

**EFFECT OF INFORMAL CREDIT TO MAIZE PRODUCTIVITY IN SUMBAWANGA
RURAL AND MBOZI DISTRICTS IN TANZANIA**

Dionis Joseph Ndolage; Gwahula Raphael and Saganga Kapaya

The Open University of Tanzania, Faculty of Business Management

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ABSTRACT

This study aimed at examining the effect of informal 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 analyze 321 sample observations of the collected secondary data which involved 107 individuals. The results indicated that informal credit has significant and positive effect on maize productivity. It was also revealed that informal credit has significant and positive association with maize productivity. The study concludes that informal credit is 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 Informal credit, smallholder farmers and maize productivity.

1. INTRODUCTION

In the past few decades, informal credit financing has been the centerpiece of many rural development programs in developing countries. The need for informal credit is more demanded and applicable in the rural areas (Ogunleye, 2018). This need is for acquiring improved inputs like modern seed, advanced technology, pesticide, insecticide, fertilizers, plant protections and so on, (Yusuph et al., 2014). Miho, (2018) posits that to meet the required essential agricultural inputs to bring about the increased maize productivity, borrowing becomes inevitable. However, little effort by most government in the developing countries have been done to support rural smallholder farmer on how to practice informal credit given the largest population who are engaged into the agricultural sector(Awotide, 2015).

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 hectares

followed by Sumbawanga rural district covering 65,434 hectares 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, (Miho, 2017; Maziku, 2017 and Rashid, 2015).

In addition to that, efforts to mobilize domestic savings and provision of credit disbursement among individuals have for too long been concentrated in the urban areas because rural smallholder farmers are thought to be too poor to save or riskier to receive credit from most formal sources, (Chandio et al., 2016). Nevertheless, the effect of less credit in financing agriculture has reduced maize productivity of most farmers in rural areas in most of the developing countries, (Ogunleye, 2018). Moreover, despite several efforts that has been made by most governments in Africa and in most developing countries, over fifty percent of the population that is engaged as smallholder maize farmer continues to have lower maize productivity (NBS, 2015).

On the same vein, agricultural sector in developing countries such as the united republic of Tanzania (U.R.T) continues to exhibit low maize productivity in comparison with developed countries like United States of America and China, (Undry, 2015). For instance, in the year 2014 maize productivity of the united republic of Tanzania was about 1.3 ton per hectare. The productivity that was low when compared to other countries like South Africa that had 2.7 ton per hectare and the World whose maize productivity was at 4.3 tons per hectare (NBS, 2015). Thus, due to the increasing needs for informal credit to facilitate maize productivity worldwide, the analysis of the effect of informal credit on maize productivity is the consequential issue to Tanzanian rural agriculture stakeholders, (Rashid, 2015). In the other word, there was a need to conduct this study in Tanzania context so that to contribute in the literature for the effect of informal credit on maize productivity in rural areas.

2. LITERATURE REVIEW

2.1 Theoretical Grounding and Hypothesis Formulation

In this part, the theoretical review reflects among the relationship between the real world practices and current theory of financial intermediation. Critical analysis of this current theory of financial intermediation expected to leads to several building blocks of a new financial intermediation theory (FIT). Therefore, in this study financial intermediation theory literature reviews was used to provide an explanation on why these financial intermediaries exist then the link between informal credit and maize productivity was established. In addition to that, this study uses neoclassic economic growth theory (NEGT) in explaining the concept of maize productivity. The current neoclassical economic growth theory (NEGT) provided an economic model of growth that outlines how steady economic growth rate results when capital, labour and technology come into play, Masoud, (2014). 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 considered that, it is necessary to provide capital

injection from relevant variation sources in a more comprehensive approach. Hence, the introduced informal credit accommodated capital variables in neoclassical economic growth theory (NEGT).

Furthermore, 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 FIT 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 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, apart from banks, any other non formal institutions(i.e. informal ones) can also make loans and assess the loan applicant's credit worthiness and be able to monitor their performance. He also posited that improving the efficiency of informal sectors like lending from friends, may lead into agricultural productivity same as the banks. Based on this view, this study proposing hypotheses that includes informal sector as the financial intermediaries that create short-term debts and deposit to fund loans. This study has also considered maize productivity of rural smallholder farmers in Tanzania context. The proposed hypothesis stated that;

H0: Informal credit has a positive and significant effect on maize productivity among rural smallholder farmers.

2.2 Empirical Grounding

Effect of Informal Credit on Maize Productivity of Rural Smallholder Farmers.

In this sub section, the current study focuses on the effect informal credit to maize productivity to rural smallholder farmers in Tanzanian context. The mentioned informal credit includes the credit receive by individual maize farmers from either rotating saving and credit association (ROSCAS), money lenders, traders (trade lenders), communal clubs, relatives and friends or store owners/merchants farmer lender. Some authors who identified informal credit and maize productivity relationship includes that of Ngegba et al., (2016) and Yusuf et al.,(2015).

The study by Ngegba et al.,(2016) examined the impact of village saving and loan association on farm productivity in lower Banta chiefdom, in southern Sierra Leone. The aim of this study was to investigate the impact of village saving and loan association on farm productivity in Banta Gbangbatoke (lower Banta) chiefdom in Movamba district of Sierra-Leone. The researcher used primary data, mixed method approach combining quantitative and qualitative method and the design was multistage stratified random sampling. The data analysis was done using descriptive statistics. The results of analysis showed that access from village saving and loan association had a positive and significant effects on agricultural (farm) productivity. However, the current study improved this study by employing random effect model in analyzing the three years panel data with 321 sample observations. Another study by Cheruiyot et

al.,(2016) in Kenya assessed on the effect of rotating savings and credit association (ROSCAS) to agricultural productivity. The study used a total sample size of 57 respondents and analyzed data using descriptive data analysis. The results show that ROSCAS had positive and significant effect in increasing agricultural productivity leading into improving the lives of middle income earners. Moreover, a study by Nwankwo, (2008) from Nigeria examined the effect of informal credit on agricultural productivity. In this study, the author used random sampling to get a sample size of 150. Descriptive statistics was used for the data analysis. The study results revealed that informal credit had positive and significant relationship with agricultural productivity. It also revealed the use of informal credit to other social activities hence insignificant to maize productivity. Another study by Yusuf et al., (2016) examined the effect of informal credit on maize productivity of small scale farmers in Nigeria. The researcher used primary data that were gathered using structured questionnaires that was administered to small scale farmers. Multistage stratified random sampling techniques were employed to select a sample of 75 respondents. The collected data were quantitative and the analysis was done using descriptive statistics and farm budgeting. The results from all methods of analysis showed that informal credit had positive and significant effects on maize productivity to small scale farmers in rural areas. However, the current study improved this study by employing random effect model and three years panel data with 321 sample observations.

Despite these revealed 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 bank credit as suggested by the theory of financial intermediation or informal credit as suggested by the current study depending on its availability. The diagram stipulates the modified model of the theory of financial intermediation and informal credit is a contributed variables. 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 2.1) shows the connection between and informal credit and maize productivity investigated in this study.

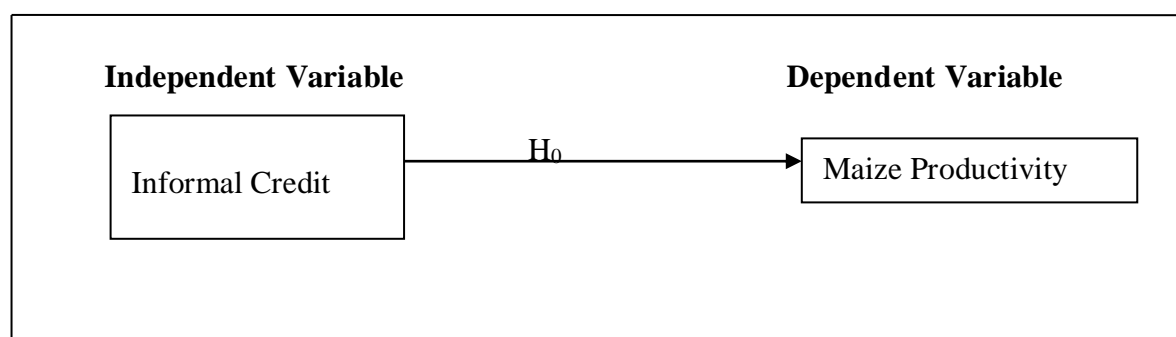


Figure 2.1 Conceptual framework of the study

Source; Developed from theoretical literature review (2020)

3. MATERIALS AND METHODS

3.1 Targeted Population and Area of the Study

The targeted 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 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 credit facilities 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 credit facilities 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, 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 credit facilities 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

Informal credit variable were measured from their ratios. These ratios were obtained by taking the total individual informal 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, informal credit rendered to farmer in that year (season), the individual informal credit that rendered credit, individual credit (Tzsh) from the particular individual source and total individual credit (Tzs) received by individuals.

Table 3.1 Measurement of Informal Credit

Years (Season)	Independent variable	Lender (s)	Individual Credit received (Tzs)	Total individual Credit Received (Tzs)
	Informal credit	Rotating saving and credit association (ROSCAS)		
		Relatives and friends credit		
		Maize trader’s credit		
		Agricultural input traders		
		Private money lenders		

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 harvest (home, godown etc.)				

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

3.5 Data analysis

In this study, before the actual data analysis, collected data was virtually inspected to check for incompleteness, data entry errors and data which are missing. This was done to ensure that data was of good quality. Therefore, the quantitative data for all three research objectives were tabulated and analyzed by the relevant statistical tool. 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 informal 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 informal credit injected and the control variables. Therefore, maize productivity was explained as a function of informal credit together with the control (dummy) variables.

Thus, written as;

Moreover, the other reason for use of regression equation were to determine whether informal explains a significant variation in maize productivity, determine how much of the variation in the maize productivity variable can be explained by informal 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**

The multiple linear regression models were run and Stata 13 command tool used to check for multicollinearity was vif and the results are shown in table 4.1

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.

Table 4.1 below indicates that the VIF for informal credit ratio is 1.347. The Tolerant values (1/VIF) for informal credit ratio is 0.742. 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, multicollinearity results in 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.

Table 4.1 Multicollinearity Test Results Using VIF Test

Variables	VIF	1/VIF
info ratio	1.347	.742
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)*

4.2 Regression results for Independent Variable Determinants.

The independent variable for this study was informal credit. This was measured from individual informal credit ratio. This ratio was obtained by taking the total individual informal credit

borrowed in a particular season over total money used (capital injected) by a farmer per acre. The result from table 4.2 shows that, informal credit ratio variable is significant to maize productivity. Also the results show that, a unit increase of informal credit ratio increases maize productivity of the individual farmer by 1.96 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 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 variables (i.e informal 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 variables 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
info_ratio	1.95** *	1.95** *	1.94** *	1.92** *	1.92** *	1.92***	1.88** *	1.96** *
_cons	(0.28) 5.62** *	(0.28) 5.35** *	(0.28) 5.52** *	(0.27) 1.80	(0.27) 3.36	(0.28) 4.66***	(0.28) 5.30**	(0.29) 4.27
Obs.	(0.71) 321	(0.92) 321	(0.68) 321	(2.42) 321	(2.53) 321	(1.51) 321	(2.48) 321	(3.72) 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 grammes of maize produced 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 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)
	RE_a	RE_b	RE_c	RE_d	RE_e	RE_f	RE_g	RE_h
info_ratio	1.95**	1.95**	1.94**	1.92**	1.92**	1.92***	1.88**	1.96**
	*	*	*	*	*		*	*
	(0.28)	(0.28)	(0.28)	(0.27)	(0.27)	(0.28)	(0.28)	(0.29)
landprepc							0.31	0.32
osts							(0.34)	(0.34)
ploughcos							0.02	0.13
ts							(0.25)	(0.25)
tractorcost							0.12	0.22
s							(0.72)	(0.76)
seedcosts							0.08	0.04
							(0.40)	(0.41)
weedingc							0.14	0.13
osts							(0.45)	(0.45)
harvestcos							0.46	0.46
ts								

	(0.38)	(0.38)
cleaningcosts	0.15	0.15
	(0.31)	(0.31)
transports	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 multicollinearity. 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 implies 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) RE_a	(2) RE_b	(3) RE_c	(4) RE_d	(5) RE_e	(6) RE_f	(7) RE_g	(8) RE_h
info_ratio	1.95* **	1.95** *	1.94** *	1.92* **	1.92* **	1.92* **	1.88* **	1.96* **
ages	(0.28)	(0.28)	(0.28)	(0.27)	(0.27)	0.23 (0.20)	(0.28)	0.16 (0.21)
educ_levels						0.14 (0.22)		0.11 (0.24)
house_size						0.18 (0.24)		0.14 (0.25)
experiences						-0.23 (0.16)		-0.26* (0.16)
farmsizes						-0.16		-0.33

						(0.45)		(0.46)
modernseed						0.37		0.53
						(0.44)		(0.45)
pesticide						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

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). Therefore, pair wise correlation analysis was employed so that to determine the relationship between variables without inferring cause and effect of those variables. Table 4.5 shows that, the correlation results for informal credit ratio (info_ratio) to maize productivity is +0.365*. This correlation results indicates that, informal credit is significant to maize productivity. It also implies that, there is medium correlation among informal 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 of selected individual.

In addition to that, the correlation results of the use of informal credit to the use of modern maize seed, pesticide, insecticide, fertilizer, hand hoe, plough and tractor are +0.029*, +0.154*, +0.135*, +0.154*, +0.112*, -0.08 and - 0.051 respectively. These correlation results indicates that, the correlation of using informal credit to the use of modern maize seed, pesticide,

insecticide, fertilizer, hand hoe are all significant to maize productivity and the correlation of using informal credit to the use of plough and tractor are all not significant to maize productivity. It also indicates that, there is small correlation on the use of informal credit to the use of modern maize seed, pesticide, insecticide, fertilizer, hand hoe, plough and tractor. It further indicates that, the correlation of using informal credit to the use plough and tractor has an inverse relationship to maize productivity for respondents.

Likely, 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 of using 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 results on the use of plough to the use of tractor are -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								
(2) info_ratio	0.365*	1							
	(0)								
(3) modernseed	-0.014	0.029	1						
	(0.806)	(0.6)							
(4) peticicide	0.072	0.154*	0.418*	1					
	(0.202)	(0.006)	(0)						
(5) insecticide	0.028	0.135*	0.535*	0.598*	1				
	(0.622)	(0.016)	(0)	(0)					
(6) fertilizer	0	0.154*	0.523*	0.208*	0.399*	1			
	(0.998)	(0.006)	(0)	(0)	(0)				
(7) handhoes	0.053	0.112*	0.07	0.111*	0.06	0.009	1		
	(0.346)	(0.047)	(0.216)	(0.049)	(0.288)	(0.866)			
(8) ploughs	-0.063	-0.08	0.048	-0.003	0.018	-0.099	0.068	1	
	(0.263)	(0.155)	(0.391)	(0.959)	(0.752)	(0.077)	(0.23)		
(9) tractors	-0.016	-0.051	0.096	0.073	0.127*	0.078	-	-	1
							0.315	0.34	
							*	9*	
	(0.779)	(0.367)	(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 informal credit on maize productivity of smallholder farmers in Sumbawanga rural and Mbozi districts in Tanzania. Findings revealed that, an increase in informal credits 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. These results also indicate that, majority of respondents used informal credit and there was higher dispersion (i.e the extent to which a distribution is stretched (spread) or squeezed) to respondents who used informal credit. These findings are consistent with that (Duniya and Adinah, 2015 and Chiu et al., 2014) whose findings revealed that agricultural credit has a positive and significant effect on agricultural productivity to rural smallholder farmers. Moreover, findings from the correlation matrix on table 4.5 revealed the informal credit ratio of 0.365*to maize productivity. This result implies that informal credit is positive and significant to maize productivity. This result also indicates that, a unit of Tzs increase of informal credit increases 0.365 units of maize productivity of individuals. These findings are in line with that of (Babajide, 2012) whose findings revealed that agricultural credit is significant and have positive effect to agricultural productivity.

6. CONCLUSION AND RECOMMENDATIONS

The study has confirmed that informal credit is significant and has a positive effect on maize productivity. It was also confirmed that informal credit has a positive association with maize productivity. Hence, we concluded that informal credits are predictors of maize productivity to rural smallholder farmers in Tanzania.

It is therefore recommended that, the policy to be reviewed to improvise 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 credit facilities 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, large farms both private and public.

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