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Digital Financing Services and Agri-Business Performance Rwanda

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Abstract

Agriculture in developing countries including Rwanda is progressing provides the basic necessities for the families and the country. The availability of technology within the compilation of agriculture would be of added value so as to solve the poverty issue and boost agriculture productivity which in turn ensures food security. The current research aims to identify the contribution of digital financing towards agricultural productivity in Rwanda. The general objective of this research is to explore the role of digital financing in Agricultural Productivity, Specifically, the following objectives were considered: To assess the digital financing services offered to farmers in Rwanda, to examine the role of digital financial services on agricultural productivity, to examine the challenges that farmers face in using digital financing in Rwanda. The study adopted the descriptive survey as a study design. The target population was 1300 from 6 Rwandan Districts, RAB agriculture specialists, Agronomists at the Sector and at the District, and agents banking from institutions that offer digital financial services. The sample size was 329 individuals, among them there are 305 respondents which got through the Simple random sampling method and 24 respondents got from the purposive sampling method. The primary data was collected through structured questionnaires; whereas secondary data through reading and analysis of relevant books, reports and journals. The data collected was edited, coded and fed into SPSS software v. 20 and Microsoft Excel for analysis, using descriptive, inferential statistics. Regression analysis was done to investigate the relationship between hypothesized variables. The research findings revealed that among the major of digital financing services offered to farmers to increase their agricultural productivity, Mobile Banking and Mobile Money is at 68.5% and the study participants' perceptions on the role played by digital financial services on the agricultural productivity where reported that they agreed by 94.1% that digital finances play a key role in the agricultural productivity in Rwanda. On the side, among the main challenges faced by farmers in using digital financing in Rwanda, limited digital literacy was reported at 44.6%. The study found that digital financing services have a weak negative contribution to Agricultural productivity where it contributes ($\beta=-0.215$) to Agricultural productivity. The Agent Banking services also have a weak negative contribution towards Agricultural productivity ($\beta=-0.038$) on Agricultural productivity and the digital wallets has a contribution of ($\beta=-0.197$) on Agricultural productivity. In conclusion, the researcher found that Digital

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Financial Services has a statistically significant contribution to the Agricultural productivity of Rwanda.

1. Introduction

Critics within the growing body of literature challenge the efficacy of digital financing for development programs, presenting evidence to substantiate their claims. In the realm of distributing market price information through Management Information Systems (MIS), studies by Camacho and Conover (2011), Fafchamps, and Minten (2012) underscored the poor adoption of MIS and their limited impact on agricultural outcomes. Building on this foundation, Burrell and Oreglia (2015) further delved into the enhancement of agricultural decision-making processes and the necessity for market price information. They contended that utilizing mobile phones to disseminate market information through MIS has limited relevance, as price information alone is insufficient in aiding decision-making processes (Burrell & Oreglia, 2015).

The Digital Agriculture Profile for Rwanda leverages the collective knowledge of stakeholders to evaluate the current state of digital agriculture in Rwanda. This evaluation delves into key participants across agricultural value chains, identifies primary challenges, and explores opportunities to overcome these obstacles through innovative technologies. The goal is to assist investors and implementers in optimizing their efforts, focusing on opportunities with the highest potential (adapted from Zakalias, 2018).

Access to finance poses a significant barrier to increasing agricultural productivity for smallholder farmers in Rwanda. This challenge is often associated with the limited availability of bank branches in rural areas, hindering farmers' access to necessary financial services. Digital financing solutions, such as mobile money and online lending, have the potential to address this problem by providing farmers with convenient and affordable access to loans and other financial services. Agriculture is also a key component of the SMART Rwanda Masterplan, aiming to transform agricultural practices for increased productivity, commercialization, and industrialization. Initiatives like the Smart Nkunganire System (SNS) and the Smart Kungahara System (SKS) have been introduced to leverage digitalization for productivity growth (Hennie Bester, 2022).

Rwandan farmers face challenges in accessing essential financial services, such as loans and savings, due to low technological literacy and risks associated with the agricultural environment. Digital solutions, including mobile money and online lending platforms, offer promising alternatives, providing convenient and affordable access to financial services that empower farmers to support and scale their businesses.

While acknowledging the potential of digital solutions for agricultural transformation in Rwanda, start-up financial technology companies encounter obstacles such as limited funding options.

The lower capital invested in agriculture, coupled with a lower number of elite individuals engaging in agriculture and climate change variations, poses challenges. To assess the extent to which digital financing has improved the living conditions of Rwandan farmers (Baumüller, 2018; Nakasone et al., 2017), this study aims to fill the existing research gap by exploring the relationship between digital financing services and agricultural productivity in Rwanda.

Key factors currently hindering digitalization in Rwandan agriculture include low computer literacy among farmers, restricted access to capital, challenges with input quality and access, and limited research on climate-smart agriculture. This study seeks to address these challenges

and investigate the impact of digital financing on agricultural productivity. The objectives are to contribute valuable insights to the under-researched field of digitalization in Rwandan agriculture, provide evidence-based recommendations for policymakers and stakeholders, and empower farmers through digital financing, ultimately leading to increased agricultural productivity and economic growth in Rwanda. The research aims to investigate whether digital financing has contributed to agricultural productivity in Rwanda, considering its vital role in the eyes of different beneficiaries.

1.1. Objectives of the study

The current research is made of both general and specific objectives and these are shown in the following arguments:

1.1.1. General objective

The general objective of this research is to explore the contribution of Digital Financing Services on Performance of Agri-Business in Rwanda

1.1.2. Specific objectives

Specifically, the following objectives were considered:

1. To assess digital financial services offered to farmers in Rwanda
2. To examine role of Digital Financing Services and Performance of Agri-Business in Rwanda
3. To examine the challenges that farmers face in using digital financing in Rwanda.

2. Literature review

2.1. Theoretical framework

This part dealt with the elaboration of the theories that were developed in needs of making the research richer and understandable and it deals with checking at the variables that were elaborated in the content and their respective theories.

2.1.1. The access to credit theory

The theory proposed by researchers Michael Carter and Jacob Yaron in 1994 posits that access to credit is a critical constraint on agricultural productivity and suggests that digital financing can alleviate this constraint by providing farmers with affordable credit (Carter & Yaron, 1994). The Access to Credit theory asserts that farmers with credit access are more likely to invest in agricultural inputs such as seeds, fertilizers, and machinery, consequently leading to heightened agricultural productivity.

Access to credit is deemed essential for agricultural productivity for several reasons. Firstly, credit aids farmers, particularly small-scale ones with limited financial resources, in financing the purchase of necessary agricultural inputs. Secondly, credit helps farmers smooth their income over time, offering support during periods of low production and facilitating investment during high production periods, which are often influenced by weather and other factors. Lastly, credit enables farmers to take risks by financing new technologies or practices that can potentially increase productivity.

Digital financing emerges as a solution to address the limited access to credit for farmers. Platforms providing digital financing through mobile phones or other digital devices offer farmers quicker, easier, and more affordable access to credit. Growing evidence supports the Access to Credit theory; a study by the World Bank found that access to credit can increase agricultural productivity by up to 20% (World Bank Economic Review, 8(1), 27–50).

In the field of agricultural economics, the Access to Credit theory holds significance, as it has the potential to empower farmers, enhance productivity and income, and contribute to overall economic development (Carter & Yaron, 1994).

2.1.2. The risk management theory

David Just and Klaus Deininger's "risk management theory" (2002) proposes that digital financing helps farmers mitigate agricultural risks by enabling access to weather and crop insurance and other risk management products. This reduces financial losses during crop failures or unforeseen events, ultimately boosting agricultural productivity.

Several factors underscore the importance of risk management for farmers:

Vulnerability to natural hazards: Weather fluctuations, pests, and diseases threaten crop yields and income.

Limited financial buffers: Small-scale farmers often lack resources to purchase traditional insurance or risk management tools.

Inefficient decision-making: Risk aversion can deter farmers from adopting new technologies or practices due to potential investment losses.

Digital financing addresses these challenges by facilitating access to risk management products through mobile phones and other digital devices. This makes obtaining insurance quicker, easier, and potentially more affordable for farmers.

Supporting evidence for the risk management theory is growing. A study by the International Food Policy Research Institute found that weather insurance can increase agricultural productivity by up to 15% (The World Bank Research Observer, 17(2), 181–207).

Therefore, the risk management theory holds significant relevance for finance and accounting. It presents a promising approach for farmers to mitigate risk and enhance their productivity.

2.1.3. The market access theory

This theory was proposed by researchers such as Jennifer Reinikka and Jakob Svensson in 2004. They argue that digital financing can help farmers to connect with buyers and sellers in the market, which can lead to higher prices for their products.

This can increase farmers' income and incentivize them to invest in agricultural productivity. Reinikka, J., & Svensson, J. (2004). Leakage from social funds: Evidence from a randomized evaluation in Uganda. There are several reasons why market access is important for agricultural productivity. First, farmers often have limited access to markets. This is especially true for small-scale farmers, who often lack the resources to transport their products to markets or to negotiate with buyers.

Second, farmers often face low prices for their products. This is because they are often at the mercy of buyers, who can take advantage of their lack of market power. The lack of market access can lead to inefficient production decisions. For example, farmers may be reluctant to invest in new technologies or practices if they are not confident that they will be able to sell their products at a profit.

Digital financing can help to overcome the constraint of limited market access for farmers. Digital financing platforms can provide farmers with access to information on prices, buyers, and sellers. This can help farmers to connect with buyers and sellers in the market, and to negotiate better prices for their products.

There is a growing body of evidence that supports the market access theory. For example, a study by the World Bank found that digital financing can increase agricultural productivity by up to 10%. *Quarterly Journal of Economics*, 119(4), 1221–1250. The market access theory is an important and relevant theory for finance and accounting. It has the potential to help farmers to increase their income and productivity.

2.1.4. Improved efficiency theory

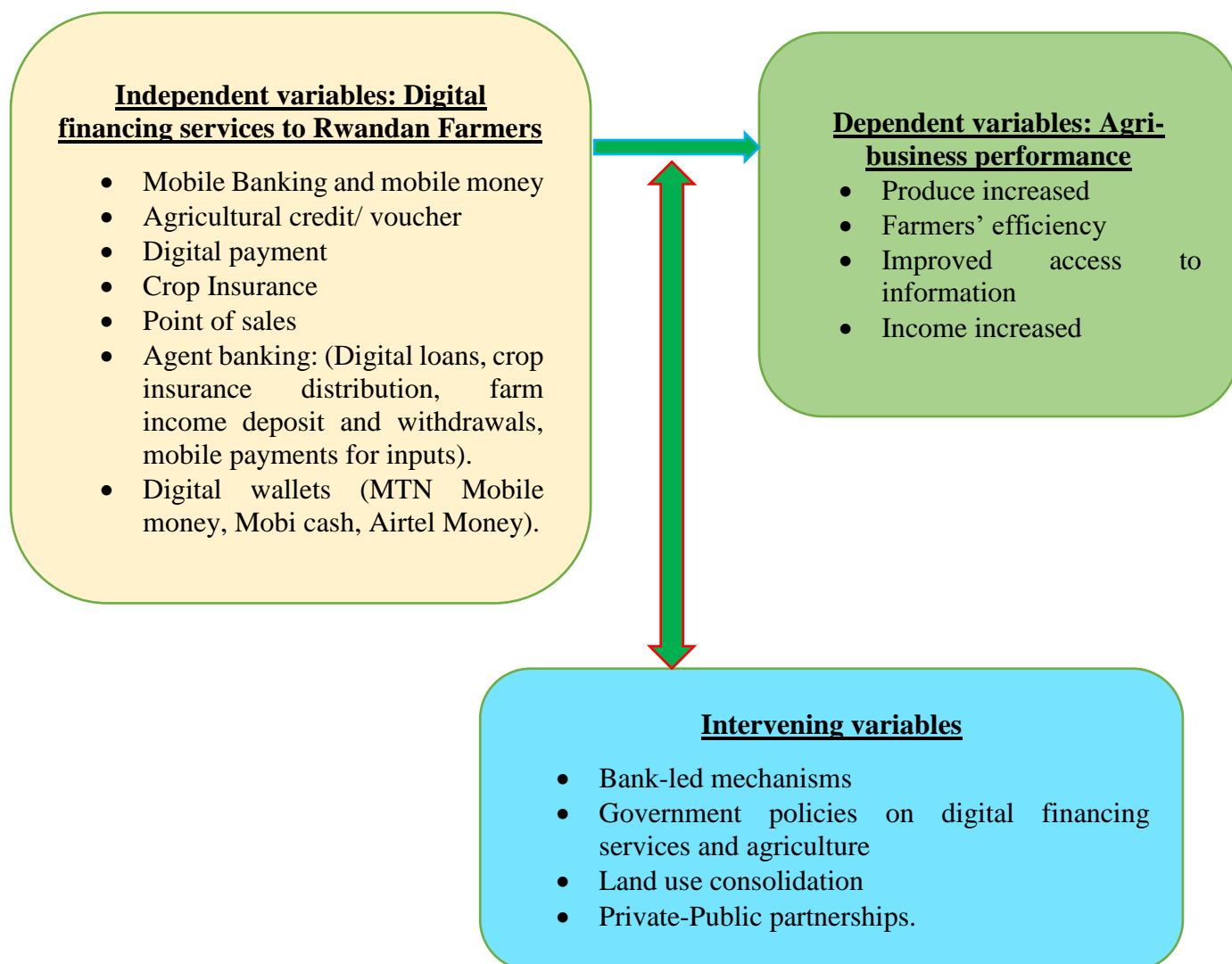
The theory, introduced by researchers Simon Evenett and Bernard Hoekman in 2007, asserts that digital financing plays a crucial role in enhancing the efficiency of farmers' operations. According to Evenett and Hoekman (2007), digital financing provides farmers with real-time information on prices, weather, and other market conditions, empowering them to make informed decisions about their production and marketing strategies. Efficiency is vital for agricultural productivity due to several reasons. Firstly, efficient farmers are more likely to achieve increased output with fewer inputs, resulting in heightened productivity and profits facilitated by access to real-time digital finances. Secondly, digital literacy enables efficient farmers to adapt to market changes, sustaining productivity and profitability in dynamic market conditions. Thirdly, efficient farmers are better positioned to adopt new technologies and practices, contributing to continuous productivity improvement.

A growing body of evidence supports the efficiency theory. For instance, a World Bank study found that digital financing could increase agricultural productivity by up to 5% (World Bank, 2007). The efficiency theory holds the potential to empower farmers, fostering increased productivity and profitability in their agricultural endeavors (Evenett & Hoekman, 2007).

2.2. Conceptual Framework

Conceptual framework forms the heart of the study; it is the foundation of the very objectives (research hypothesis) of the study; it dictates the direction of literature review, forms the basis of analysis, conclusions and recommendations. Conceptual framework is normally summarized in a schematic diagram; it basically shows the relationship between digital financial services such as Agents Banking services, Digital wallets, Digital finances services as independent variables and Agricultural productivity includes Produce increased, Farm income increased, Farms' efficiency, Access to information improved as dependent variables. The intermediating variables considered in this study include Bank-led mechanisms, Government policies, Land use consolidation, and Private-public participation.

Figure 1: Conceptual framework



Source: Adopted from Tsan et al. (2019)

3. Material and methods

The current research employed the descriptive design where mean, percentages and standard deviation represented. In this research, the targeted population is made of 1,300 including 1,276 people made of farmers who have participated in the digital finance to improve their agriculture activities. These 1,276 people are farmers from different Districts from Rwanda. In addition, (24 people) made of 6 from RAB agriculture specialists, twelve (12) Agronomists (6 at sector level and 6 from the district level), 6 people from digital financing (3 from bank of Kigali and 3 banking agents) who facilitate farmers in day-to-day transaction using electronic devices including mobile banking, mobile money, Urubuto pay, agriculture insurance fees payment were purposively targeted.

The sample was obtained through the use of Yamane formula of calculating the sample size, the following formula shows each and everything of concerns.

This formula is written as $n = \frac{N}{1+N(e^2)}$. Thus, $n = \frac{N}{1+N(e^2)} = \frac{1,276}{1+1,276(0.05)^2} = 304.5 \cong 305$ respondents

Where N = Total population,

n = Sample size,

e = Margin Error of 5%

From this point of study, a smaller portion of the population was selected to represent the whole population in the area. Upon selecting the study's respondents; the researcher used both simple random and purposive sampling.

In conducting research study, the required data was gathered from both primary and secondary data. To obtain useful and accurate data and ultimately come up with valid results, the researcher used the questionnaire, interview schedule, and documentation.

After data processing, it subjected to descriptive analysis to create meaning of what collected from the field and find out the relationship that support or disagree with original or new hypothesis by using statistical package for social sciences (SPSS v20) and Microsoft excel. Information presented in form of tables and graphics.

In order to draw conclusions from the survey, the researcher used linear regression analysis. The following regression analysis model will be used:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \epsilon_i$$

Where:

Y is agriculture output per acre at period i

β_0 is a constant-coefficient

β_1 , β_2 and β_3 are Regression Slope coefficients

X_{1i} : The electronic payments for period i

X_{2i} : The level of agent banking used for period i

X_{3i} : The digital payment system applied the period i

ϵ = Stochastic value of error term

After the estimation, the researcher consulted the mean, median and use descriptive statistics about the interaction between the research variables. In addition, the test of coefficient of determination adhered in the research.

4. Research findings

This chapter shows the findings of this research by presenting it from analysis. In this part, there are questions which intended to be asked as referred to what were the research objectives. They were presented so as to ensure that the research objectives got their respective responses. These are shown below:

4.1. Role of digital financial services in the productivity of agriculture

This section aims at the presentation of points of view of study participants concerning the role played by digital financial services on the productivity of agricultural sector in Rwanda.

Table 1: Role of DFS in the productivity of agriculture in Rwanda

DFS play a great role on the productivity	Frequency(n)	Percent (%)
Strongly agree	201	65.9
Agree	86	28.2
Disagree	12	3.9
Strongly disagree	6	2
Total	305	100

Source: Primary Data, September 2023

According to the table 1 showing the perceptions of respondents on the role played by digital financial services on the agricultural productivity in Rwanda, the majority of respondents reported that they agreed by 94.1% (Agreed and Strongly Agreed) that digital finances play a key role in the agricultural productivity in Rwanda

According to some key informant.... *Digital financing is aligned with the mandate of government of Rwanda of boosting economy through good service delivery, digital financing on input is time saving and farmer access inputs on time and their farming practices are well aligned with farming period, for those who have smart phones can access weather forecast and plan ahead on their farming practices including to choose crop that resist on a certain climatic conditions this reduce yield lose and increase quantity of produce as per unit of area cultivated compared to who do not access those information, also through online banking system such as mobile money, mocash credit farmers access short term credit to buy agro-chemicals, pay labor forces used as casual works all these contribute to increase of productivity and performance compared to those who do not.*

She continued saying that... *though digital financing services some farmers got link to apply to grants for horticulture production from World that facilitated them to prepare well their land, examining their soil composition, application of appropriate agro-chemicals, instouring agricultural infrastructures such as irrigation system, greenhouses, and other agricultural intensification expertises that enhances the increase of productivity of cut flowers, potatoes, ibrid maize, Chilli teja and Habanero, avocados and other vegetables and fruits, by now export has increased due to increase of productivity(KIs,Ngoma Musanze, Nyaruguru, Ruhango districts, 2023).*

The 5.9% reported that they disagreed (disagreed and strongly disagreed) with this statement. From the same table; it can be observed that the respondents have a good perception on the role played by digital financial services on the agricultural productivity in Rwanda.

4.2. The digital financial services offered to farmers in Rwanda

This section aims at presenting the research findings according to the first objective of this study targeted “to assess digital financing services offered to farmers in Rwanda” towards agricultural productivity and profitability. The respondents have provided their points of view

on the digital finance services offered to farmers in different localities so that they can increase agricultural productivity. The table below presents the information on the related objective.

Table 2: Digital Financial Services offered to farmers to increase their agricultural productivity

Digital financial services offered to farmers	Frequency(n)	Percent (%)
Mobile banking and mobile money	209	68.5
Agricultural credit	71	23.3
Digital payment	5	1.6
Crop insurance	11	3.6
Market information	9	3.0
Total	305	100.0

Source: Primary Data, September 2023

According to the table 2, the study findings revealed that the majority of respondents reported that digital financing services offered to increase their agricultural productivity is Mobile Banking and Mobile Money by 68.5%, Agricultural credit by 23.3%, Crop insurance by 3.6%, Market information by 3.0% and digital payment by 1.6%.

From the same table 9, it is was observed that Mobile Banking and Mobile Money is the most digital financial service offered to Rwandan farmers to increase their agricultural productivity.

4.3. The Agents Banking Services provided by Banks towards enhancement of digital financing to promote agricultural productivity in Rwanda

This section aims to present the agents banking services provided by banks to farmers towards enhancement of digital financing to promote agricultural productivity in Rwanda.

Table 3: Agents Banking Services provided by Banks to farmers towards enhancement of digital financing services.

Agents Banking Services provided by Banks to farmers	Frequency(n)	Percent (%)
Digital loans for farm inputs	206	67.5
Crop insurance distribution	62	20.3
Farm income deposit and withdrawals	37	12.1
Total	305	100.0

Source: Primary Data, September 2023

According to the table 3, the research findings revealed that the majority of respondents reported that they received Digital loans for farm inputs by 67.5%, Crop insurance distribution by 20.3% and lastly, Farm income deposit and withdrawals by 12.1% as agents banking services provided by banks towards enhancement of digital financial services to promote agricultural productivity.

4.4. The examples of digital wallets used in payments of money to farmers in Rwanda

The implementation and the use of digital wallets in payments of money by farmers is among the facilities that lead to an increase in agriculture productivity. The table below presents the data on the subject matter:

Table 4: The digital wallets used in payments of money by farmers in Rwanda

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Digital wallets used in payments of money by farmers	Frequency(n)	Percent (%)
MTN Mobile Money	236	77.4
Airtel Money	54	17.7
Bank Mobile Apps (BKash)	15	4.9
Total	305	100.0

Source: Primary Data, September 2023

According to the table 4, on the side of digital wallets used in payments of money to farmers in Rwanda, the majority of respondents reported that they used MTN Mobile Money by 77.4%, Airtel Money by 17.7% and only Bank Mobile Apps (BKash) by 4.9%.

4.5. The Main challenges and hindrances that farmers face in using digital financing in agriculture in Rwanda.

This section aims at presenting the research findings related to the third objective that sought out the main challenges that farmers face in using digital financial services in Rwanda.

Table 5: The Main challenges that farmers face in using digital financing in Rwanda

Main challenges	Frequency(n)	Percent (%)
Limited digital literacy	136	44.6
Poor network (limited connectivity)	65	21.3
Limited financial literacy	58	19.0
High interest rate	23	7.5
Uneven cash flow	23	7.5
Total	305	100.0

Source: Primary Data, September 2023

Based on the results in table 5, showing the main challenges faced by farmers in using digital financing in Rwanda, the majority of study participants reported that they faced limited digital literacy as challenge by 44.6%, Poor network (limited connectivity) by 21.3%, Limited financial literacy by 19.0%, High interest rate and uneven cash flow by 7.5% respectively.

From the same table 5, the research findings revealed that most of respondents are changed by the limited digital literacy.

Table 6: The Main burdens of agricultural productivity in Rwanda

Main burdens of agriculture in Rwanda	Frequency(n)	Percent (%)
Climate variability and vulnerability	124	40.7
Access to high quality inputs and technology	94	30.8
Market linkage	38	12.5
Land constraints	49	16.1
Total	305	100.0

Source: Primary Data, September 2023

According to the table 6 showing the main hindrances of agricultural productivity in Rwanda, the research findings revealed that the majority of respondents reported that climate variability and vulnerability is one the main burdens of agriculture productivity by 40.7%, Access to high quality inputs and technology by 30.8%, land constraints by 16.1% and lastly market linkage by 12.5%.

Table 7: The Extent to which agricultural productivity has been increased as result of access to digital financial services in Rwanda.

Factors of productivity	SA		A		D		SD		Mean	δ
	n	(%)	n	(%)	n	(%)	n	(%)		
Crop yield increase	209	68.5	74	24.3	13	4.3	9	3.0	1.49	0.929
Income increased	241	79.0	61	20.0	0	0.0	3	1.0	1.24	0.549
Farms efficiency	242	79.3	54	17.7	2	0.7	7	2.3	1.29	0.722
Access to information improved	233	76.4	69	22.6	0	0.0	3	1.0	1.27	0.560

Source: Primary Data, September 2023

According to the 7, the research findings revealed that the majority of respondents reported that they strongly agree by 68.5%, agree by 24.3%, disagree by 4.3% and only 3.0% who were strongly disagreed that Crop yield increase after they accessed digital financial services.

It is observed that that majority of respondents 92.8% have reported that the agricultural productivity has been increased as result of access to digital financial services in Rwanda, with a mean score of 1.49 and standard deviation of ($\delta = 0.929$).

From the same table 7, the research findings revealed that the majority of respondents have reported that they strongly agree by 79.0%, agree by 20.0% and 1.0% who strongly disagreed that Income increased as results of access to digital financial services. This implies that 99.0% of the total respondents reported that agricultural productivity has been increased as result of access to digital financial services in Rwanda, with a mean score of 1.24 and a standard deviation of ($\delta = 0.549$).

On the side of Farms' efficiency, the majority of study participants reported that they strongly agree by 79.3%, agree by 17.7% and strongly disagree by 2.3% that Farms' efficiency is one of the results from the access to digital financial services. This implies that 97.0% of the total respondents agreed that agricultural productivity has been increased as result of access to digital financial services in Rwanda, with a mean score of 1.29 and a standard deviation of ($\delta = 0.722$).

From the table 7, the research findings revealed that the majority of respondents responded that they strongly agree by 76.4%, agree by 22.6% that access to information improved is one of the results of access to digital financial services in Rwanda and only 1.0% disagreed with statement.

It observed that agricultural productivity has been increased as result of access to digital financial services in Rwanda, with a mean score of 1.27 and standard deviation of ($\delta = 0.560$).

4.7 Regression coefficients

Multiple linear regression analysis is used to determine whether there is an influence of digital financial services on agricultural productivity. The regression model was run to test whether the model is significant or not. The statistical significance was verified by the Coefficient (β), t-statistic and Prob.

In additional, statistically significant relationship between the dependent variable (Agricultural productivity) and independent variables (Digital Financial Services, Digital Wallets and

Agents Banking Services) from the model were accepted at 5% significance level. The analysis applied the statistical package for social sciences (SPSS) to compute the measurements of the multiple regressions for the study. Model relationship with the agricultural productivity of these variables can be arranged in a function or equation as follow:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \epsilon, \text{ Where:}$$

Y = Agricultural Output, β_0 = Constant, β_1 = regression coefficient of variable X_1 ,

β_2 = regression coefficient of variable X_2 β_3 = regression coefficient of variable X_3 ,

Where X_1 = Digital Financial Services, X_2 = Agents Banking Services, X_3 = Digital Wallets, and

ϵ = error / confounding variables.

Tables 8 : Regression coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1 (Constant)	1.503	.037			41.102	.000
Digital Financial Services	-.215	.013	-.583		-16.097	.000
Agents Banking Services	-.038	.017	-.078		-2.206	.028
Digital Wallts	-.197	.017	-.414		-11.550	.000

a. Dependent Variable: Productivity

Source: Primary Data, September 2023

From the research findings, the following values were obtained: $\beta_0=1.503$, $\beta_1=-0.215$, $\beta_2=-0.038$, $\beta_3=-0.197$. The regression model can therefore be expressed as follows:

$Y=1.503-0.215X_1-0.038X_2-0.197X_3$. Therefore, Agricultural productivity is measured by **1.503-0.215 Digital Financial Services- 0.038 Agents Banking Services- 0.197 Digital Wallets.**

At 5% level of significance all three variables which are Digital Financial Services, Agents Banking Services and Digital Wallets were find to be negative since their p-values were below the acceptable threshold of 0.05 and were negatively associated with Agricultural Productivity.

5. Conclusion

In regard to the first research objective which was aiming to asses digital financial services offered to farmers in Rwanda to increase agriculture productivity, the information gathered from table 9 indicates that the prime among the digital financing services used by farmers to increase agriculture productivity was the use of Mobile banking and mobile money, this was presented at 68.5%, the second round of respondents said that they use Agricultural credit whereby it was presented at 23.3%. In the same vein, it has been observed that the use of Crop insurance was presented at 3.6% among the total number of respondents who were in the research ground and only 3.0% reported that they used market information to increase their agricultural productivity.

As per the second research objective of this study which was talking about the agent banking services provided by banks toward enhancement of digital financing, the information gathered from table 10 indicates that the major among the agent banking services provided by banks toward enhancement of digital financing was digital loans for farm inputs and this was presented at 67.5%, the second round of respondents said that the crop insurance distribution is considered and this was presented at 20.3%. In the same vein, it has been observed that the use of farm income deposit and withdrawals was presented at 12.1 % among the total number of respondents who were in the research ground.

According to the third specific objective which was aiming to examine the challenges that farmers face in using digital financing in Rwanda, the results presented in table 12 indicates that the prime among the main challenges that farmers face I using digital financing in Rwanda was digital literacy and this was presented at 44.6%, the second round of respondents said that poor network (limited connectivity) is considered and this was presented at 21.3%.

In the same vein, it has been observed that the high interest rate and uneven cash flow were also reported as the main challenges by 7.5% respectively.

The researcher's findings demonstrate that there is an influence of digital financial services on agricultural productivity. The results analysis showed that there is a contribution of digital financial services on Agricultural productivity in Rwanda with $\beta_1 = -0.215$ on Digital Financial Services, $\beta_2 = -0.038$ on Agents Banking Services and $\beta_3 = -0.197$ on Digital Wallets. This can be supported by the government initiatives made to enhance agricultural productivity. The negative direction may be caused by the wrongly implementation of the different ways of giving the farmers the digital financing services with lack of digital literacy for farmers.

6. Recommendations

In light of what has been revealed in study, a number of recommendations can be made:

Rural farmers are recommended to increase the creative and innovative perspectives related to the seeds manipulation and re-production and couple this with joining the digital financing schemes in their home localities

The financial institution is recommended to keep on assisting in getting the loans to farmers who have potentialities of increasing productivity of agriculture. This is the solution from the challenge of lower level of access to finance which was among the challenges faced by farmers in their day-to-day duties.

There Ministry of agriculture is recommended to set the continuous and effective member support comes from member interest. Therefore, interest should be sustained by creating a good business image by rendering efficient and more interesting service on the basis of the needs of the members. Thus, encouraging non-members to join the cooperative.

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