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Access to Bank Loans and Smallholder Farmers' Paddy Productivity; A case of Mvomero District, Tanzania

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Abstract

Limited access to credit is one of the main limitations facing smallholders in Africa. Therefore, the study on which this paper is based, aimed at comparing smallholder farmers' paddy productivity before and after their access to loans from formal financial institutions. The study adopted a cross-sectional research design whereby data were collected once from 110 smallholder paddy farmers in Mvomero District using a questionnaire. In addition, key informant interviews and focus group discussions were conducted to enable triangulation. Quantitative data from the questionnaire were analyzed using SPSS whereby both descriptive and inferential statistics were determined. Study findings show that the paddy crop continues to play an essential role in the majority of households in the study area. Paddy productivity, on the other hand, was relatively low. The results from the linear regression show that loan size, age of household, farm size, the use of fertilizer and farming experience were significantly associated with paddy productivity. They further show that the major challenges faced by smallholder farmers in their access to bank loans were high-interest rates, loan inadequacy, and high collateral demand. The results of the paired sample t-test show that there is a difference in productivity before and after farmers accessed bank loans. Despite the importance of paddy farming to household livelihoods, it was reported that access to credit has a positive impact on the productivity of paddy farmers.

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1.0 Introduction

Agriculture is the backbone of the economy and the primary source of income in the majority of developing countries, Tanzania included. However, the majority of farmers are subsistence farmers with poor incomes. Agriculture generates an average of about 20% of the total gross domestic product (GDP) of SSA and employs over 50% of the population, mostly as smallholder farmers (World Bank, 2019). Paddy farming is among the means of life and a means of livelihood asset and food security for people in many parts of the world. Globally, 55 percent of the area under rice cultivation is irrigated and contributes 75 percent of the total rice production (Thiyagarajan and Gujja, 2012). Tanzania's rice sector is among the major sources of employment, income and food security for farming households, and a reliable food supply for the urban population (CFC, 2012). Rice is among the food crops whose demand in SSA hence its growing importance in attaining food security (Amos, 2014). In East Africa, Tanzania is the leading producer of rice and ranks second after Madagascar in the SSA countries (Msafiri, 2021). In Tanzania, rice is the second most cultivated food and commercial crop grown after maize, with a cultivated area of about 681 000 ha, which represents 18% of the cultivated land. In addition, yields are generally very low (1-1.5 tons/ha.) as most are grown using traditional methods. Moreover, 71% of the rice is grown under rainfed conditions. About half of the country's rice is grown by 230 000 smallholder farmers in the regions of Tabora, Shinyanga and Morogoro (URT, 2009). With large amounts of suitable, unfarmed, arable land, a high rate of self-sufficiency and current low yields, the Government of Tanzania hopes to increase rice production and become a large exporter of rice for the region and Africa. Regardless of this, Tanzania's rice productivity is low and varies from 1.2 to 2.4tons/ha under rain-fed farming. The low yields obtained by subsistence rice growers are attributed to several factors such as the use of low-yielding varieties, inadequate and unevenly distributed rainfall, weed infestations, the prevalence of pests and diseases, and marginal use of the irrigation potential (URT, 2000; CFC, 2012). According to Musunguzi (2016), agricultural productivity is a measure of the performance of the agricultural sector as it provides a hint of the sector's efficiency. Moreover, agricultural productivity statistics play a significant role in determining sources of economic growth while also showing technical variations and justification for any price changes. There are a variety of factors contributing to the low productivity of agriculture in Africa, not the least of which is the limited use of improved agricultural technologies, particularly improved seeds, fertilizers, and mechanized farming facilities, which by themselves are a result of a lack of access to agricultural financial services such as loans (Langyintuo, 2020). Though some studies (Isaga, 2017; Mbonaga, 2019) have been done, concentration has been on farmers' access to credit. Furthermore, based on the reviewed literature few studies were found to have dealt with differences in productivity affecting paddy farmers who are loan beneficiaries. Therefore, the manuscript aims at exploring the differences influencing smallholder farmers' rice productivity in Mvomero District. The paper could be more useful to policy makers with all other stakeholders interested in coming up with measures and strategies to raise smallholder farmers' paddy productivity. The current study's findings are expected to provide an understanding of the role of loans on the smallholder farmer's paddy productivity. Furthermore, the study findings are useful in the development of Tanzania's paddy/rice sector, and in meeting the second Sustainable Development Goals (SGD), which are to end hunger, achieve food security and improved nutrition and promote sustainable agriculture (UNDP, 2015).

2.0 Literature Review

Financial limitations severely limit the market participation of smallholder farmers. Most smallholder farmers don't have access to banks. 75% of rural smallholder agricultural business owners use mobile money services made available by cell phone operators (M-Pesa, Airtel

money, and Tigo Pesa). They consequently struggle to get precise information from banks and other official financial bodies (Maziku, 2012). Additionally, according to the Financial Sector Deepening Trust (FSDT) Annual Report (2017–2018), enhancing policies and increasing farmers' awareness of farming activities can increase productivity, enhance farmers' creditworthiness, and increase access to funding from lenders, it was observed that only 13 of the 24 banks surveyed, nevertheless, offered any agricultural lending products (FSDT, 2018). Although access to loans may not have a direct effect on agricultural productivity, it may have a sizable indirect effect through its favorable effects on the adoption of agricultural technology, increased capital for farm investment, hired labor, and increased household welfare due to improved healthcare access (Petrick, 2004; Awotide et al., 2015).

2.3 Theoretical Framework

Based on the theme of the current study, the study concentrates on the "Technology Diffusion Theory". The eventual effect of this diffusion is that people, as part of a social system, try to adopt a new concept, behavior, or product (Roger, 2003). In the current study, the theory is based on farmers' decisions to adopt new practices and technologies. When a person adopts something new, they are doing something different from what they were doing previously, such as adopting or using a new product, or learning and performing a new activity (Sahin, 2006). Generally, the theory postulates that farmers with access to credit are more likely to adopt modern farming technologies, use improved seeds, acquire larger land size, apply an adequate amount of fertilizer and hire labour, which intends to increase their farming productivity.

2.4 Conceptual Framework

The study's conceptual framework (Figure 3.1) shows how access to loans can be associated with paddy productivity. Generally, it is expected that farmers with access to loans can improve their farming technologies and increase input use. In addition, they may be more able to hire more labour thus, enhancing their productivity. Consequently, a lack of enough capital or non-access to loans could result in low productivity. According to CBS (2014) loans make it possible for farmers to apply adequate inputs required for production hence increasing productivity.

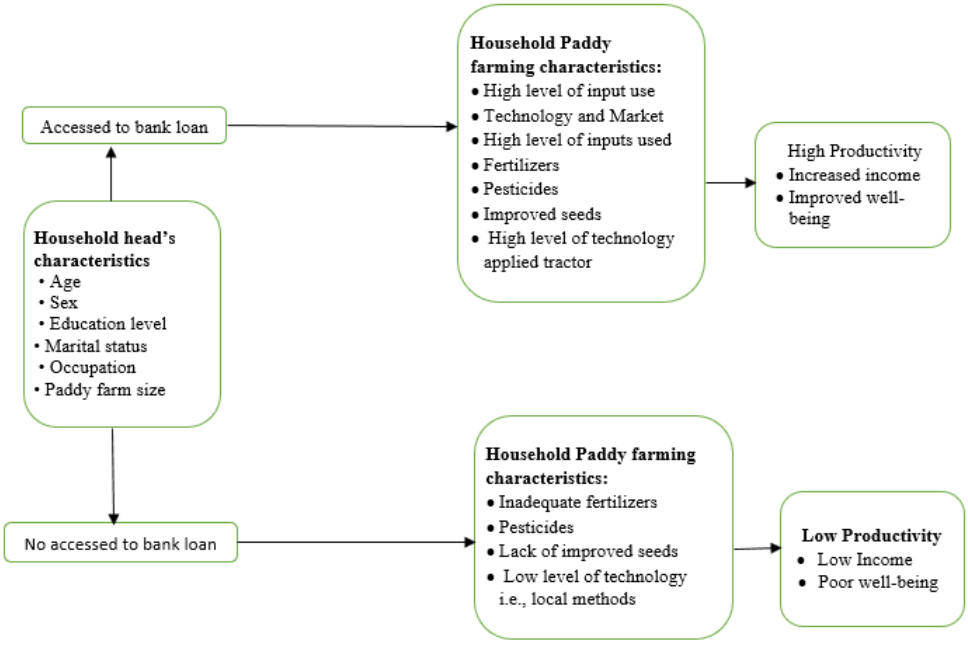

Figure 1.0: Conceptual Framework for the study on access to formal loans and paddy productivity

3.0 Research Methodology

3.1 Description of the study area

The study was conducted in Mvomero District, Morogoro Region, Tanzania. Mvomero District was purposively selected for the study due to the availability of smallholder farmers constituting the majority of the population in the district and the availability of financial institutions, specifically banks that give out loans to smallholder farmers in the study area. Furthermore, the study area has favourable agro-ecological conditions that support paddy cultivation (URT, 2017).

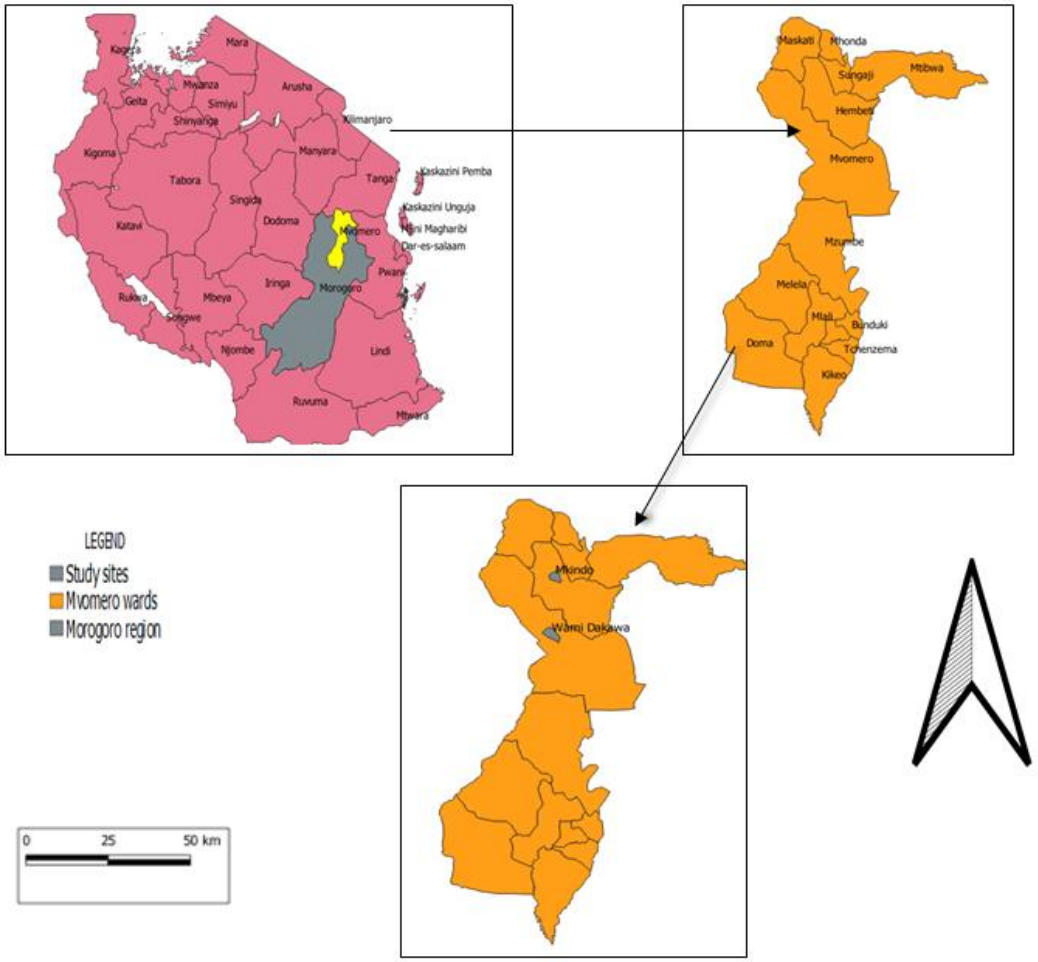

Figure 2: Map showing Mvomero District
Source: Author's Construct.

3.2 Research design

The study adopted a cross-sectional research design. The design was thought to be suitable for the current study as it enables one to obtain data while at the same time allowing the determination of cause-and-effect relationships (Matthew and Ross, 2010).

3.3 Sampling techniques and sample size

A total of 110 smallholder paddy farming households in the Mvomero District were selected to participate in the study. Respondents were selected based on the farmer borrower registers obtained from NMB and CRDB branches in Morogoro. The selection criteria for this population were purposive; that is, smallholder farmers who are loan beneficiaries were the target. The sample size was determined according to Boyd *et al.* (1981), with an intensity of 25% for every

sampling frame. The reason for using 25% intensity was due to the low availability of the number of smallholder farmers who have accessed loans in the study area.

3.4 Data collection

Primary data were collected from respondents using a pre-structured questionnaire with both open and closed-ended questions. In addition, data were collected through KIIs. A total of 4 KIIs, and FGDs were conducted. To ensure validity and reliability of the collected data, the data gathering tools were pre-tested in the study area, before the actual data collection to guarantee familiarity and clarity.

3.5 Data Analysis

Data were analyzed using both descriptive through frequencies and percentages and inferential statistics through paired sampled t-test and multiple linear regression model. Quantitative data collected through the questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS version 20).
The multiple regression equation used for analysis is as explained below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_{11} X_{11}$$

Where;
Y = Productivity (kg/ha)
β_0 = Constant Variable
X_1 = Age (Years)
X_2 = Marital status (1 = married, 0 = not married)
X_3 = Household size (total number of people in a household)
X_4 = Loan size (Amount received)
X_5 = Farm size (Measured in hectares)
X_6 = Access to improved seeds (1=Yes, 0= No)
X_7 = Education Level (1=No formal, 2=Primary, 3=Secondary, 4= post-secondary)
X_8 = Extension services (1 = Yes, 0 = No = 0)
X_9 = Labour use (total number of labours used per hectare)
X_{10} = Fertilizers use (Amount of fertilizer per hectare in kg)
X_{11} = Paddy Farming Experience (Farmer's actual years in paddy farming)
ε = Error Term

For the case of qualitative data that were gathered through KIIs and FGDs, content analysis was used, whereby the responses from the participants were categorized into meaningful themes.

4.0 Findings and Discussion

4.1 Respondent's demographic and socio-economic characteristics

According to the study findings (Table 1), the demographic and socio-economic characteristics of the respondents show that the majority (61.8%) of the respondents were males and 38.3% were females. The results in Table 1 show that the mean age of the respondents was 42.3 years. The study revealed that more than half (55.5%) were adults aged between 36 and 60 years, followed by youth aged between 18 and 35 years (36.4%). Finally, a few (8.2%) were over 60 years old. Table 1 also shows that over three-quarters (78.2%) of the respondents were married, 15.5% were single, (5.5%) were widows, and (0.9%) were separated. In addition, Table 1 shows that more than three-quarters (80.9%) had attained and completed primary school education, over a tenth (13.6%) had no formal education at all, and only a few (5%) had

attained secondary school education. Concerning farm size, the average farm size in the study area was 2.4 ha. More than a half (66%) of the respondents possessed 0.4–1.6 ha, followed by over a third (35.5%) having 1.6–2.8 ha, and a few (1.8%) had greater than 2.7 ha.

Furthermore, all (100%) of the respondents depend on crop production as their main source of income (Table 1). This suggests that agriculture is the pillar of the majority of rural people's economies. Slightly more than two-fifths (43.6%) indicated having more than 15 years of paddy farming experience, slightly more than one-third (35.5%) who had farming experience of 0 to 5 years, and about one-fifth (20.9%) who had farming experience of 5 to 15 years.

Table 1 Respondents Demographic and Socio-economic Characteristics (n = 110)

Characteristic		Mean	Frequency	Percentage
Respondent's Sex	Male		52	61.8
	Female		58	38.2
Respondent's Age	8-35 years	41.5	40	36.4
	36-60 years		61	55.5
	>60 years		9	8.2
Respondent's Marital Status	Single		17	15.5
	Married		86	78.2
	Separated		1	0.9
	Widowed/widow		6	5.5
Respondent's Education Level	No formal education		15	13.6
	Primary		89	80.9
	Secondary		6	5.5
Household's Farm Size (in ha)	< 0.4	2.4	3	2.7
	0.4 – 1.6		66	60
	1.6 – 2.8		39	35.5
	>2.8		2	1.8
Household's Major Source of Income				
	Farming		110	100
Respondent's Farming experience (in years)	0 – 5		39	35.5
	5 to 15		23	20.9
	> 15		48	43.6

4.2 Respondent's paddy productivity

Table 2 shows the averages of 3 055.71 kg and 1 277.1 kg/ha for paddy production and productivity respectively, for households in Mkindo and Dakawa. The findings show that about half of the study households producing paddy in 2021 had farm sizes larger than 1 ha.

Table 2: Households' paddy production in Mvomero District for the 2021 cropping season

Characteristics	Total (n=110)	Mkindo (n_m=50)	Dakawa (n_d=60)
Average households' total paddy production (kg) in 2021	3055.71	2604.8	3431.4
Average households' paddy productivity (kg/ha) 2021	1277.1	1138.56	1392.5
Average farm size (ha) under paddy production	1.59	1.37	1.77

In the case of the Morogoro Region in general, which is the leading region for rice production in Tanzania for the 2020/2021 season, it contributes about (13%) of total rice production in Tanzania. The total area harvested is 1100 ha with an average production of 2400, followed by Shinyanga, which contributes about (12%) of total rice production (USDA, 2022). With an average production of 2310 and a total area harvest of 1100ha, the regions with the least

production are Arusha and Iringa, whose contribution is less than 2% of the total rice production in the country (USDA, 2022). The observed paddy yields in the study area (Mkindo and Dakawa) is relatively higher than the Morogoro region average of 1 100 kg/ha (USDA, 2022). According to USDA, (2022) paddy productivity in East Asia, South Asia, Southeast Asia, the European Union and Iran in the 2020/2021 season stood at 4 590, 6 190, 4 110, 3 820, 6 780 and 5 270Kg/ha. The world's average during the same period stood at 4590kg/ha. Therefore, when compared to levels seen elsewhere in the world, the detected values were comparatively low. Low input use and agricultural technology are two potential reasons for the low yield seen, both of which are a result of a shortage of agricultural funds.

5.3 Socio-economic factors associated with smallholder farmers' productivity

A multiple linear regression model was used to determine the association of socio-economic factors and bank loan access on paddy productivity.

According to the linear regression results (Table 3), the coefficient of determination (R^2) is 0.472, and this implies that the eleven independent explanatory variables which were included in the regression model, explained 47.2% of the variation in paddy productivity, which is the dependent variable, while the other (52.8%) was due to variables that were not involved in the equation.

Table 3: Multiple regression results on the socio-economic factors associated with respondents' (smallholder farmers) paddy productivity

Variables (Factors influencing paddy productivity)	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	952.390	2810.49		3.389	.001***		
Age of household head	112.976	57.982	.198	1.948	.044**	.520	1.924
Marital status of the household head	31.886	87.602	-.026	-.236	.733	.446	2.243
Household size	1.767	42.598	.004	.041	.967	.458	2.181
Loan size	169.459	48.545	.470	3.491	.001***	.297	3.364
Farm size	-392.737	73.548	-.701	-5.340	.000***	.313	3.200
Access to improved seeds	-72.185	65.686	-.106	-1.099	.274	.579	1.726
Education level	19.608	68.084	.025	.288	.774	.723	1.383
Extension services	96.116	89.437	.092	1.075	.285	.741	1.350
Number of labourers used	81.137	54.282	.151	1.495	.138	.527	1.896
Fertilizer used	126.652	41.228	.236	3.072	.003**	.911	1.097
Paddy farming experience	118.832	50.238	.336	2.365	.020**	.267	3.752

$R=0.687$; $R^2=0.472$; Std. Error of the Estimate = 260.650; Durbin-Watson = 2.070; $p = 0.000$ NB: *, ** and *** refer to significance at the 10(0.1), 5(0.05), and 1 (0.01) percent respectively

The linear regression results (Table 3), show that the amount of loan applied in the 2020/2021 season had a positive beta coefficient of 169.46 and was statistically significant ($p < 0.001$) on paddy productivity. This means that farmers who applied for a greater amount of loan had an increase of 169.46kg in paddy productivity.

The argument above was supported in the FGD, where one participant said:

> *Most farmers whose yield is higher are those who have acquired a higher loan size, unlike others like me, who received small loans which were insufficient in fulfilling my farming requirements. For example, with regard to fertilizer, the standard and recommended number of bags of fertilizer per 0.4ha is 3, but as a result, my harvest differs significantly from that of the person who received a large sum and was able to purchase the standard and recommended number of bags of fertilizer* (a 52-year-old male FGD participant, MKINDO, 26th August 2021).

The study's finding corresponds with the findings of Mbonaga (2019), who reported a negative and statistically significant ($p<0.001$) observation that the size of a formal loan facility used by smallholder rice farmers has a great impact on the production of rice. In addition, Wicaksono (2014) also reported that agricultural credit was positive and statistically significant in association with rice productivity. Additionally, a 10% increase in agricultural credit is associated with a 1.2 ton per hectare increase in productivity. Further, the results confirm the findings of CBS (2014); Dzadze *et al.* (2012); Diagne and Zeller (2001); and Hulme and Mosley (1996), who reported that higher loans allow farmers to use the necessary inputs for production, resulting in increased productivity. However, the benefits of the increase in productivity may vary due to some effects of agro-ecological factors such as; unpredicted rainfall and sunlight, which fluctuate over different periods. According to FAO statistics, meteorological conditions, notably rainfall amount and consistency, have a substantial impact on maize and rice output (FAO, 2004). The argument above was supported in the FGD where it was said:

> "*Unlike other farming seasons, this season was bad for me as I applied for a larger loan amount of money to increase my farming venture. Unfortunately, the rains of this season were too much and my farm is located in a position where rain water accumulated my farm hence, the yield obtained in this season was quite low"* (FGD, MKINDO, 27th August 2021).

The results presented in Table 3 show that paddy farming experience, measured in years, was statistically and significantly ($p<0.05$) associated with paddy productivity. That is to say, farmers who had plenty of years of experience in paddy cultivation had a good understanding of diverse production patterns such as seasonal trends, frequent pests and diseases, and so on, and had high crop productivity. The observation is in line with findings by Maniriho *et al.* (2018), who reported that crop farming experience, measured in years, had a significant impact on productivity. Further, similar observations have been reported in the literature, confirming the findings of Nsiah *et al.* (2010) and Tauer (1993), who reported that experience in farming is vital as knowledge accumulates over time, leading to higher crop quality and productivity. Nonetheless, they differ from those of Omache (2016), whose results showed that there is a negative correlation between farmers' experience and agricultural productivity. Hence, it implies that farming experience has a negative relationship with agricultural productivity. Similarly, Sanusi (2010) and Doss *et al.* (2003) reported that farmers with more farming experience are less likely to boost output because they are conservative and prefer employing local farming methods and low-tech equipment and informal funding sources, whereas younger farmers are more open to new technologies compared to older ones. In such a scenario, the experience could also affect productivity negatively. The results presented in Table 3 show that the household head's age was statistically and significantly ($p<0.05$) associated with paddy productivity. As a person's age increases, so does their agricultural productivity. This is most likely because as a person grows older, his or her farming experience grows as well, increasing productivity. The results agree with the finding of Urgessa (2015),

who reported that the household head age was statistically significant at a 1% level, implying that the likelihood of the household head maturing and increasing his/her farm practice experience would be considerable, allowing the household to raise its farm land productivity. Further, Tauer (1993) reported that although agricultural yield rises as a person gets older, production peaks in middle age and subsequently declines with age. The results on farm size were statistically and highly significant ($p<0.001$) on paddy productivity. That is to say, farmers who had a large farm size also reported high productivity. The findings agree with what has been reported in the literature (Mbonaga 2019; Omotilewa *et al*., 2021) that there is a positive relationship between farm size and productivity, meaning an increase in farm size results in an increase in farmers' crop productivity. Further, the results conform to findings by (Mburu *et al.,* 2014; Kaloi *et al.,* 2020; Lemmesa and Gemechu (2016) who reported that larger farms have higher technical productivity than smaller farms and those larger farms are more likely to use water-saving technologies, hence, increasing rice yields. Study findings (Table 3) also show that the use of fertilizer was statistically and significant ($p > 0.01$) associated with high productivity. The findings conform to FAO (2019), argument that fertilizer use per hectare is one of the most important factors to consider to increase crop productivity and production in Africa. In addition, Omache (2016) reported that increased agricultural productivity comes through the use of fertilizers. Generally, the use of fertilizers has a considerable positive impact on agricultural productivity and could help boost yield (kg/ha). Findings in Table 3 further show that the other variables, such as labour size, extension services, education level, marital status of the household, household size and use of improved seeds were not significantly associated with farmers' productivity. Nonetheless, the findings show that the education level of farmers had a positive beta coefficient, implying that an increase in the level of education has the possibility of increasing farmers' crop productivity. The finding concurs with that of Paltasingh and Goyari (2018), who argued that farmers' level of education of farmers influences the adoption of modern technologies, thereby influencing their crop productivity. In addition, Urassa (2010) argues that the household head's education is thought to boost the possibility of using improved agricultural production technologies and thus increasing agricultural productivity. Hence, farmers with greater levels of education are more likely than their counterparts to have an impact on crop productivity.

The regression analysis results (Table 3) also show that household size was not significantly associated with paddy productivity. This could be because the more people in a household, the more work they have to do, especially if many of them are not involved in farming and the household head has to do it all. The findings are comparable to those of Ngongi and Urassa (2014), who discovered a negative relationship on the same. Where the number of household members grows, the household becomes less productive. However, some previous research in Tanzania, for example, contradict the results of Amare *et al.* (2016) who reported that household size has a substantial impact on-farm productivity. Further, the regression analysis results (Table 3) on marital status show a positive beta coefficient of 31.886, meaning that married individuals exhibited relatively higher paddy productivity than their counterparts. However, the relationship is statistically insignificant. The findings are similar to the findings of Masunga (2014), who reported that marital status influences the productivity of farmers, where married farmers are more likely to be obligated to engage more in production to serve family consumption and commercial purposes. The regression analysis results (Table 3) also show that the amount of labour used is positively associated with paddy productivity in the sense that farms with many labourers, reported higher productivity compared to those with fewer. The findings are similar to the findings of Kaloi *et al.* (2020), who reported that labour size had a positive effect and was significantly ($p<0.001$) associated with rice productivity. Thus, suggesting that an increase in labour size increases productivity. In addition, literature

(Msangi, 2017; Gollin, 2018) shows that labour size impacts the productivity of farmers, with those using more labour being more productive than those with less. Generally, paddy productivity is labour intensive and requires lots of labour during planting, transplanting, weeding and harvesting in the absence of machinery. The regression analysis results (Table 3) also show that access to extension services was not significantly ($p > 0.05$) associated with paddy productivity. Nonetheless, it had a positive beta coefficient, suggesting that an increase in the frequency of access to extension services has a possibility of increasing farmers' paddy productivity. The finding is in line with Kaloi *et al.* (2020) and Musingazi (2016), who reported that access to extension services is positively and significantly ($p < 0.001$) associated with high productivity, suggesting that the benefit of equipping farmers with skills and new agricultural practices enhances yields. On the contrary, accessing extension services without access to fertilizers and other inputs may have no impact on crop yields (Urassa, 2015). According to the study's findings (Table 3), access to improved seeds was not significantly associated with paddy productivity. In one of the villages studied, Mkindo, in Hemebeti Ward, the majority of smallholder farmers lacked access to improved rice seeds from local agro-dealers and therefore had to go 22 km away to Dakawa, to obtain the improved seeds. The finding contradicts those by Mukasa and Salami (2017) who reported that few smallholder farmers with access to loans were able to boost their productivity by the use of improved seed varieties, explaining that those farmers who had access to loans purchased inputs such as improved seeds to increase their productivity, while the majority of farmers who had no access to loans used native seeds. Furthermore, findings by Chand *et al.* (2011) and Rugumamu (2014) report that the use of better seeds and fertilizer increases agricultural yield.

5.4 Productivity of the smallholder farmers before and after their access to loans

Paired sampled t-test results presented in Table 4 below, give the summary of farmers' mean difference between paddy harvest before and after accessing the bank loan.
H_0 = There is no change in paddy productivity when farmers access bank loan
H_1 = There is a change in paddy productivity when farmers access bank loan

The test statistic is $t = 10.05$, with 109 degrees of freedom, and $p \leq 0.0001$. Because the p-value is less than $\alpha = 0.05$, we reject the null hypothesis that there is no change in productivity as farmers access to bank loans led to increased paddy yields (kg/ha), and state that there is a difference, on average, in productivity between farmers when they have an access to bank loans when they have no access to a bank loan. Moreover, during the study, the majority of respondents reported having higher paddy productivity after acquiring bank loans. However, the rest of reported a lack of increased productivity due to unavoidable circumstances and natural calamities. Generally, paddy productivity levels increased by 414kg/ha compared to the period before the access of a loan. The above results are consistent with the findings of Magali (2013) who reported that there is a significance difference in changes in the yield of rural SACCOS borrowers before and after taking loans. Hence, the conclusion that access to loans was associated with an increased in crop yield. Similar findings were observed by Hounsou *et al.* (2021) who used two groups whereby, one group consisted of farmers who had access to credit and the other group was the counterfactual. The counterfactual group of beneficiaries had paddy productivity of 1519 kg/ha whereas the treated group who had access to credit had a paddy productivity of 1797 kg/ha. Therefore, the treated yield was higher 278.17 kg/ha hence, a productivity gain of 15% on average. Similarly, the findings of Assouto and Houngbeme, (2020) also showed the same results revealing a great improvement in the productivity among farmers who accessed a bank loan, whereby those with access resulted in a 30.7% rise from 1 150kg / ha to 1502 kg/ha. Further to the above, Rugumamu (2014) reported that having adequate financial resources enables the adoption

of improved technologies and innovations which boosts crop yields. The study by Chandio *et al.* (2021) showed that credit improves people's living conditions by increasing farm productivity, hence improving their well-being. Nonetheless, Dossou *et al*. (2020) argues that in some instances smallholder paddy farmers experience a delay in credit provision which affects the farming calendar thus, resulting in a decline or low paddy productivity occurring after acquiring a loan. These findings show that access to loans from financial institutions has a positive influence on the agricultural productivity of smallholder's farmers, who experience productivity gains comparable to medium and large farms. This demonstrates that if smallholder farmers had access to loans, their productivity would genuinely improve.

Table 4: Paired t-test results for comparison between paddy harvest before and after accessing the bank loans

Paired Samples Test								
	Paired Differences							
				95% Confidence Interval of the Difference				
	N	Mean	Std. Error Mean	Lower	Upper	T	df	Sig. (2-tailed)
Paddy Productivity after bank loan in (kg)	110	1 2077.1	34.4076	277.69608	414.08574	10.053	109	.000
Productivity before bank loan in (kg)	110	931.2						

6.0 Conclusion

Based on the study findings and the discussion presented in the manuscript, the following conclusions are made. First, it can be concluded that paddy productivity (kg/ha) in Mvomero District is significantly lower than yields recorded in other parts of the world in general. Secondly, it can be concluded that access to sufficient credit is associated with high productivity. It is also concluded that smallholder paddy farmers' farm size is associated with high productivity, with larger farms performing better. It is further concluded that the use of fertilizers as expected leads to high paddy productivity. It is also concluded that the paddy farming experience, together with the age of the household head, is associated with high productivity. Lastly, it can be concluded that Paddy farmers who had access to bank loans generally led to increased paddy productivity. Based on the study findings and the study conclusions it is recommended that the government of the United Republic of Tanzania and all stakeholders of the agriculture sector including financial institutions should continue to improve loan granting service system to ensure that many more farmers may have an access to bank loan services to increase their productivity

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