



Digital Platforms for Linking Agriculture Investors with Smallholder Farmers in Nigeria.

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Conflict of interest

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Authors Contribution

AJA (40%) Designed the study, developed outline, designed analytical tools, read the drafts

OBO (40%) Collection of data, analysis of data, writing of first draft

WFI (20%) Coordinated data collection, proofread the first draft

Abstract

The study assessed digital platforms used to link agriculture investors with smallholder farmers in Nigeria. Content analysis and in-depth interviews were used for the study. Three digital platforms, namely the ThriveAgric, EZ Farming and Farmcrowdy were purposively chosen for this study. Results showed that ThriveAgric is user friendly; EZ Farming and Farmcrowdy provide risk assessment scores for easy monitoring. Also, ThriveAgric uses the Agricultural Operating System (AOS) to track farmers' activities. EZ Farming uses social media platforms for adverts and campaign while Farmcrowdy innovatively used the platform to render advisory services to the farmers. ThriveAgric and Farmcrowdy invested in crop and livestock production while EZ Farming areas of investments were crop, livestock, fisheries, farm equipment and hydroponics. Smallholder farmers' derived benefits were mainly observed in the aspect of reduction in post-harvest losses. Untimely delivery of agricultural inputs and cost of running the platforms were identified as major impediments to the effective deployment of the platform by the farmers and operators of the platforms respectively. Cost

sharing mechanism should be incorporated into the partnership to ensure sustainability and a win-win situation. Also, regular review of the initiative by all the stakeholders is strongly recommended.

Introduction

Agriculture in developing countries and sub-Saharan Africa remain the driver of the economy as the majority of the population derives livelihood from the sector. Globally, there are over 608 million farms in the world out of which 90% are family farms producing 80% of the world's food (Ricciardi et al., 2018). Despite these, smallholder farmers are the poorest category in most of the developing nations. According to Mutsvangwa-Sammie and Manzungu (2021), over 60 percent of the population in the sub-Saharan Africa live on less than US\$2 per day, and 40 percent live on less than US\$1 per day. Subsequently, hunger and undernourishment are on the increase affecting almost 9% of the world population (Roser and Ritchie, 2019). Similarly, more than 2 billion people of the world population lack regular access to safe, nutritious and sufficient food (FAO, et al., 2019).

Efforts at increasing food production in sub-Saharan Africa have not been sustainable. Issues such as weak rural financial network leading to credit constraints have traditionally been a discouraging factor for smallholder farmers' adoption of improved production practices. According to Kanza, et al., (2022), provision of support services need to be designed in a special way to accommodate the characteristics of smallholder farmers such as low financial literacy, lack of collateral and their sole dependent on rain-fed irrigation. It is, therefore, expedient to step up the rate of food production in order to feed the world population that is projected at 9.7 billion in 2050. (Gu, et al., 2021). For farmers to perform at their optimum, the need for farmer-centric services and information cannot be over-emphasized. Well-organised and articulated collaboration with service providers will ensure the reliable provision of agric-support services to the farmers. Meanwhile, there is the need for service providers to be well abreast with farmers' production, financial and marketing records in order to ease the delivery of support services.

In Nigeria, agriculture plays a vital role in the national economy. The sector employs about 70% of the country's population (USAID, 2022). Nevertheless, since the discovery of oil in commercial quantity in the early 70s, the contribution of the sector to the Gross Domestic Product (GDP) has been plummeting. For instance, in 2021, agriculture contributed 23.36% to the country's GDP, whereas it was 31.41% from industry and 43.79% from the service sector (Statista, 2022). Despite a series of agricultural policies and interventions, the country has not been able to achieve its potential to be self-sufficient in food production. Inadequate finance with low public and private sector investment has been identified as some of the factors limiting agricultural development in Nigeria. Similarly, government spending on agriculture has been on the decline. While the federal expenditure increased from 4.2 trillion in 2010 to 5.2 trillion in 2016, the expenditure on agriculture decreased from 106 billion Naira in 2010 to 77 billion in 2016 (Olomola & Nwafor, 2018). This shows a decrease in public spending to agriculture from three percent in 2010 to one percent in 2016. This situation is a shortfall to the African Union 2003 Maputo declaration that requires all member nations to allocate at least 10 percent of the national budgets to agriculture. The share of agriculture to other sectors is negligible despite increase in private investment into agriculture. For instance while, the 1.6% or US\$195.7 million of the total capital inflows into

the country in 2017 was higher than the US\$22.47 received in 2016, the sector lags behind the share of other sectors such as Servicing - 13.75%, Production - 12.16%, Telecoms - 4.96%, Oil & gas - 3.57% and Financing - 2.76% (PwC, 2018).

According to Tsan et al., (2019) access to finance, extension services and market linkages can lead up to 57% increase in income for farmers, and to 168% increase in yield. This is so as access to agricultural support services is capable of making farmers to adopt better technologies, purchase agricultural inputs and make decisions that will improve the overall performance of their farm enterprises. It is therefore pertinent to deploy a pragmatic approach to remove the bottlenecks at financing agriculture. This may involve change in strategies to reflect current realities in using modern technologies towards linking smallholder farmers to relevant actors. Some of these challenges could be addressed through the use of Information Communication Technology (ICT). Digital technologies through ICTs open arrays of opportunities for farmers, investors and entrepreneurs to improve efficiency of production and marketing of agricultural produce. Such an approach situates within the innovation system thinking.

An innovation system is defined as an interactive learning process in which different types of intermediaries performing intermediation roles and their potential contribution to innovation system functions (Kanda, et al. 2019). The system sees innovation as not exclusively technical intervention (that is, developing high-yielding variety) but also institutional issues such as agricultural finance, markets and policies. This paper takes the position of Edwards-Schachter (2018), that crowd farming is “innovative” when it (i) introduces novel approaches or financing products to address established problems; (ii) extends proven financing products to new markets or customers (smallholder farmers in this instance); and/or (iii) includes new types of investors or sources of capital to address development problems. In the crowd farming, the digital platforms make participation easier as each one can become involved and monitor the progress of his investment at any time. Thus, the operators of the platform were able to invest in the capacity building of the smallholder farmers to improve their productivity. Thus, the crowd farming platform is fittingly an innovative way of addressing inadequate and inclusive agricultural financing in Nigeria.

Crowd farming as an aspect of crowdfunding is a digital platform of donations, loans and investment capital for farmers and agro-entrepreneurs looking for funds to set up and expand their businesses. Crowd farming, therefore, offers an innovative approach to solving the inadequacies in agricultural finance and production issues. Using digital platform, crowd farming links smallholder farmers who possess agricultural skills and farmland with individuals with investment funds but with limited technical skills. The return on investment is then shared as specified in the agreement. Being an emerging digital platform that is recently taking root in the Nigerian agriculture sector, it has now become imperative to empirically review its effectiveness at addressing inadequate production inputs including finance toward increasing food production. This paper is, therefore, designed to examine the nature of crowd farming within the Nigerian agriculture context. Specifically, it (i) described the platform operational process, (ii) examined innovative ways of linking smallholder farmers to production inputs, (iii) ascertained areas of investments and the number of farmers bankrolled by investors through the platforms, (iv) identified benefits of utilising digital technology by smallholder farmers and (v) determined challenges in deploying digital technology platforms towards improving smallholder farmers' productivity.

Methodology

Nigeria is situated in the West African region and lies between longitudes 3⁰ and 14⁰ and latitudes 4⁰ and 14⁰. It has a land mass of 923,768 sq.km. It is bordered to the North by the Republics of Niger and Chad; it shares borders to the West with the Republic of Benin, while the Republic of Cameroun shares the Eastern borders right down to the shores of the Atlantic Ocean. Nigeria population as at 2022 is estimated around 216.7 million (Statista, 2022). From this population, 53.4 percent lived in urban centers, while 46.6 percent lived in rural areas. According to Kemp, (2022), the country's internet penetration rate was 51.0 percent of the population in 2022.

Content analysis and in-depth interviews with key informants were used for this study. Two in-depth interviews with operators of the digital platforms and farmers' representative were conducted. Three crowd farming platforms were purposively chosen based on expert recommendation and their prominence in Nigeria digital agricultural landscape. The three platforms were: ThriveAgric, EZ Farming and Farmcrowdy. The home page of the digital platforms was chosen as the unit of analysis. Content analysis of the websites involved: operational process obtained from 'our process' section, innovative ways of linking smallholder farmers to production inputs from 'about us' section, areas of investments obtained from 'home page' of the website.

The contents were observed within June/July 2021. Likert-like type scale of Agree (2), Undecided (1) and Disagree (0) was used to measure benefits derived by smallholder farmers in utilizing digital technology. The cut-off point of 1.0 was used as decision rule to categorise as high benefits (>1.0) and low benefits (<1.0). In-depth interviews were conducted to determine challenges of deploying digital technology platforms at improving smallholder farmers' production performance. Ten farmers were interviewed to gain insight into challenges and benefits of using the digital platforms. Percentage was used to present the data.

Results and Discussion

Platform Operational Process

ThriveAgric platform is described as user-friendly as it allows users to navigate easily through the mobile application and website. The website is not complicated or complex and each icon and text are graphically arranged and investors can invest easily in their choice farm. This means that participation in agricultural enterprise has been brought to the fingertips of investors through digital technology. This supports OECD (2018) that digital technologies are changing agriculture and the food system. Although the platform does not give pictorial progress of the farm, investors can still monitor activities on the farm via the dashboard on the mobile application or website. Just unlike before, investors can now get involved in agriculture without physically being present. While EZ Farming also contains features such as in ThriveAgric, it adds another component of the risk assessment score that enable investors to understand possible risks associated with the prospective investment. This feature helps to achieve transparency and better risk decisions by the stakeholders. Also, using a personal account created for the transaction, investors can check the impact of the investment, names and pictures of farmers being funded. Moreover, through the platform, investors can arrange for a physical inspection of the farm. The visit is usually best during any of the major farm operations such as land clearing, planting, harvesting and marketing.

Farmcrowdy provides pictorial imaging and allows investors to track farm progress throughout the cycle. The investors also have the opportunity to visit the farm and monitor the progress of the agricultural activities. Upon the completion of a successful farming cycle, Farmcrowdy would pay the sponsors their initial sponsorship (to an electronic wallet that is on the dashboard) in addition to the return on investment. Sponsors can either choose to transfer their profits to their bank accounts after a successful farming cycle or to reinvest the proceeds in sponsoring another farm. However, Farmcrowdy stands out as farmers and other agricultural practitioners can get finance directly from the platform after filling in necessary information under the Farmcrowdy Structured Finance.

Innovative Ways of Linking Smallholder Farmers to Production Inputs

ThriveAgric deploys skilled agricultural extension workers to form a relationship with farmers, build farmers' capacity on good agronomic practices and ensure timely delivery of production inputs. ThriveAgric also uses the Agricultural Operating System (AOS) to allow the Operations Department track farmers' activities on the field. Through this system, output can be predicted and farmers can as well be linked to local and global markets. EZ Farming however uses farming boot camps to build farmers' capacity. On completion of the training, production inputs were supplied to the farmers. EZ Farming also utilises social media platforms to showcase their products for possible engagement with investors and agricultural input companies. Farmcrowdy uses approaches such as produce aggregation, structured finance and agricultural insurance to make their products attractive to prospective investors and farmers. Farmcrowdy is also noted for efficient linkage with farmers through the provision of production inputs.

Specific Areas of Investments and Number of Farmers Bankrolled

ThriveAgric invested in the crop (such as cowpea, groundnut, maize, okro, pepper, rice, sorghum, soybeans, tomatoes, watermelon) and livestock (such as cattle, poultry, sheep and goat). The platform has raised \$4,000,000 and produced 560,000 metric tonnes of grains on almost 142,000 hectares of land. The return on investment (ROI) on this platform ranges from 7 to 30 percent within 3 – 9 months depending on the type of investment (ThriveAgric webpage, 2021) EZ Farming has an investment amount of \$600,000 on approximately 8,000 hectares of land. It has empowered 121 farmers and created jobs for 128 youths who have become commercial farmers. The areas of investment are crops (cassava, chili pepper, cucumber, ginger, groundnut, maize, pineapple, rice, soybeans, tomatoes and yam) and livestock (piggery, poultry, sheep and goats). The return on investment (ROI) ranges from 13-60 months depending on the type of investment (EZ Farming webpage, 2021). Farmcrowdy has raised \$15,000,000 with 424,966 farmers' networks across the country on 349,000 hectares of farmland. The areas of investment are crop (cassava, cowpea, ginger, groundnut, maize, okro, pepper, rice, tomatoes and watermelon) livestock (cattle and poultry), fisheries, farm equipment and hydroponics. The platform has raised 3 million chickens and processed 2,000 fit-for-slaughter bulls. The return on investment (ROI) ranges from 10 to 40 percent within 4 - 11 months depending on the type of investment (Farmcrowdy webpage, 2021).

Benefits of Utilising Digital Technology by Smallholder Farmers

Table 1 shows that the reduction in post-harvest losses (\bar{x} = 2.0) was the main benefit smallholder farmers derived from participating in the digital platform. The provision of a guaranteed market in the transaction would have removed the bottleneck of searching for

buyers for the farmers. Through this process, post-harvest losses especially at the farm gate level have been minimal. Then, adequate provision of production inputs ($\bar{x}= 1.4$). The result indicates that the platforms have ensured the provision of necessary production inputs to the smallholder farmers. With this, the farmers are expected to enjoy better production performance. Also, the farmers showed interest in continuous use of the platform ($\bar{x}= 1.2$). Meanwhile, income arising from the arrangement was found low ($\bar{x}= 0.9$). Farmers may consider the income low neglecting the fact that the balance payment was fewer production costs and service charges.

Table 1: Perceived benefits of the utilization of digital technology by smallholder farmers

Variable	Mean (\bar{x})
The income from the platform is sufficient for sustainable livelihood.	0.9
There is adequate provision of production inputs.	1.4*
Post-harvest loss is well minimised.	2.0*
The tendency to continue using this platform is very high.	1.2*

Source: Field survey 2021

Challenges in Deploying Digital Technology Platforms toward Improving Smallholder Farmers' Productivity

Patronage in digital technology platforms depends on how much traffic the website draws to itself. How much potential investors a platform gets will depend on number of people that visits the site. Creating activities through content creation, sponsored posts, paid advertisement among others aimed at driving visitors to the platform may be challenging. The Finance and Administrative Manager of one of the cases interviewed said: *“What I can call a challenge is the high cost of making use of the digital technology for running continuous campaigns to get high traffic on our website”*. Also, another respondent said: *“A major challenge is getting farmers to understand the model of crowd farming in modern agriculture, farmers are resistant to change and they want to keep doing the farm activities in primitive manners”*. The digital literacy level of the farmers will surely depend on their ability to respond to the innovation. Farmers’ resistance to change in farming practices may hamper the expected production performance. Conducting field trip and establishing demonstration plots may convince the farmers on importance of best agronomic practices. Other informants said: *“The cost of training large numbers of farmers is a challenge especially in project areas where there is a large turnout of farmers.”* This is so as farmers in sub-Saharan Africa view agricultural training as public good. Unless farmers are made to appreciate the significance of training and willing to pay for the services, the sustainability of the innovation may be threatened. Meanwhile, farmers interviewed opined that untimely delivery of production inputs portend great impediment to smooth running and participation in the programme. Inputs are critical factors in production and its timely availability will determine farmers’ continuous participation in the partnership.

Conclusion and Recommendations

Crowd farming has proven to be an innovative approach at linking smallholder farmers to production inputs. The platforms possess certain features for investors and operators to

monitor farm activities at real time. Digital platforms have been deployed in both crop and livestock production. Although smallholder farmers are yet to experience appreciable income from their engagement on the platform, the opportunities for linkages with service providers and learning on good agronomic practices may eventually translate to tangible economic gains in the long run. Government and farmers organisations should intensify efforts toward awareness creation and digital literacy to ensure that more farmers take advantage of the platforms. Also, government should regulate the activities of various crowd farming platforms to prevent fraudulent tendencies on the part of operators.

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