FINANCIAL TECHNOLOGY AND SMALLHOLDER FARMERS IN GHANA: AN EMPERICAL INVESTIGATION

Research Paper

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Abstract

Ghana's financial industry has changed over the years and the country's cashless system has taken over financial transactions. Most of FinTech's past studies had their impact on the financial sector. However, given that these smallholder farmers rarely have access to credit facilities and increased use of financial technology, the study intended to find out how well farmers know about financial technology, the primary factors affecting their use of technology, and the influence FinTech has on them. In understanding the phenomenon, the research sampled 50 small holder famers however only 47 respondents took part in the survey. Results showed that most smallholder farmers had strong mobile money knowledge compared to other financial technologies. Also it was determined that the adoption of financial technology such as mobile money did not directly affect smallholder productivity for the studied region. It was recommended by the researcher that, investors should consider investing in farmers' digital financial technology to improve food security and economic development.

Keywords: Fintech, Cashless system, Ghana, Finance.

1 INTRODUCTION

Financial services notion stretches back to the eras when cowries and other monetary media were traded for goods and services. This originated centuries ago and, inter alia, paper notes and metallic items (coins) have been used to pay for goods and services. The Ghanaian currency itself also developed from when the country used to trade in pound and shilling money because of our colonial links to the usage of cedi and pesewa, and now Ghana cedi and Ghana pesewa. The Bank of Ghana issued pounds, shillings and pence on 14 July 1958 (Bank of Ghana).

Yiridoe (2005) revealed in his research that Ghana's cowrie money, a prominent trading medium in Ghana before the West African Pound and afterwards the cedi, is now only a remnant. In Ghana, Financial Technologies is rapidly catching up in the financial industry, and various institutions are moving towards adopting technology platforms and apps to reach their consumers. Many areas of the Ghanaian economy, including health, education, energy, and even banking, have witnessed FinTech's better utilization in their company.

Nearly half of Ghanaian dwells in poor regions. The 2010 Statistical Service census found that, despite the agricultural sector remained Ghana's largest labor employer; the percentage of individuals engaged in agriculture fell to roughly 42 percent compared to more than 50 percent in the previous census. In most rural regions, agriculture and agriculture are the major sources of population income (Ghana Statistical Service, 2012) In this day of technological advances, the usage of smartphones and other gadgets like as tablets has increased by a larger portion of our population, and most of our smallholder farmers may be said to be part of this wave. A survey done by GSMA Ecosystem Accelerator team in

the third quarter of 2019 found that Ghana has 15.1 million active smartphone devices (Omondi, 2020). However, it is worth questioning if Ghana's smallholder farmers, despite the growth of electronic gadgets, are aware of the abundance of FinTech accessible.

Again, with the financial technology accessible to Ghana's farmers, how has the employment of these technical tools affected agricultural productivity? On this note this research intends to measure the influence of financial technology on the productivity of small holder farmers.

2 LITERATURE REVIEW

A plethora of studies have been done on the impact of financial technologies on different sectors and parts of our lives. Particularly much work has been done on the impact or effect of financial technology on the financial sector (Manfred, 2017; Domeher et. al., 2014; Asante-Gyabaah et. al., 2015) Most studies have been done in the area of the impact of financial inclusion on farmers livelihood or productivity (Kumar and Gupta, 2019; Koomson and Ibrahim, 2018; Abraham, 2018; Fowowe, 2020). Little work has however been done in the area of the impact of financial technologies on smallholder farmers.

Manta (2017) in a study in Romania, looked at financial innovations (Globtech and FinTech) in Agriculture and rural development and after analyzing secondary data and studying industry trends concluded that in order to achieve financial inclusion of farmers and rural folks, there was the need to develop models that incorporates emerging financial technologies. McIntosh and Mansini (2018) in a working paper sanctioned by the Asian Development Bank looked into the use of financial technology in the agriculture sector. The study was based on data from member countries of the ADB on the use of FinTech and how it impacts agriculture inn all the member countries over the period between 2000 and 2016. It was concluded that in order to directly improve agriculture within the member countries of the ADB, it was necessary to include financial technologies in order to bring on board all those smallholder farmers who have been unbanked.

Wang and He, (2020) focused their research on digital financial inclusion and farmers' vulnerability to poverty with China as a case study. They argued that despite the overwhelming influx of digital financial systems, there is little evidence on a relationship between the financial technologies and poverty. Their study employed data from 1900 farmer households in China and the results of their analysis showed that digital financial inclusion positively reduced farmers' vulnerability to poverty in China.

In Africa, Pambo (2014) conducted a research into financial technological innovations and access as the key to unlocking agricultural potential in Kenya. The study specifically focused on prospects for financial innovations and access in improving dairy farmers' livelihoods through a case study approach. The findings showed that financial technology innovation was the missing link in achieving improved agricultural productivity and food security in Kenya and that to improve agricultural financing and access to credit by smallholder farmers, financial technology policies needs to be implemented.

In an ongoing study by Udry et al., (2020) on the impact of digital credit for small-scale farmers in Ghana, the preliminary report highlights access to credit by farmers. The research is studying 2000 farmers in the Ashanti region and partnering with farmerline solutions to provide access to financial services such as savings and loans to digital means in order to ascertain its direct impact on the financial inclusion and overall productivity of the small-scale farmers.

3 RESEARCH METHODOLOGY

To measure the impact of financial technologies on the productivity of small scale farmers, the researcher used quantitative research methods.

3.1 Research Settings

The respondents were drawn from two communities, namely; Osonodompe and Adusa which are both located in the Ga West Municipal Assembly of the Greater Accra Region of Ghana. These communities are both rural farming communities with majority of the indigenes of the communities being smallholder farmers. The common crops grown in these two communities are Maize, Cassava, Pepper, Tomatoes and Plantain.

3.2 Data collection and analysis

The research, in his quest to collect data for the study, administered questionnaires. These data were then analyzed using statistical packages for social science (SPSS). The sampled data was analyzed into descriptive data and a regression analysis was produced to understand the relationship between the variables and interests. Below are the regression models for the study;

$$\varepsilon(Y_i) = \alpha_0 + \alpha_1 X_i \text{.....(1)}$$

represents the intercept which is the value of ε(Yi) when Xi=0 and represents the slope of the line with its interpretation being the rate change in ε(Yi) per unit change in X.

The dependent variable Yi is said to be random in nature from a population of random variables with the mean of each population given by ε(Yi).

$$Y_i = \alpha_0 + \alpha_1 X_{i1} + \alpha_2 X_{i2} + \alpha_3 X_{i3} + ... + \alpha_p X_{ip} + \varepsilon_i \text{.....(3)}$$

Subscription notation has been extended to include a number on each X and α to identify each independent variable and its regression coefficient. In a multiple regression model, there are p independent variables and including α0, p'=p+1 parameter to be estimated.

The regression coefficient of the multiple regression models gives the change in the dependent variable (Yi) as result of a change in either of αi when the other independent variable remains the constant and α0 interprets as the change in the dependent variable (Yi) without including the independent variable (Xi).

4 RESULTS

Out of 50 questionnaires that were sent, only 47 were administered making 94% of the response rate. 50 respondents were sampled from both communities to represent the entire population.

4.1 Demographics

In Table1 Participant's demographics are detailed. We can see that there is very good distribution between male and female participants and also their ages.

Gender		**Age**		**Total**
	31 – 40	41 – 60	61 and above	
Male	4	27	2	33
Female	1	8	5	14
Total	5	35	7	47
Percentage	10.63	74.46	14.89	

Table 1. Cross tabulation between gender and age.

Table 2 provides more details about farmers' gender and the number of years they have worked as farmers. The results show that 40.42% of the farmers have been working between 1-5 years.

Gender	Number of years as a farmer			Total
	1 – 5	6 – 10	Above 10	
Male	13	12	8	33
Female	6	3	5	14
Total	19	15	13	47
Percentage	40.42	31.91	27.75	

Table 2. Cross tabulation between gender and number of years of the farmer.

Table 3 details the gender of the farmers and the crops they cultivate. From the table it can be seen that 68% of the respondents cultivate maize.

Gender	Crop Cultivated					Total
	Maize	**Cassava**	**Tomatoes**	**Pepper**	**Pineapple**	
Male	23	7	1	1	1	33
Female	9	3	1	0	1	14
Total	32	10	2	1	2	47
Percentage	68	21.27	4.2	2.12	4.2	

Table 3. Cross tabulation between gender and crops cultivated.

Table 4 shows the educational qualifications of the respondents. Majority of the respondents 59.57% had basic education.

Gender	Level of Education			Total
	Basic	**Secondary**	**No Formal**	
Male	22	4	7	33
Female	6	0	8	14
Total	28	4	15	47
Percentage	59.57	8.51	31.91	

Table 4. Cross tabulation between gender and education.

Table 5 presents details of the locality of the farmers. The results show that 68% of the respondents are from Osonodompe and the remaining 32% from Adusa.

Gender	Locality		Total
	Osonodompe	**Adusa**	
Male	23	10	33
Female	9	5	14

Total	32	15	47
Percentage	68	32	

Table 5. Cross tabulation between gender and locality.

4.2 Knowledge of Fintech

The respondents were asked to rank their knowledge in FinTechs, 31.9% (15) had excellent knowledge in Mobile money. However 95.7% (45) had poor knowledge in E-banking and Banking Apps respectively. Also 97.9 (46) had poor knowledge in Payment applications.

Factors	Frequency	Percentage
Mobile Money	15	31.9%
E-banking	45	95.7%
Banking Apps	45	95.7%
Payment Apps	46	97.9%

Table 6. Ranking Knowledge in FinTechs.

4.3 Factors affecting the use of FinTech

Table 7 represents the highest ratings of factors influencing the use of FinTech according to the study. Ranking from the highest factors such as difficulty in usage, Access to smartphones and cost, were strongly agreed by 80.9% of the respondents respectively. This is followed by level of education which was 74.5%. Then poor internet connection also was 57.4%. Finally privacy and security was scored by 34%.

Factors	Frequency	Percentage
Level of education	35	74.5%
Poor internet	27	57.4%
Difficulty In Usage	38	80.9%
Access to Smart phones	38	80.9%
Privacy and security	16	34%
Cost	38	80.9%

Table 7. Factors affecting the use of FinTech.

4.4 Factors affecting the use of FinTech

From table 8, it can be observed that, coefficient determination which is the R squared records a value of 0.511 and can be interpreted to mean that 51.1% of the variations in the model has been explained by the regression model and this indicates that the regression model is good.

Model	R	R Square	Adjusted R	Std. Error	Durbin Watson
1	0.715	0.511	0.451	1665.2	2.00

Table 8. Model Summary

Table 9 below show that the p-value recorded is 0.00 and comparing this p-value with a significance level of 0.05 which is the alpha value, it can be noted that the p-value calculated is less than the alpha value. It can therefore be concluded that at a 5% or 0.05 significance level, the estimated regression model is significant.

Model	Sum of squares	df	Mean square	F	Sig.
Regression	118715121.243	5	23743024.249	8.563	0.000
Residual	113683670.757	41	2772772.457		
Total	232398792.000	46			

Table 9. ANOVA Table

Table 10 shows the estimated coefficients of the model calculated using the ordinary least square method and the value of each of the independent variables and its significance to the model based on the decision rule discussed in chapter three. Observing the p-values calculated, it can be seen that Yields (tons) is the only independent variable that recorded a p-value less than a 0.05 level of significance (alpha level). A p-value of 0.00 is less than 5% therefore the independent variable (Yield) is very significant to the regression model. The values of all the VIF calculated for each of the independent variables is less than 10. It can therefore be concluded that multi-collinearity does not exist among the independent variables.

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5$$

Becomes

$$Y = 0.092 X_1 - 0.008 X_2 + 0.716 X_3 - 0.056 X_4 + 0.016 X_5$$

Model	Standardized Coefficients (Beta)	t	Sig.	Collinearity Statistics Tolerance	VIF
(Constant)		1.093	0.281		
Size of farm(acres)	0.092	0.694	0.492	0.684	1.463
Number of years as a farmer	-0.008	-0.063	0.950	0.753	1.328
Yields(tons)	0.716	6.145	0.000	0.880	1.137
Gender	-0.056	-0.406	0.687	0.636	1.573
Use of Momo for Business	0.016	0.121	0.904	0.674	1.483

Table 10. Coefficients

5 DISCUSSIONS

In most of the research done on financial technologies, the focus has been its impact of financial markets and organizations and general livelihoods but little has been done on the impact of these financial technologies on smallholder farmers. The lag in the literature made it necessary for this study to be conducted.

The main objective of this study was to determine the impact of financial technology (FinTech) on smallholder farmers. Specifically, the study sought measure the impact of FinTech on the productivity of the farmers and the factors that affect the use of these technologies.

The first specific objective considered was the level of knowledge of FinTech of the smallholder holder farmers and from the results, 59.6% of the farmers interviewed did not have smart phone which is an essential tool for accessing financial technologies. Furthermore 78.7% of the respondents use mobile money but only 40.4% of this actually use the technology in their farm business. In directly measuring the farmers' knowledge of financial technologies, they were made to rank their level of knowledge looking at the FinTechs available to them; Mobile money, e-banking, banking apps and other payment apps. Majority of the respondents which is about 70.2% cumulatively had a fairly good to excellent working knowledge of mobile money but had a poor knowledge and appreciation for other financial technologies available to them. In comparison, Kikulwe et al. (2014) discovered in their study in Kenya that about 90% of the smallholder farmers have adopted the use of mobile money services. Kirui et al. (2012) also confirm in their study that although 96% of farmers are aware of mobile phone-based money transfers, only about 52% use the platform for their farm business

The main focus of the second objective was to ascertain the major factor(s) that affect the use of FinTechs by the smallholder farmers. Again, some factors were provided for the respondents to rank in order of the extent to which the factors affect their use of FinTechs. From the study, the major factors that affect the smallholder farmers' use of FinTech include their level of education where, 74.5% indicated that it affects their use of FinTech to a large extent. Another major factor is the access to smart phones and devices which saw 80.9% of the respondents say that it is a huge barrier to the use of FinTech. The cost of using the technology was also well mentioned as a major factor as well as poor internet connection in areas where smallholder farmers are located as stated by 57.4% of the respondents. These findings on the factors that affect the use of FinTech is similarly consistent with that of Nath et al (1998) where they looked at the issues, problems and perspective associated with electronic banking and commerce.

The third specific objective of the study was to assess the impact of financial technology on the productivity of smallholder farmers. Regression analysis was used to study the relationship between the variables of interest. The results as shown in chapter four implies that 51.1% of the changes in smallholder farmers' income which is a measure of productivity has been explained by the various independent variables in the regression model.

It can also be deduced that considering all the variables at a significance of 5%, quantity of yields of a farmer is the most significant variable that causes much changes in the income which directly measures the productivity of a smallholder farmer. Comparing yields and the use of mobile money and their impact on income, the study showed that, yields have a direct impact on the income of farmers as compared to the use of mobile money which causes marginal changes to the income. Kikulwe et al. (2014) in their study on mobile money, smallholder farmers and household welfare discovered that smallholder farmers who use mobile money are more likely to use fertilizers and hire labours which are essential in improving productivity of the farmer. The study also showed that a number of the smallholder farmers use mobile money in the purchase of inputs and payment of labour as confirmed by Grossman and Tarazi (2014).

6 CONCLUSION

Based on the analysis and the findings, it can be concluded that, the level of knowledge of smallholders in financial technologies is low. Majority of the farmers know and use mobile money platforms more as compared to other technologies where farmers have little or no idea. Smallholder farmers who use the mobile money also seldom use the technology in their farm business. Only a small number of farmers use mobile money for purchasing inputs and pay labour as well as sometimes receive payment for

produce. Also Looking at the factors that influence smallholder farmers adoption or use of financial technologies, it can also be concluded that major or significant factors that affect the use of the technologies include Level of education ,Access to smart phones and devices, Cost of using technologies and Poor internet connection finally the impact of FinTech on smallholder farmers' productivity, it can be concluded from the findings that even though some of the farmers use mobile money in their business to either pay for inputs and labour or receive payments, the use of mobile money and for that matter financial technologies does not have a direct impact on smallholder farmers' current productivity though the productivity may be improved if the technologies are adopted and used by the farmers.

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