-.0831321	.1163145	-0.71	0.475
_cons	-4.970718	1.421843	-3.50	0.000

Significant at 1% ***, sig at 5%** sig at 10%*

We tested whether age of the smallholder farmer could affect the access to formal credit. The econometric results indicated that age of respondent is positively related to the access of formal credit showing that aged people have more chance to access formal credit form financial institutions compared to younger people. However the relationship is not statistically significant even at 10 percent significance level. This findings does not confirm the previous studies by Henri-Ukoha et al. (2011); Sebopetji & Belete (2009)

Also we analyzed on whether male are better than female in terms of access to formal credits. We analyzed the relationship between gender and access to formal credit by smallholder rice farmers in rural areas. The econometric results found negative relationship between age and access to formal credit. This finding support the findings by Akpan et al., (2013); Isaga (2018); Yehuala (2008). However the relationship is not statistically significant even at 10 percent significance level.

Whether married smallholder rice farmers have more access to formal credit than unmarried one was among of the question in the study. We examined the relationship between marital status and access to credit and found that although they are positively related, the married smallholder rice farmers have more access to credit than their counterpart. The econometric results indicated relationship was not statistically significant.

Education level of smallholder rice farmers does not affect the access to formal credit from financial institutions. The econometric results indicated inverse relationship between education level and access to credit and the relationship was not statistically insignificant even at 10%. This was contrary to the findings of (Isaga, 2018), that revealed education level of smallholder rice farmers was a crucial influencing factor to formal credit access. Findings in this study shows that education level itself does not influence access to formal credit by smallholder rice farmers in rural areas.

We also measured on whether the farming experience affect the access to formal credit by smallholder rice farmers. Econometric results shows negative relationship between farming experience and access to credit. Furthermore we did not find statistically significant relationship between farming experience and access to formal

credit facilities. Therefore farming experience of a smallholder farmer is not likely to affect access to formal credit. The findings is conforms with the arguments that smallholder rice farmers with more farming experiences are less likely to access formal credit facilities because they are believed to be conservative and therefore prefer sourcing funds from informal sources like friends, produce buyers and money lenders (Sanusi & Adedeji, 2010).

Literatures suggest that smallholder rice farmers cultivating large farm size have higher loan repayment rate and therefore, more access to formal credit (Henri-Ukoha et al., 2011; Yehuala, 2008). We measured whether farm size cultivated by farmer affect the access to formal credit. The empirical results indicated that farm size cultivated by smallholder farmer are positively related to access to formal credit facilities. However, the relationship is statistically insignificant even at 10% significance level.

With regard to our study, we also studied the effects of collaterals owned by the smallholder rice farmers' towards access to formal credit. The econometric results show that the value of collateral owned by formal credit applicant have effect towards formal credit facility access. Furthermore results indicated negative relationship which is statistically significant at 5 percent. It is more likely that farmers with high value collaterals do not prefer to use formal credit rather than using internal sources of funds. This is consistent with the findings of Chauke et al. (2013) that the increase in assets accumulation by smallholder rice farmers will results into a decrease in dependence of credit hence reflect the reality. In one way this might be due to enough savings made during the harvesting seasons which is sufficient to cover all farming costs. On the other way they might be avoiding risks associated with credits which might results into confiscation of collaterals in case of credit default (Akpan et al., 2013).

It was hypothesized that the credit applicants with savings in the financial institutions could have more access to formal credit than their counterpart. Interestingly we found inverse relationship between savings and access to formal credit. The explanation of this could be that smallholder rice farmers who apportion part of their

income for saving could have more abilities to finance farming activities through amount saved lather than placing as guarantees to formal credit access. However, the relationship is statistically insignificant. The findings in this study on insignificant effect of savings on access contradicts with the findings of (Akudugu, 2012; Dzadze et al., 2012; Ololade et al., 2018)

The size of formal credit given to credit beneficiaries was among the key question in this study. Literatures show that access to formal credit facility depends on the size applied to the financial institutions. In most cases financial institutions prefers to provide medium and large credits rather than small amounts (Isitor et al., 2014). The motive behind is to minimize the costs of disbursement and collection incurred by financial institutions. However based on the nature of small scale farming activities, farmers' needs formal credits in small portions. Therefore increase operation costs to the financial institutions thus could affect the access to formal credit facilities especially to the applicants with small credit sizes. The econometric results in this study show that loan size has positive relationship with the access to formal credit provided by financial institutions to the smallholder rice farmers. Furthermore the relationship is statistically significant at 5 percent. This can be clarified as smallholder rice farmers who apply medium and large credit facilities have more chance of access to formal credit than those applying small credits. These results confirms the findings of Anyiro & Oriaku (2011); Samson & Obademi (2018).

Moreover, several researchers have elaborated the significance of the interest charges associated with the formal credits as the predictor of the access to formal credit by the smallholder rice farmers in rural areas. The scholars argue that the interest charges affect smallholder rice farmers to access formal credits from financial institutions due to the nature of small scale farming sector (Ibrahim & Aliero, 2012; Rahji & Fakayode, 2009). Interestingly, econometric results indicated strong statistically significant positive relationship at 1 percent. This means that even if the interest charges increases, the demand for formal credit by smallholder rice farmers is still there. This might be due to limited number of financial institutions which leaves the farmer facing liquidity problems with no choice thus disregards the interest rate charges.

We also measured the effect of transaction costs on access to formal credit by smallholder rice farmers from financial institutions in rural areas. Contrary to our prior expectations, econometric results revealed positive relationship which is statistically significant at 10 percent level. This implies that possibility of smallholder rice farmers sourcing formal credit facilities from financial institutions is not discouraged by an increase of transaction costs. It is likely that due to the critical needs of formal credit facilities, smallholder rice farmers in rural do not take into consideration the transaction costs. The econometric results in this study contradicts with the findings of the previous studies by Chenaa et al. (2018); Gichuki et al. (2014); Ibrahim & Aliero (2012) that transaction costs have negative impacts on access to formal credit facility by smallholder rice farmers in rural areas.

The number of days taken during application of formal credit facility does not affect smallholder rice farmers' access to formal credit from financial institutions. The econometric results indicated positive relationship between lending procedure and access to credit. Contrary form what we expected, the relation was not statistically significant, and thus lending procedure does not influence access to formal credit by smallholder rice farmers in rural areas. However the findings confirms the findings of Gichuki et al. (2014)

The distance between smallholder rice farmers in rural areas affects the access to formal credit facilities. The coefficients of proximity were related to smallholder rice farmers' access to formal credit and coefficients are statistically significant. This findings is consistent with findings by Anyiro & Oriaku (2011) while contradicts with the studies by Akudugu (2012); Chauke et al. (2013); Hussain & Thapa (2012).

Literatures show that smallholder rice farmers specifically in rural areas have limited knowledge on the availability of financial services provided by financial institutions (Akpan et al., 2013; Anyiro & Oriaku, 2011; Oboh & Kushwaha, 2009; Sanusi & Adedeji, 2010). From this aspects the need of extension services from credit officers become crucial to raise awareness of farmers towards the opportunities available such as microcredits for farming activities. Therefore in this study we expected that smallholder rice farmers with extension services by credit officers from

financial institutions will have more chances to access formal credit facilities. The econometric results show that extension services does not influence access to formal credit by smallholder rice farmers (negative coefficient). Moreover the coefficients for the extension services are statistically not significant even at 10 percent level.

4.2.2 The Influence of Access to Formal Credit Facilities Production Pperformance among Small holder Rice Farmers

The objective was to analyze the influence of access to formal credit facilities on production performance of smallholder rice farmers. Data were analyzed by using ordinary multiple regression analysis using production capacity as a dependent variable (*linprodcap*) with three independent variables namely access to finance, loan size and farm size (*accesstofin, farmsize and loansize*).

The r-squared value shows that explanatory variables explain the dependent variable by 80.88 percent (for detailed Stata output consider appendix 4.7). The results and interpretation for each explanatory variables are presented here below. Table 4.3 shows the econometric results of the model.

Table 4.3 The Influence of Access to Formal Credit Facilities on Performance

lnprodcap	Coef.	Std. Err.	z	P>z
acctofina	0.360398	0.043711	8.25	0.000***
farmsize	0.193932	0.004027	48.16	0.000***
lonsize	-5.25E-08	1.26E-08	-4.16	0.000***
_cons	8.219966	0.022519	365.03	0.000

Access to credit

We measured the partial effect of access to formal credit on the production performance of smallholder rice farmers in rural areas. The econometric results from the analysis indicate that access to formal credit facilities increases the production performance of smallholder rice farmers in Mbalari district. The variable has a positive coefficient which is statistically significant at 1 percent significant level.

This indicates that access to formal credit influence the production performance (measured in kilograms) of smallholder rice farmers. However, we compared the mean differences between credit beneficiaries and noncredit beneficiaries, the independent t test results indicates that the mean difference between production capacity of smallholder rice farmers and access to formal credit is significant (appendix 4.8). This implies that smallholder rice farmers with access to formal credit facilities have higher average production capacities (22,266.07 kilograms per acre) than their counterparts (10,276.18 kilograms per acre), therefore meet our expectation that production capacity is positively influenced by access to from credit facilities by smallholder rice farmers in Mbarali District. The results confirms the findings of Girabi & Mwakaje (2013); Hazarika & Alwang (2003); Mpuga (2010), that smallholder rice farmers with access to bank loan have higher production capacity due to ability to buy advanced farming technologies, advanced farming implements such as seeds and pesticides.

Farm size

The production performance of the smallholder rice farmers depends on the farm size cultivated. The econometric results on the relationship between farm size and production performance indicate that farm size cultivated is significantly influence production performance of smallholder rice farmers. The relationship between farm size and production performance is positive hence coefficient of farm size is positive and strongly statistically significant at 1 percent significance level. The results confirms the findings of Dzadze et al. (2012); Hazarika & Alwang (2003); Oboh & Kushwaha (2009) that smallholder rice farmers with large farm size cultivated have higher production capacity than smallholder rice farmers with small farm sizes.

Loan size

Furthermore we analyzed on whether the size of a formal credit facility taken by the smallholder rice farmers' influence production performance. The econometric results indicated negative and statistically significant at 1 percent significance level. These results confirms the findings of Dzadze et al. (2012; Hazarika & Alwang (2003); Oboh & Ekpebu (2011).

CHAPTER FIVE
CONCLUSIONS, RECOMMENDATIONS AND AREAS FOR FUTURE STUDIES

5.0 Introduction

This chapter presents conclusions, recommendations and areas for future studies. Specific conclusions are presented based on the objectives of the study on which the first part presents the factors that affects access to formal credit facilities by smallholder rice farmers in rural areas of Tanzania. The second part presents the influence of credit access on production performance to smallholder rice farmers in rural areas of Tanzania. The conclusion parts are followed by implications of the study, recommendations and areas for future studies.

5.1 The Factors that Affects Access to Formal Credit Facilities by Smallholder Rice Farmers in Rural Areas of Tanzania

This part presents the factors affecting access to formal credit facilities by smallholder rice farmers in rural areas of Tanzania. Based on econometric results from Chapter 4 we can conclude that collateral, proximity, transaction costs, loan size and interest rates, effect the access to formal credit by smallholder rice farmers in Mbarali District. The p – values of interest rate and proximity were significant at 1 percent significance level, loan size and collateral value were significant at 5 percent and transaction costs was significant at 10 percent of significance level. The remaining variables were not. These are age, gender, educational level, marital status, extension services, farming experience, which were not statistically significantly affecting access to formal credit facilities in Mbarali District.

5.2 The Influence of Credit Access on Production Performance of Smallholder Rice Farmers in Rural Areas of Tanzania

This section presents the influence of credit access on production performance of smallholder rice farmers in rural areas of Tanzania. From the econometric results we can conclude that access to formal credit, farm size and loan size influence the production performance of smallholder rice farmers in rural areas of Tanzania. The coefficients of these variables are statistically significant at 1 percent significance

level. This conclusion confirms the previous studies that access to formal credits facilities improves the production performance of smallholder rice farmers (Girabi & Mwakaje, 2013).

5.3 Implications of the study

The financial institutions providing different forms of credit facilities should expand their operations into rural areas where large number of small scale farmers are residing. This will reduce the challenge of distance facing smallholder rice farmers. The findings show positive relationship, implying that the demand of formal credit is still high because people in rural areas lack means to finance their farming activities. Distance remains to be an obstacle as from the study only 9 percent of the sampled respondent have an access to formal credit facility. This imply that there is a need to increase the number of financial institutions specifically in rural areas. This might improve the access to formal credit facilities to large number of smallholder rice farmers.

Higher interest rates charged may not improve access to formal credit facilities. As the empirical evidence form econometric analysis of this study imply that the need of formal credit facilities is high. Despite of the increase in interest rates still there is higher demand of credit facilities among farmers in rural areas. This might be due to the lack of alternative sources of finance. Also it might imply that rather than accessing informal sources of credits still formal sources of credit is needed because it appears to be cheaper than other forms of credit. This means by charging lower interest rates on credits provided, financial institutions can still generate profits while improving credit access to smallholder holder farmers. The same applies to transaction costs, which were also significant.

Microcredit institutions in rural areas should consider the lending policies to properly suite the rural environment. The significance of collaterals variable as one among of the factors affecting access to formal credit by the smallholder rice farmers. Therefore financial institutions should minimize the requirements associated with formal credit facilities, this will attract more applicants of credit in which increases the users of financial services offered hence increases profit.

The provision of large loan size (credit facilities) may not improve the access to formal credit by smallholder rice farmers in rural areas. It should be noted that based on the small scale farming, micro credits should be given priority so as to reach large number of the applicants. The financial institutions providing micro credits should increase the focus on providing micro credits rather than large credit so as to meet the demands of smallholder rice farmers who are dominating the agriculture sector in Tanzania. On the other hand, the empirical results increase in loan size results into decrease in production capacity of smallholder rice farmers. This implies that there is inefficient allocation of credits provided by microcredit institutions to the smallholder rice farmers. The results are understandable and meaningful because of the poor utilization of credits to the planned farming activities and therefore spends in non-farming activities leading into poor production capacity by smallholder rice farmers. The smallholder rice farmers should utilize the credits provided effectively and efficiently so as to improve their production capacity.

The empirical evidence from the econometric results revealed that smallholder rice farmers with access to formal credit facilities experienced higher production performance than those smallholder rice farmers with no access. This imply that formal credit facilities plays a vital role in the production performance. This conforms with the empirical evidence from previous studies which suggested to improve the provision of microcredits especially to the poor households will results into transformation of their production capacity thus leads to economic growth.

Furthermore smallholder rice farmers should transform from traditional farming into commercial farming. This will helps to improve the production performance by employing advanced farming technologies. This goes together with expansion of cultivated areas as indicated by the econometric results of our study which shows that increase in farm size cultivated results into increase in production capacity.

5.4 Recommendations

With respect to the current vision of the Government “industrialization economy” will be attained when the agriculture sector is improved. This means increase in production capacity of smallholder rice farmers will help to provide sufficient raw

materials for the industries. The government of Tanzania together with the other development partners needs to take deliberate measures by introducing friendly policies to promote the development of the agriculture sector which employs majority of the people than the other sectors in the economy.

The government should also increase the investment in agriculture sector through providing incentives and subsidizes to the smallholder rice farmers. This will increase efficient and the production capacity. Example facilitating farm equipment such as tractors, power tillers and harvesting machines at subsidized purchasing prices will increase the affordability to large number of smallholder rice farmers in rural areas. Also expansion of the state owned financial institutions especially Tanzania Agriculture Development Bank to the rural areas on which farming is a main economic activity to the majority of people.

The financial sector should make deliberate efforts in providing cheaper source of finance especially in agriculture sector which is the backbone of the economy of the country. Also improving the lending requirements to reflect the environment of small scale farming industry, which will results into improving access to formal credit facilities therefore solve the problem of inadequate source of finance in rural areas.

Knowledge on both advanced farming techniques and fund management should be provided to the smallholder rice farmers. This will increase efficient in allocation of resources and therefore sustainable development will be achieved.

5.5 Limitations and Areas for further studies

In this study we attempted to determine the factors affecting access to formal credit facilities by smallholder rice farmers in rural areas of Tanzania. However the conclusion made are based on data collected from sampled 300 smallholder rice farmers in Mbarali District. This might be biased hence there are several areas producing rice. Future studies may consider exploring the determinants of access to formal credits in other rural areas so that increase the reliability of the findings which covers different areas from different smallholder farmers.

Second, the study attempted to assess the influence of access to formal credit facility on production performance of smallholder rice farmers in rural areas. The

conclusions made were based on three variables including access to formal credit facility, credit size ad farm size. This might have been left many other useful variables; hence omitting relevant variables might affect the estimates of regression coefficients in the model. The future researches should focus on large number of factors affecting production capacity of smallholder rice farmers in rural areas.

Also in the study we found only 9 percent of credit applicants had access to formal credit facilities. This means the majority of credit applicants used the other sources of credits to finance their farming activities thus informal source of credits became a solution. Future studies should focus on the effects of informal sources of credits in small scale farming industry.

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APPENDENCES

Appendix 1: Survey questionnaire

ENGLISH VERSION

Hello, my name is MBONAGA, RICHARD A, A Student of Master's Degree of Science in Accounting and Finance from Mzumbe University. I am studying the influence of credit accessibility on smallholder rice farmers' performance in Tanzania. I am therefore requesting for your participation in providing some information to assist in my study. This study is for academic purpose only. I assure you that any data submitted will be treated with strict confidential. Your participation is voluntary

Thank you in advance for taking part in this study.

Choose the most correct answer and fill in the blanks in the following questions.

QUESTIONAIRRE NO: ……

CONTACT ……

A1. Sex

(a) Male { }

(b) Female { }

A2. Age ……

(a) 20-30 years { } (b) 31-40 years { } (c) 41 -50 { } (d) 50 and above

A3. Marital status

(a) Married { }
(b) Not married { }

A4. Level of education

(c) Not attended formal education { }
(d) Primary education { }
(e) Secondary Education { }
(b) College/university education { }

A5. Location …….

A6. For how long (years) have you been farming? ……

A7. What is the size of your farm (acres)?

2015	2016	2017	2018

B. ACCESS TO CREDIT FACILITIES

B1. Do you need credit facility to run your farming activities?

a) YES { }
b) NO { }

If no please go to part D.

B2. Do you have an access to credit facilities from financial institutions?

a) YES { }
b) NO { }

If no please go to part C.

B3. If yes, from which financial institution?

a) Bank { }
b) SACCOS { }
c) Microfinance institution { }
d) Any other, mention please……..

B4. Is collaterals needed during application of credit facility from financial institutions?

a) YES { }
b) NO { }

B5. What is the value of your collateral used during application of credit facility? …….

B6. What is the distance to financial institution (km)? .....

B8. How many days does it take to make repayment for credit facility?

2015	2016	2017	2018

B9. What was the transaction costs incurred during application and processing of the credit facility?

2015	2016	2017	2018

B10. What is the amount of the loan applied for to the financial institution in four years?

2015	2016	2017	2018

B11. What was the amount granted in each year?

2015	2016	2017	2018

B12. What was the amount of interest paid for the loan given?

2015	2016	2017	2018

B13. Do you repay the credit facility in different instalments?

a) YES { }
b) NO { }

If yes, how many instalments in each year

2015	2016	2017	2018

B14. Do you get visits from the credit officers during farming seasons?

a) YES { }

b) NO { }

If yes how many visits per year?

2015	2016	2017	2018

C. What factors makes you fail to access to credit facilities?

Please mark a tick (√) to choose the correct answer

		YES	**NO**
C1	Lack of enough Collaterals that makes failure on access of credit facilities from financial institutions		
C2	Long distance from financial institutions thus makes it difficult to access credit facilities		
C3	Credit facility/ Loan size applied was too big		
C4	Interest charged is high		
C5	Transaction cost of processing a credit facility is high		
C6	I am not visited by credit officers		
C7	The credit facility take short time to be repaid		
C8	Limited number of instalments		
C9	Default of previous loan		

C10. Any other factors, mention please

1……..

2……..

3…….

D: PRODUCTION PERFORMANCE OF SMALLHOLDER RICE FARMER

Please indicate the level of output per acre

Year	Output (bags)	Kilograms	Average price (tshs)	Total revenue (tshs)
2018				
2017				
2016				
2015				

DODOSO LA UTAFITI

Mimi MBONAGA, RICHARD A, ni mwanafunzi wa shahada ya uzamili katika sayansi ya Uhasibu na Fedha kutoka Chuo Kikuu Mzumbe. Nafanya utafiti juu ya **MCHANGO WA MIKOPO KATIKA UZALISHAJI KWA WAKULIMA WA MPUNGA WADOGO WADOGO WILAYA YA MBALARI, TANZANIA**. Hivyo basi, ningependa kuomba ushirikiano wako kwa kunisadia kutoa taarifa muhimu ambazo zitasaidia kukamilisha utafiti huu. Utafiti huu utatumika kwa malengo ya kitaaluma tu na si vinginvyo, hivyo basi, taarifa zote zitakazotolewa zitakuwa ni siri. Hata hivyo, ushiriki wako ni wa hiari.

Natanguliza shukrani zangu za dhati kwa kukubali kuwa sehemu ya utafiti huu.

Soma maswali yafuatayo na ujaze katika nafasi zilizo wazi kwa jibu lililo sahihi zaidi

DODOSO NO: ……

MAWASILIANO ……

A1. Jinsia:

(a) Me { }

(b) Ke { }

A2. Umri katika miaka ……..

(a) 20-30 { } (b) 31-40 { } (c) 41 -50 { } (d) 50 na zaidi

A3. Hali ya ndoa:

(f) Nimeoa/Nimeolewa { }

(g) Sijaoa/Sijaolewa { }

A4. Kiwango cha elimu

(h) Sijasoma { }

(i) Elimu ya msingi { }

(j) Elimu ya sekondari { }

(b) Elimu ya juu { }

A5. Mahali /Eneo…….

A6. Umekuwa ukijihusisha na kilimo cha Mpunga kwa muda wa miaka mingapi? ……

A7. Shamba lako lina ukubwa wa ekari ngapi?

2015	2016	2017	2018

B. UPATIKANAJI WA MIKOPO

B1. Je, unahitaji mkopo ili kuendeleza shughuli zako za kilimo?

c) NDIYO { }
d) HAPANA { }

Kama jibu lako ni HAPANA nenda sehemu D.

B2. Je, una mkopo wowote kutoka taasisi yoyote ya kifedha?

c) NDIYO { }
d) HAPANA { }

Kama jibu lako ni HAPANA, nenda sehemu C.

B3. Kama jibu lako ni ndiyo, je ni taasisi gani ya kifedha ambayo umechukua mkopo?

e) Benki { }
f) SACCOS { }
g) Taasisi ndogo za kifedha mfano, FINCA, BRAC & VICOBA{ }
h) Nyingine, tafadhali taja……..

B4. Je, kuna dhamana yoyote iliyohitajika wakati wa kuomba mkopo wako?

c) NDIYO { }
d) HAPANA { }

B5. Je, dhamana yako iliyotumika kuombea mkopo ilikuwa na thamani ya kiasi gani? …….

B6. Taasisi ya kifedha ipo umbali wa kilomita ngapi kutoka mahali ulipo? .....

B8. Ulitumia siku ngapi kukamilisha zoezi la kupata mkopo wako?

2015	2016	2017	2018

B9. Ni gharama zipi ulizoingia wakati wa kushughulikia mkopo wako mpaka kukamilika?

2015	2016	2017	2018

B10. Ni kiasi gani cha fedha ulichoomba kutoka taasisi ya kifedha kwa kipindi cha miaka minne?

2015	2016	2017	2018

B11. Ni kiasi gani cha fedha ulichopewa kwa kila mwaka?

2015	2016	2017	2018

B12. Kiwango gani cha riba ulichotozwa kwa mkopo uliopewa?

2015	2016	2017	2018

B13. Je, unalipa marejesho ya mkopo wako kwa awamu?

c) NDIYO { }
d) HAPANA { }

Kama jibu lako ni NDIYO,

Je huwa unalipa kwa awamu ngapi? ……..

2015	2016	2017	2018

B14. Je huwa unatembelewa na maafisa mikopo msimu wa kilimo?

c) NDIYO { }

d) HAPANA { }

Kama jibu lako ni NDIYO, ni mara ngapi kwa mwaka?

2015	2016	2017	2018

C. Sababu zipi husababisha mtu ashindwe kupata mkopo?

Tafadhali weka alama ya (√) katika jibu sahihi

		NDIYO	**HAPANA**
C1	Ukosefu wa dhamana za kutosha husababisha mtu kushindwa kupata mkopo kutoka taasisi za kifedha		
C2	Umbali kutoka taasisi za kifedha hufanya watu washindwe kupata mikopo		
C3	Kiasi cha mkopo kilichoombwa kuwa kikubwa Zaidi		
C4	Kiwango cha riba kinachotozwa kuwa kikubwa Zaidi		
C5	Gharama za kushughulikia mkopo kuwa kubwa sana		
C6	Kutokutembelewa na maafisa mikopo kutoka taasisi za kifedha		
C7	Muda mfupi unaotolewa kuanza kurejesha mkopo		
C8	Awamu za kurejesha mkopo kuwa chache sana		
C9	Kushindwa kumaliza deni la mkopo wa awali		

C10. Taja sababu zingine kama zipo

1……..

2……..

3…….

D: KIWANGO CHA UZALISHAJI KWA WAKULIMA WADOGO WA MPUNGA

Tafadhali onyesha kiasi cha mapato kwa ekari moja

Mwaka	Pato (gunia)	Kilo	Wastani wa bei (Tshs)	Jumla ya mapato(Tshs)
2018				
2017				
2016				
2015				

Appendix 3.1

```
. corr prodcap lonsize acctofina farmsize
(obs=900)
```

	prodcap	lonsize	acctof~a	farmsize
prodcap	1.0000			
lonsize	0.4468	1.0000		
acctofina	0.3833	0.7106	1.0000	
farmsize	0.9332	0.3603	0.2841	1.0000

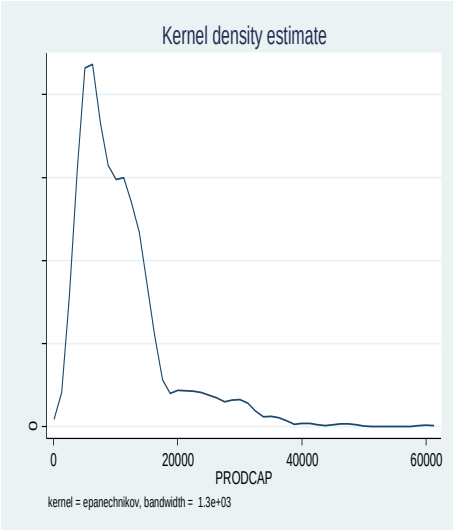
Appendix 3.2

```
. vif
```

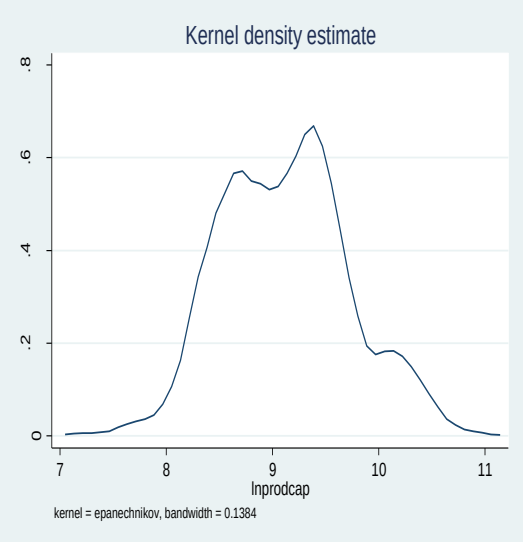
Variable	VIF	1/VIF
lonsize	2.14	0.467763
acctofina	2.02	0.494126
farmsize	1.15	0.868615
Mean VIF	1.77	

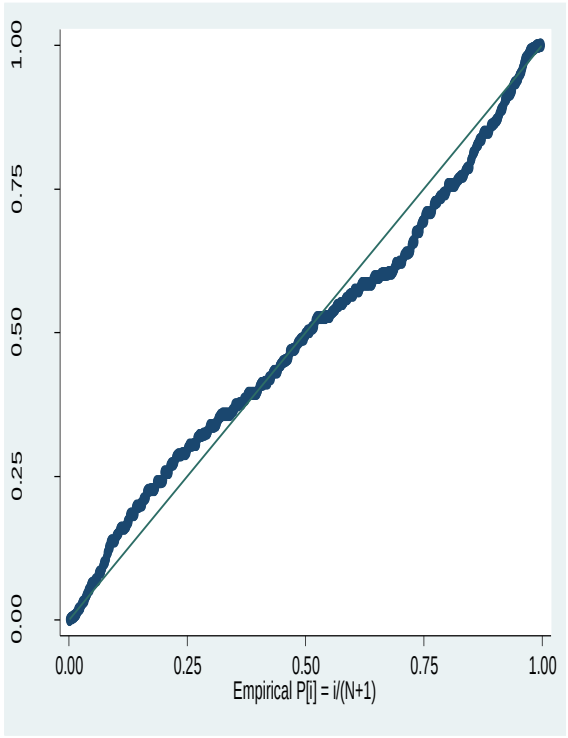
Appendix (3.3)

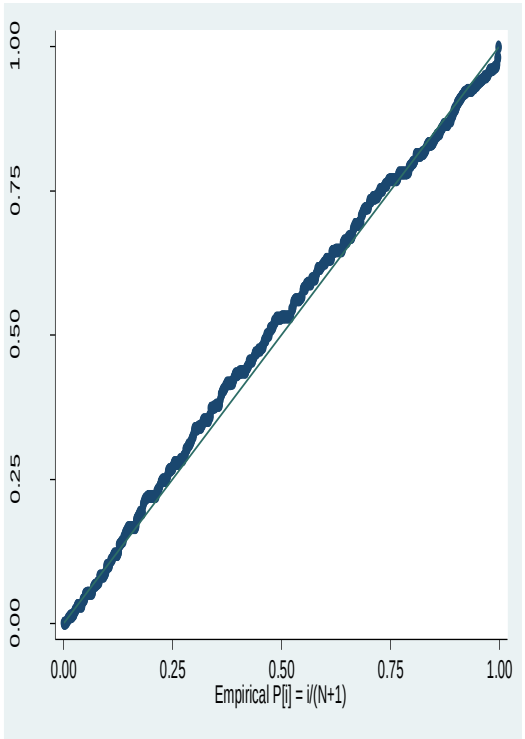
Production capacity before



Production capacity after




0.00
0.25
0.50
0.75
1.00
Empirical P[i] = i/(N+1)


0.00
0.25
0.50
0.75
1.00
Empirical P[i] = i/(N+1)

Appendix 3.4

```
. hettest

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

         chi2(1)      =   664.60
         Prob > chi2  =   0.0000
```

Appendix 4.1 Chi square of gender and access to formal credit

```
. tabulate sex acctofina, chi2 column
```

Key
frequency *column percentage*

SEX	ACCTOFINA 0	1	Total
0	258 30.50	6 11.11	264 29.33
1	588 69.50	48 88.89	636 70.67
Total	846 100.00	54 100.00	900 100.00

Pearson chi2(1) = 9.2022 Pr = 0.002

Appendix 4.2 Chi square of marital status and access to formal credit

```
. tabulate mstat acctofina, chi2 column
```

Key
frequency *column percentage*

MSTAT	ACCTOFINA 0	1	Total
0	231 27.30	5 9.26	236 26.22
1	615 72.70	49 90.74	664 73.78
Total	846 100.00	54 100.00	900 100.00

Pearson chi2(1) = 8.5443 Pr = 0.003

Appendix 4.3: Chi square of education level and access to formal credit

```
. tabulate edulev acctofina, chi2 column
```

Key
frequency *column percentage*

EDULEV	ACCTOFINA 0	1	Total
1	145 17.14	5 9.26	150 16.67
2	383 45.27	25 46.30	408 45.33
3	260 30.73	19 35.19	279 31.00
4	58 6.86	5 9.26	63 7.00
Total	846 100.00	54 100.00	900 100.00

Pearson chi2(3) = 2.6465 Pr = 0.449

Appendix 4.4

```
. ttest  farmexp, by( acctofina)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	846	10.62234	.1951762	5.676911	10.23925	11.00543
1	54	14.85185	1.043233	7.666165	12.75939	16.94431
combined	900	10.87611	.1965433	5.896299	10.49037	11.26185
diff		-4.229511	.81594		-5.830883	-2.62814

```
    diff = mean(0) - mean(1)                                      t =  -5.1836
Ho: diff = 0                     degrees of freedom =      898

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

Appendix 4.5

```
. ttest farmsize, by( acctofina)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	846	4.387116	.082074	2.387212	4.226023	4.548209
1	54	7.472222	.4893015	3.595617	6.490808	8.453637
combined	900	4.572222	.0859979	2.579936	4.403442	4.741002
diff		-3.085106	.3473835		-3.766884	-2.403328

```
    diff = mean(0) - mean(1)                                      t =  -8.8810
Ho: diff = 0                     degrees of freedom =      898

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

Appendix 4.6

Poisson regression — Number of obs = 900; LR chi2(14) = 282.98; Prob > chi2 = 0.0000; Log likelihood = -64.434537; Pseudo R2 = 0.6871

acctofina	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.0048256	.0313312	0.15	0.878	-.0565824	.0662336
sex	-.9756644	.7374304	-1.32	0.186	-2.421002	.4696727
mstat	.1558556	.561325	0.28	0.781	-.9443212	1.256032
edulev	-.2072613	.277906	-0.75	0.456	-.7519469	.3374244
farmexp	-.0292772	.0329212	-0.89	0.374	-.0938015	.0352472
farmsize	.0539753	.0691907	0.78	0.435	-.0816359	.1895865
collval	-6.94e-08	3.08e-08	-2.25	0.024	-1.30e-07	-9.02e-09
proximity	.0201925	.0076656	2.63	0.008	.0051682	.0352168
maturity	.0124734	.0129397	0.96	0.335	-.0128879	.0378347
saving	-1.48e-07	1.01e-06	-0.15	0.883	-2.12e-06	1.82e-06
transctcost	4.77e-06	2.78e-06	1.72	0.086	-6.80e-07	.0000102
lonsize	2.37e-07	9.74e-08	2.44	0.015	4.64e-08	4.28e-07
interrate	18.60845	3.13413	5.94	0.000	12.46567	24.75123
extesev	-.0856463	.1179467	-0.73	0.468	-.3168175	.1455249
_cons	-4.98266	1.424231	-3.50	0.000	-7.774101	-2.19122

Appendix 4.7

Random-effects GLS regression — Number of obs = 900; Number of groups = 300

R-sq: within = 0.6882; between = 0.8285; overall = 0.8088 — Obs per group: min = 3; avg = 3.0; max = 3

corr(u_i, X) = 0 (assumed) — Wald chi2(3) = 2705.15; Prob > chi2 = 0.0000

lnprodcap	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
acctofina	.3603979	.0437107	8.25	0.000	.2747266	.4460693
farmsize	.193932	.0040267	48.16	0.000	.1860397	.2018242
lonsize	-5.25e-08	1.26e-08	-4.16	0.000	-7.73e-08	-2.78e-08
_cons	8.219966	.0225189	365.03	0.000	8.17583	8.264102
sigma_u	.21664057					
sigma_e	.1469296					
rho	.68494085	(fraction of variance due to u_i)				

Appendix 4.8

```
. ttest prodcap, by ( acctofina)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	846	10276.18	222.785	6479.941	9838.903	10713.46
1	54	22266.07	1552.508	11408.55	19152.14	25380.01
combined	900	10995.57	247.7849	7433.547	10509.27	11481.88
diff		-11989.89	964.2258		-13882.29	-10097.5

```
    diff = mean(0) - mean(1)                                      t = -12.4347
Ho: diff = 0                     degrees of freedom =      898

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