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EFFECT OF FORMAL FINANCIAL INSTITUTIONS CREDIT TO MAIZE PRODUCTOVITY IN SUMBAWANGA RURAL AND MBOZI DISTRICTS IN TANZANIA

Dionis Joseph Ndolage; Gwahula Raphael, PhD and Saganga Kapaya, PhD
The Open University of Tanzania, Faculty of Business Management

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ABSTRACT

This study aimed at examining the effect of formal financial institutions credit to maize productivity of rural smallholder farmers in Sumbawanga rural and Mbozi districts in Tanzania. The study was guided by the theory of financial intermediation and neoclassical economic growth theory. The research design was descriptive quantitative in nature where balanced panel data for the year 2018 to 2020 was used. Random effect model was used to analyses 321 sample observations of the collected secondary data which involved 107 individuals. The results indicated that formal financial institutions credit has significant and positive effect to maize productivity in rural areas. It was also revealed that formal financial institutions credit has significant and positive association with maize productivity in rural area in Tanzania. The study concludes that formal financial institutions credits are predictor of maize productivity to rural smallholder farmers in Tanzania. Thus, it is recommended that policy makers (government) should set policies that encourage the increase of financial access points, reduced transaction costs and enrolling agricultural trustworthy agents in rural areas.

Keyword: : Formal financial institutions credit, smallholder farmers and maize productivity.

1. INTRODUCTION

Importance of formal financial institutions credit to smallholder farmers in rural areas is undisputable and widely acknowledged since it develops high potential and most productive farmers who are the foundation for creating the viable infrastructure for agricultural productivity, (Ohens et al., 2018). (Chandio et al., 2015 and Owusu, 2017) posited that, credit facilities are considered as a catalyst that activates factors of agricultural productivity and makes under-used functional capacity for increasing maize productivity. It also plays pivotal role in agricultural development as it equips rural smallholder farmers to reap economies of scale and venture in fields of production that are expected to be new empowering them and providing `utilities for widening their market expectation, (Kudakwashe and He, 2019).

In the past few decades, formal financial institutions credit financing has been the centerpiece of many rural development programs in developing countries. Moreover, donors and most Governments in the developing countries have recognized that financial constraints continue to weaken performance in maize productivity and have directly link to poverty seen in rural area,

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(Ademola et al., 2017). Both internal and external shocks which have been affecting maize productivity like long period of dry season, lack of inputs and floods have continued lowering maize productivity, (Amurtiya et al., 2018). They also argued that, the effects of low maize productivity have affected most of the developing countries gross domestic product (GDP) growth performance and a large segment of population in the World especially those leaving in rural areas (Olaniyi et al., 2012).

Moreover, in Tanzania, most societies consume maize as their staple food and the need for maize productivity has increased globally on which its importance has increased an interest in the research on the factors that affect it (NBS, 2015). Maize agriculture occupies about 45% of the total land of Tanzania and about 4.5 million of rural smallholder farmers utilize their land for maize agriculture (NBS, 2015). Maize is highly grown in Mbozi district with 67,736 hactares followed by Sumbawanga rural district covering 65,434 hactares in southern highland part of Tanzania (NBS, 2012). Its production contributes about 31 % of the total food crop production and constitutes more than 75 % of the cereal consumption in Tanzania, (Olaniyi et al., 2012 and Verheye, 2010). Rural smallholder farmers produce over 85% of total national maize production, the rest being contributed by community farms, large farms both private and public, (Maziku, 2017 and Rashid, 2015).

Miho, (2018) argued that, formal financial institutions credit to maize productivity to rural smallholder farmers is inevitability for the global economic development. She further posited that, different countries provide enabling environments for investing in maize productivity as a way of expanding and consolidating their economies. Moreover, Linh, (2019) posited that, formal financial institutions credit are inevitable in purchasing agricultural inputs. The agricultural inputs considered by Linh, (2019) includes, fertilizers, pesticides, modern seeds, plough and tractors. However, these studies ended on inconclusive results. Some studies that concluded a positive and significant relationship on formal financial institutions credit and maize productivity includes that of (Miho, 2018; Chandio et al., 2015 and Mustafa, 2017) from outside Africa. In Africa are (Ogunleye, 2018; Aphu et al., 2017 and Owusu, 2017) and in Tanzania are Nsubil, 2018. However, some of the studies that revealed some contradicting results include that of (Kinuthia, 2018 and Mwakaje et al., 2013). This shows no consensus on the revealed results on the relationship of the two variables among scholars. Hence, this study was guided by financial intermediation theory and neoclassical economic growth theory to determine the effect of formal financial institutions credit to maize productivity to rural smallholder farmers in Tanzania context.

2. LITERATURE REVIEW

2.1 Theoretical Grounding and Hypothesis Formulation

The theoretical frame work for this study is financial intermediation theory and the link with economic growth theory. The concept of financial intermediation theory was brought up, starting in the mid twenty-th century in the 1960's about sixty years ago by the work of Guley and Shaw, (1960). The starting work of (Gurley and Shaw, 1960) on financial intermediation theory was based on the agency theory and the theory of informational asymmetry. In addition to that, the financial development nexus was an established source(s) of debate among economists since

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Patric (1996)'s seminal work that established his first hypothesis. He hypothesized on a bi direction relationship among financial development and countries economic growth.

Several empirical literatures have tested this hypothesis, (Methew and Thompson, 2005). With regard to (Gertler and Kiyotaki, 2011) financial intermediation can accelerate economic growth by influence rate of saving and the marginal productivity of investment(s). He further argued that the role of financial intermediaries lies in the views of financial intermediation and consider its major role as to transfer financial resources from savers in an economy to investor(s). Werner, (2016) argued that, formal financial institutions credit (i.e., banks) can loans and assess the loan applicant's credit worthiness and be able to monitor their performance. He also posited that improving the efficiency of formal financial institutions sectors may lead into agricultural productivity. Based on this view, this study used the theory of financial intermediation and proposed the hypothesis which states that;
H0: Formal financial institutions credit has a positive and significant effect on maize productivity among rural smallholder farmers.

On the other hand, neoclassical economic growth theory (NEGT) was first introduced by Robert Solow and Trevor Swan in the year 1956. Initially neoclassical economic growth theory (NEGT) considered exogenous population increases to set the increase in economic growth rate, later on in the year 1957 Robert Solow incorporated technology change. The theory postulates that short term economic equilibrium results from a varying amount of capital and labour that play a major role in increasing productivity, solow and Trevor, (1988). Masoud, (2013) posited that with neoclassical economic growth theory, capital and labour are received as income input variables that contribute to agricultural productivity. He further argued that, its theoretical construction is based on the national aggregates of capital and labour, on which the contribution of capital and labour in the national aggregate, are simply the amount of contribution of each factor of production received in the aggregate. Therefore, this study introduced formal financial institutions credit (i.e. bank credit) as the source of capital variables.

2.2 Empirical Grounding

The Effect of Formal Financial Institutions Credit on Maize Productivity.

Majority of the literatures on the relationship of the formal financial institutions credit and maize productivity, so far are mainly concentrated in developed countries such as the United States of America, European countries and some Asian countries contrasted to sparse research undertaken in developing countries where formal financial institutions credit are probably mostly needed to rural smallholder farmers (Adjognon et al., 2017). In this study, the mentioned formal financial institutions credit includes the credit receive by individual maize farmers from either commercial banks, cooperative and rural development banks, microfinance banks, agricultural banks or investment banks. Some global authors who identified this relationship include that of (Chandio et al., 2018; Chandio et al., 2015; Sarker, 2016 and Nissar et al., 2015). Others Africa and East Africa includes that of (Amurtiya et al., 2018; Aphu et al., 2017; Mustapha, 2017; Joseph et al., 2013; Anetor et al., 2016 and Kinuthia, (2018).

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Chandio et al., (2018) examined the effects of agricultural credit on wheat productivity of rural smallholder farmers in Pakistan. The aim of this study was to evaluate the impact of long-term loans (LTL) and short-term loans (STL) to wheat productivity of small farms (SFs). The study area and population targeted was Sindh which is the third largest and second highest populated province in Pakistan. The researcher used primary data that were gathered using modified version of structured questionnaires and applied a random sampling technique to collect a sample of 180 farmers from highest wheat grower districts in Sindh. They used Cobb-Doglas production function and both STATA version 13 and software SPSS version 22 used to analyze the collected data. The study results revealed that both short-term and long-term agricultural credit had a positive and significant effect on wheat productivity. However, the current study is different from this study in which panel data with 321 sample observations was employed while Chandio et al., (2018) used crossectional data with 180 respondents.

Another author, Mustafa et al., (2017) from Nigeria, investigated the effect of access to credit and agricultural performance in Sub-Saharan Africa. The aim of this study was to evaluate the impact of accessed agricultural credit by smallholder farmers to agricultural yields per acre (productivity). The analysis of the collected data was analyzed using Panel co-integration approach. The study results indicated clear evidence that total credit positively and significantly influenced the level of agricultural productivity in the region. However, the current study employed random effect model to analyze data different from this study.

Moreover, Sarker, (2016) in Bangladesh conducted on the role of banks on agricultural development. A study used random sampling to select 50 respondents 35 agricultural loan borrowers and 15 agricultural officers as well as secondary data that were collected from annual reports of the year 2010 to 2014 from Bangladesh Bank and websites of various banks in Bangladesh. Descriptive and inferential statistics were utilized for data analysis of the data collected for the study. The findings indicate that bank credit positively influenced agricultural productivity. However, the current study is different from this study because it employed random effect model to analyze data.

Furthermore, Anetor et al., (2016) in Nigeria conducted a study on agricultural scheme funds. The study aimed at comparing the effects of formal financial institutions credit (i.e., banks) and agricultural credit guarantee scheme fund (ACGSF) on maize productivity. The author use secondary data collected in a series of 34 years form 1981to 2013. The collected data was analyzed using Vector autoregressive (VAR). The finding of this study shows that formal financial institutions credit (i.e., banks) supply have a significant effect on agricultural productivity. However, the result also showed insignificant relationship between agricultural credit guarantee scheme fund (ACGSF) and agricultural productivity.

Additionally, the study by Kinuthia et al., (2018) examined the constraints of agricultural credit on agricultural productivity of rural smallholder farmers in East Africa. The aim of this study was to examine the impact of agricultural credit on agricultural productivity and efficiency losses which is associated with agricultural credit constraints. The study area and population targeted was smallholder farmers in Tanzania and Uganda which was considered highest agricultural crops producers' countries in East Africa. The researcher used logistic regression to collected panel data. The results indicate that, in Uganda borrowers who use credit had higher agricultural

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productivity and were significant at 1 percent level as compared to those in Tanzania. Similarly, extension service(s) and some other income sources affected agricultural productivity positively at 1 percent level of significant. The current study used random effect model and panel for data analysis. These differentiate the current study from that of Kinuthia et al., (2018). Despite the revealed controversial results of the empirical literature review above, this study seconded the null hypothesis stated in section 2.1 above**.**

2.3 Conceptual Framework

The model suggests that maize productivity may be improved using formal financial institutions credit. The diagram stipulates the modified model of the theory of financial intermediation. Moreover, the study considered age, gender, fertilizers, pesticide, insecticide, households size, education, experience, maize type, infrastructure, irrigation, and levels of mechanization as the dummy or control variables. Hence, all the dummy variable have not been shown in the conceptual frame work lather they have been kept constant on this study because they are not the primary concerned on the study outcome (Linh, 2019; Chandio et al., 2018 and Mustapha, 2017). The following conceptual model (figure 2.2) shows the connection between formal financial institutions credit and maize productivity investigated in this study.

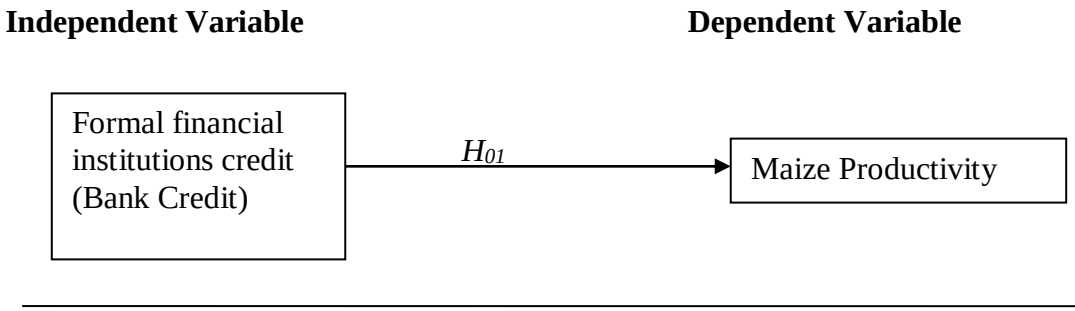

Figure 2.1 Conceptual framework of the study
Source; Developed from theoretical literature review (2020)

3. MATERIALS AND METHODS

3.1 Targeted Population and Area of the Study

The population of interest for this study was 987,132 rural smallholder maize farmers in Mbozi districts in Songwe region and Sumbawanga rural district in Rukwa region in the southern highland zone of Tanzania. This population was from 507,124 smallholder maize farmers of Mbozi district and 480,008 smallholder maize farmers in Sumbawanga rural district. Southern highland zone was chosen because is the highest maize grower zone in Tanzania, consisting of Mbeya, Iringa, Songwe, Njombe, Ruvuma and Rukwa regions producing about 42% of the total maize produced in Tanzania, (NBS, 2015). In addition to that, according to (NBS, 2012 agriculture census report in Tanzania), Mbozi district lead in maize productivity with 67,736 hectares followed by Sumbawanga rural district with 65,434 hectares. Moreover, Mbozi district is bordered to the north by Chunya district, to the east by Mbeya urban and Ileje district, to the south by Zambia and to the west by Rukwa region while Sumbawanga rural district is one of the

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three districts of Rukwa region, bordered to the northeast by Sumbawanga Urban District, to the south by Zambia and to the northwest by the Nkasi district of Katavi region

3.2 Sampling Procedure and Design

The selection of a sample from the population is commonly used because of the resource limitation to cover the whole population (Sunder et al., 2012). In this research study, the probability sampling technique was used, including multistage and random sampling to get representative sample in order to allow generalization of the findings. Multistage cluster sampling was used at three stages to get the study sample. The first stage was guided by District Agricultural and Livestock Development Officer (DALDO) in Mbozi and Sumbawanga rural districts. At this stage secondary data were obtained from district agricultural loan record book from the two districts. This was done to select wards with largely located maize farmer who are credit beneficiaries. In the second stage, based on the same assumption mentioned above, secondary data for each village were obtained from wards agriculture record book (WARB). Finally, the secondary data of each individual for the maize productivity and formal financial institutions credit from the selected villages were listed in the checklist.

3.3 Data Collection (Sources)

This study employed panel data where secondary data was used. The secondary data for both maize productivity and formal financial institutions credit were collected from wards agriculture record book (WARB) for the year 2018, 2019 and 2020. A check list was also used. This ensured that individual's important information was not overlooked. Some individual farmer's missing information in the WARB were such as land preparation cost, planting cost, weeding cost, harvesting cost, maize cleaning cost, cost of transportation of maize harvest from farm to home or gordown, plough cost and tractor cost. In addition to that, a check list with individual required information for the study and a copy of wards agriculture record book (WARD) was distributed with the help of research assistant. Sampled individuals were asked to fulfill all formal financial institutions credit and maize production information as recorded into wards agriculture record book (WARD) with help of research assistant for the three consecutive maize seasons (i.e. year 2018, year 2019 and year 2020).

3.4 Measurement Variables of the Study

Formal financial institutions credit variable were measured from their ratios. These ratios were obtained by taking the total individual formal financial institutions credit borrowed by a farmer in a particular season over total money used (i.e., capital injected) by a farmer per acre. Table 3.1 stipulates the year (season) of maize production, formal financial institutions credit rendered to farmer in that year (season), the individual formal financial institutions that rendered credit, individual credit (Tzsh) from the particular individual source and total individual credit (Tzs) received by individuals.

Table 3.1 Measurement of Formal Financial IOnstitutions Credit

Years (Season)	Independent variable	Lender (s)/Institution (s)	Individual Credit received (Tzs)	Total individual Credit

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				Received (Tzs)
2018 or 2019 or 2020	Formal financial institution's credit	Commercial banks		
		Microfinance banks		
		Corperative and rural development banks		
		Investment banks		
		Agricultural banks		

Source: Chandio et al., (2018) and Aphu et al., (2017)

Moreover, Maize productivity measurements were from the ratios of total maize produced (output) in grams per acre over total money (capital injected) used (input) in Tanzanian shillings (Tzs). The output was the total grammes of maize produced in a particular season per acre while the input was the amount of money used (i.e., capital injected) in that season per acre. Table 3.2 stipulates the year (season), identification for the money used or not used on an individual item, the total money used to all individual items and total maize produced (output) in grams per acre.

Table 3.2 Measurement of Maize Productivity.

Year (season)	Item description	Used (Please tick (√))	Not used (Please tick (√))	Total Money used (capital injected) -Tzs	Total maize produced (output) -gm/ acre
2018 or 2019 or 2020	Land hire				
	Land Preparation				
	Labour hired				
	Hoes				
	Plough				
	Tractor				
	Seeds				
	Planting				
	Weeding				
	Fertilizer				
	Pesticide				
	Insecticide				
	Harvesting				
	Cleaning				
	Transportation of				

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	harvest (home, godown etc.)				

Source: Chandio et al., (2018) and Aphu et al.,(2017)

3.5 Data analysis

The study employed panel data regression with the help of Stata 13 software. Both descriptive and inferential data analysis were employed in data analysis.

3.6 Hypothesis Testing

Equations to test the effect of formal financial institutions credit to maize productivity have been expressed as a simple regression. The purpose of this regression equation for this research was to predict maize productivity variable as a linear function of formal financial institutions credit injected and the control variables. Therefore, maize productivity was explained as a function of formal financial institutions credit together with the control (dummy) variables.
Thus, written as;

Moreover, the other reason for use of regression equation were to determine whether formal financial institutions credit explains a significant variation in maize productivity, determine how much of the variation in the maize productivity variable can be explained by formal financial institutions credit, and to control for the identified control variables.

3.7. Model Specification

Random effects models (REM) for panel data were used to estimate the data. Random effects models (REM) assumes that the individual-specific effect is a random variable that is uncorrelated with the explanatory variables. However, during the choice of the best model to use for this study, the fixed effect model (FEM) was estimated by using xtreg and least square dummy variable (LSDV). Moreover, the random effect model (FEM) was also estimated by xtreg with re. Thus, to decide between REM and FEM, both models were run and then Hausman test was performed, where random effects models (REM) had most reliable results and is the model that fitted the collected data most correctly.

4. STUDY RESULTS

4.1 Results from Multicollinearity Testing

Hair *et al.*, (2010) argued that correlation analysis and variance inflation factor (VIF) can be used to check for multicollinearity. However, Kline, (2011) posits that correlation analysis do not exactly measure the degree to which each of the independent variable is explained by the set of other independent variables and therefore opting variance inflation factor (VIF). In this study the variance inflation factor (VIF) was used to test multicollinearity. The linear regression model was run and Stata 13 command tool used to check for multicollinearity was *vif* and the results are shown in table 4.1.

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Table 4.1 Multicollinearity Test Results Using VIF Test

Variables	VIF	1/VIF
formal ratio	1.168	.856
educ levels	1.720	.581
Insecticide	2.646	.378
Pesticide	2.638	.379
Fertilizer	2.571	.389
Modernseed	2.309	.433
Farmsizes	1.426	.701
house size	1.372	.729
Experiences	1.223	.818
Mean VIF	1.910	.

Source: Data analysis (2020)

Table 4.1 above indicates that the VIF for formal financial institutions creadit ratio is 1.168. The Tolerant values (1/VIF) for formal financial institutions credit ratio is 0.856. Moreover, all variables had VIF less than 5 and Tolerant values (1/VIF) are more than 0.2. The authors posit that the VIF values greater than 5 and Tolerant values less than 0.2 indicates the presence of multicollinearity. Therefore, table 4.1 indicates that there was no multicollinearity issue in the current study as the Tolerant and VIF values did not exceed the threshold values.

4.2 Regression results for Independent Variable Determinants.

The independent variables for this study were formal financial institutions credit. This was measured from individual formal financial institutions credit ratios. This ratio was obtained by taking the total individual formal financial institutions credit borrowed in a particular season over total money used (capital injected) by a farmer per acre. The results from table 4.2 show that, formal financial institutions credit ratio variable is significant to maize productivity. Also the results show that, a unit increase of formal financial institutions credit ratio variable increases maize productivity of the individual farmer by 0.54 units.

Moreover, The within r square results from table 4.2 indicates that, model 7 and model 8 performed better as compared to model 1, model 2, model 3, model 4, model 5 and model 6. This is as well supported by a higher explanatory power for r2 on model 7 and model 8. However, the between r square results indicates model 3 performed better as compared the other model. It also shows that, the overall r square result for model 3 performed better as compared the other model. Additionally, the results from table 4.2 indicates that, the within r square results for model 1 to model 6 is 0.14. The within r square results for model 7 and model 8 is 0.17. These within r square results indicates that, model 7 and model 8 performed better as compared to model 1, model 2, model 3, model 4, model 5 and model 6. This is as well supported by their higher explanatory power, because r2 for model 7 and model 8 are higher than for that of model 1, model 2, model 3, model 4, model 5 and model 6. Therefore, these results indicate that 17% of

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the variance of dependent variable (maize productivity) was explained within individuals over time.Additionally, the between r square results 0.25 for model 3. In this group, the between r square results indicates that, model 3 performed better as compared to other models. The model 3 results, also indicates that 25% of the variance of dependent variable (maize productivity) were explained between individual independent variable (i.e formal financial institutions credit) over time. Likely, the overall r square results for model 3 is 0.26. These overall r square results indicates that, model 3 performed better as compared to other models. Model 3 results, also indicates that, 26% of the variance of dependent variable (maize productivity) are explained by the independent variable over time. The overall r square variances are based on 321 sample observations. Furthermore, table 4.2 shows the root mean square error (rmse) result of model 1 to model 7 equals to 1.12 and 1.15 for model 8. These rmse results are all close to zero which indicates that the model fit much better to the collected data. Similarly, table 4.2 indicates the chi2-tests results of 69.00 for model 8. These results indicate that, model 8 was much better than other models. This is because; the higher the results of the chi2 value indicate the model fit much better to the collected data, (Park, 2011).

Table 4.2 : Regression results

	(1) RE_a	(2) RE_b	(3) RE_c	(4) RE_d	(5) RE_e	(6) RE_f	(7) RE_g	(8) RE_h
formal_ratio	0.48**	0.48**	0.51**	0.49**	0.49**	0.53**	0.54**	0.54**
	(0.47)	(0.47)	(0.48)	(0.47)	(0.47)	(0.47)	(0.47)	(0.48)
_cons	5.62***	5.35***	5.52***	1.80	3.36	4.66***	5.30**	4.27
	(0.71)	(0.92)	(0.68)	(2.42)	(2.53)	(1.51)	(2.48)	(3.72)
Obs.	321	321	321	321	321	321	321	321
r2_w	0.14	0.14	0.14	0.14	0.14	0.14	0.17	0.17
r2_b	0.16	0.16	0.25	0.16	0.16	0.17	0.19	0.24
r2_o	0.17	0.17	0.26	0.16	0.16	0.16	0.19	0.22
rmse	1.12	1.12	1.12	1.12	1.12	1.12	1.15	1.15
chi2	54.39	54.39	.	54.23	54.23	55.34	62.66	69.00

Standard errors are in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

4.3 Regression Results for Dependent Variable Determinants

Maize productivity measurements were from the ratios of total maize produced (output) in grams per acre over total money (capital injected) used (input) in Tanzanian shillings (Tzs). The output was the total maize produced (in grammes) in a particular season per acre while the input was the amount of money used (injected) in that season per acre. Table 4.3 indicates the panel regression results for the eight models which explain the dependent variable determinants. The results indicates that, costs for land preparation, plough, tractor, seed, weeding, harvest, cleaning and transport are not significant to maize productivity. The results for a random effect model 8 indicates that, a unit increase of these cost increases maize productivity by 0.32, 0.13, 0.22, 0.04, 0.13, 0.46, 0.15 and 0.23 units respectively.

Table 4.3 Regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

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	REM	REM	REM	REM	REM	REM	REM	REM
formal_ratio	0.48**	0.48**	0.51**	0.49**	0.49**	0.53**	0.54**	0.54**
	(0.47)	(0.47)	(0.48)	(0.47)	(0.47)	(0.47)	(0.47)	(0.48)
landprepcosts							0.31	0.32
							(0.34)	(0.34)
ploughcosts							0.02	0.13
							(0.25)	(0.25)
tractorcosts							0.12	0.22
							(0.72)	(0.76)
seedcosts							0.08	0.04
							(0.40)	(0.41)
weedingcosts							0.14	0.13
							(0.45)	(0.45)
harvestcosts							0.46	0.46
							(0.38)	(0.38)
cleaningcosts							0.15	0.15
							(0.31)	(0.31)
transpcosts							0.18	0.23
							(0.37)	(0.37)

Standard errors are in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

4.4 Group of Control Variable Regression Results

The control variables used in this study are age, education level, farm size, seed type, pesticide, insecticide, household size and experience. Group separation of ordinal variables and categorical variables during regression was done so as to avoid multicolinearity. The statistics results in table 4.4 indicate that, age, education level, household size, experience and farm size was statistically not significant to maize productivity. The results also indicates that, a unit increase in the use of modern seed, pesticide, insecticide and fertilizer by individuals increases maize productivity by 0.53,0.03,0.25 and 0.15 respectively. Additionally, farming experience and farm size has a negative association to maize productivity by individuals.

Table 4.4 : Regression results

	(1) REM	(2) REM	(3) REM	(4) REM	(5) REM	(6) REM	(7) REM	(8) REM
formal_ratio	0.48**	0.48**	0.51**	0.49**	0.49**	0.53**	0.54**	0.54**
	(0.47)	(0.47)	(0.48)	(0.47)	(0.47)	(0.47)	(0.47)	(0.48)
ages						0.23		0.16
						(0.20)		(0.21)
educ_levels						0.14		0.11
						(0.22)		(0.24)
house_size						0.18		0.14
						(0.24)		(0.25)
experiences						-0.23		-0.26*
						(0.16)		(0.16)

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farmsizes						-0.16		-0.33
						(0.45)		(0.46)
Seed type							0.37	0.53
							(0.44)	(0.45)
perticicide							0.03	0.00
							(0.30)	(0.30)
insecticide							0.25	0.24
							(0.36)	(0.36)
fertilizer							0.14	0.15
							(0.46)	(0.46)
_cons	5.62***	5.35***	5.52***	1.80	3.36	4.66***	5.30**	4.27
	(0.71)	(0.92)	(0.68)	(2.42)	(2.53)	(1.51)	(2.48)	(3.72)

Standard errors are in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

4.5. Pair wise Correlation Analysis Results

Pair wise correlation analysis was employed so that to determine the relationship among variables without inferring cause and effect of those variables. This study employed Pearson correlation coefficient. Pearson correlation coefficient is the test statistics that measures the statistical relationship, or association, between two continuous variables, Creswell, (2014). The correlation results for formal financial institutions credit ratio (formal_ratio) to maize productivity is +0.11*. This correlation results indicates that, formal financial institutions credit is significant to maize productivity. It also indicates that, there is a small correlation among formal financial institutions credit and maize productivity.

Moreover, the correlation results for the use of modern maize seed, pesticide, insecticide, fertilizer, hand hoe, plough and tractor to maize productivity are -0.014, +0.072, +0.028, 0, +0.053, -0.063 and -0.016 respectively. This correlation results indicates that, modern maize seed, pesticide, insecticide, hand hoe, plough and tractor are all not significant to maize productivity. It also indicates that, there is small correlation among modern maize seed, pesticide, insecticide, hand hoe, plough and tractor to maize productivity. It further indicates that, the use of modern maize seed, plough and tractor has an inverse relationship to maize productivity for selected individual. Also, the results indicate no correlation on the use of fertilizer and maize productivity for selected individual.

In addition to that, the correlation results on the use of formal financial institutions credit to the use of the modern maize seed, pesticide, insecticide, fertilizer, hand hoe, plough and tractor are +0.031, +0.061, +0.099, + 0.053, + 0.025, -0.139* and +0.004 respectively. This correlation results indicates that, the correlation of using formal financial institutions credit to the use of the modern maize seed, pesticide, insecticide, fertilizer hand hoe and tractor are all not significant to maize productivity. It also indicates that, there is small correlation on the use formal financial institutions credit to the use modern maize seed, pesticide, insecticide, fertilizer hand hoe and tractor. It further indicates that, the correlation of using formal financial institutions credit to the use of plough is significant and has an inverse relationship to maize productivity for individuals.

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Similarly, the correlation results of the use of modern maize seed to the use of pesticide, insecticide, fertilizer, hand hoe, plough and tractor are +0.418*, +0.535*, +0.523*, +0.07, +0.048 and + 0.096 respectively. This correlation results indicates that, the correlation of using modern maize seed to the use of pesticide, insecticide and fertilizer are all significant and the correlation of using modern maize seed to the use of hand hoe, plough and tractor are all not significant to maize productivity. It also indicates that, there is small correlation on the use of modern maize seed to the use of pesticide, insecticide, fertilizer, hand hoe, plough and tractor. On the other hand, the correlation results of the use of pesticides to the use of insecticide, fertilizer, hand hoe, plough and tractor are +0.598*, +0.208*, +0.111*, -0.003, and + 0.073 respectively. This correlation results indicates that, the correlation of using pesticide to the use insecticide, fertilizer and hand hoe are all significant and the correlation results on the use pesticides to the use of plough and tractor are not significant. It also indicates that, there is small correlation on the use of pesticide to the use of fertilizer, hand hoe, plough and tractor. It further indicates that, the correlation of using pesticide to the use plough has an inverse relationship. It also shows that, a strong correlation on the use of pesticide to the use insecticide.

Moreover, the correlation results of the use of insecticide to the use of fertilizer, hand hoe, plough and tractor are +0.399*, +0.06, +0.018, and + 0.127 respectively. This correlation results indicates that, the correlation of using insecticide to the use of fertilizer is significant and the correlation of using insecticide to the use of hand hoe, plough and tractor are not significant. It also indicates that, there is a medium correlation on the use of insecticide to the use of fertilizer. In addition to that, the results indicate that, there is small correlation of using insecticide to the use hand hoe, plough and tractor.

Furthermore, the correlation results of the use of fertilizer to the use of hand hoe, plough and tractor are +0.009, -0.099 and +0.078 respectively. This correlation results indicate that, the correlation of using fertilizer to the use of hand hoe, plough and tractor is not significant and the correlation of using fertilize to the use plough has an inverse relationship. It also indicates that, there is a small correlation on the use of fertilizer to the use of hand hoe, plough and tractor. Additionally, the correlation results of the use of hand hoe to the use of plough and tractor are +0.068, and -0.315* respectively. This correlation results indicate that, the correlation of using hand hoe to the use of plough is not significant but to the use of tractor is significant. It also indicates that, the correlation of using hand hoe to the use tractor has an inverse relationship. Furthermore, it indicates that, there is a small correlation on the use of hand hoe to the use plough and tractor.

Lastly, the correlation result on the use of plough to the use of tractor is -0.349*. This correlation results indicate that, the correlation of using plough to the use of tractor is significant. It also indicates that, the correlation of using plough to the use tractor has an inverse relationship. It also indicates that, there is a medium correlation on the use of plough to the use tractor.

Table 4.5 Correlations Matrix Results

Variables	-1	-2	-3	-4	-5	-6	-7	-8	-9
(1) M. Pro-vty	1								

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(2) formal_ratio	0.11*	1							
	(0.371)								
(3) modernseed	-0.014	0.031	1						
	(0.806)	(0.584)							
(4) perticicide	0.072	0.061	0.418*	1					
	(0.202)	(0.275)	(0)						
(5) insecticide	0.028	0.099	0.535*	0.598*	1				
	(0.622)	(0.078)	(0)	(0)					
(6) fertilizer	0	0.053	0.523*	0.208*	0.399*	1			
	(0.998)	(0.343)	(0)	(0)	(0)				
(7) handhoes	0.053	0.025	0.07	0.111*	0.06	0.009	1		
	(0.346)	(0.655)	(0.216)	(0.049)	(0.288)	(0.866)			
(8) ploughs	-0.063	-0.139*	0.048	-0.003	0.018	-0.099	0.068	1	
	(0.263)	(0.013)	(0.391)	(0.959)	(0.752)	(0.077)	(0.23)		
(9) tractors	-0.016	0.004	0.096	0.073	0.127*	0.078	-0.315*	-0.349*	1
	(0.779)	(0.937)	(0.088)	(0.193)	(0.023)	(0.166)	(0)	(0)	

Source: Data analysis (2020)

5. DISCUSSION OF THE RESEARCH FINDINGS

The study aimed at determining the effect of formal financial institutions credit on maize productivity of smallholder farmers in Sumbawanga rural and Mbozi districts in Tanzania. Findings revealed that, an increase in formal financial institutions credit ratio increased maize productivity of rural smallholder farmers. These findings are consistent with that (Anigbogu et al., 2015) whose findings revealed that agricultural credit is significant and has a positive relationship to agricultural productivity. Also the results indicate that, fewer respondents used formal financial institutions credit and there was lower dispersion to respondents. These findings are consistent with that (Duniya and Adinah, 2015 and Chiu et al., 2014) whose findings revealed that bank credit has a positive and significant effect to agricultural productivity but few rural farmers borrows from banks.

Moreover, findings from the correlation matrix on table 4.5 revealed 0.11* for formal financial institutions credit ratio to maize productivity. This result shows that formal financial institutions credit is positive and significant to maize productivity in rural areas. These results also indicate that, a unit of Tzs of formal financial institutions credit increases 0.11 of the total maize productivity of the individuals. These findings are in line with that of (Babajide, 2012) whose findings revealed that agricultural credit significant and have positive effect to agricultural productivity.

6. CONCLUSION AND RECOMMENDATIONS

The study has confirmed formal financial institutions credit has significant and positive effect on maize productivity. It also confirmed that formal financial institutions credit has positive

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relationship with maize productivity. Hence, we conclude that formal financial institutions credits are a predictor of maize productivity to rural smallholder farmers in Tanzania. It is therefore recommended that, policy have to be reviewed to improvise rural farmers to access credit facilities and other capacity building strategies which will influence more participation in the sector. This study also recommends that, the government should set policies that encourage the increase of financial access points in rural and remote areas, reduced transaction costs, user friendly regulations to formal financial institutions credit lenders, ensuring safety of money lenders, input availability to farmers and stability as well as enrolling agricultural trustworthy agents in rural areas.

7. AREAS FOR FUTURE RESEARCH

This study recommends that future studies should look into what transpires in the community farms and may also include other regions from other zones of the country.

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