ASSESSMENT OF THE APPLICATION OF ANDROID PHONE IN AGRICULTURAL PRODUCTION IN CROSS RIVER STATE

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Abstract
This study assessed the application of android phone in agricultural production, to include number of farmers with android phones for agricultural production, agricultural operations android phones can be utilized and challenges faced by farmers in using android phones for agricultural production. Survey research design was used. A multi-stage sampling procedure was adopted to select the respondents for the study. Data used were collected from 764 out of 810 farmers by means of questionnaire. Frequency and percentages were used to answer research question 1, while research questions 2 & 3 were answered with mean and standard deviation. Independent t-test was used to test all the null hypotheses at 0.05 level of significance. The results of this study showed that there has been a rise in the number of farmers using android phones for both Agricultural and financial transactions, but with limited farmers having challenges of fragile nature of android phone as well as the fear of charging phones.
Keywords: Assessment, Application, Android Phones, Agricultural production

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Introduction

The agriculture industry, which is essential to world economies and livelihoods, has not been exempt from mobile technology's disruptive potential (Kamal & Bablu, 2023). The use of android phones, sometimes referred to as smart phones, in agriculture has transformed agricultural productivity by giving farmers instant access to a vast array of tools and resources. Humans have widely embraced and used technology in all spheres of life, including agriculture (Krithikashree, 2018). Agriculture-related technologies have proven to be able to improve agricultural productivity and management. These tools let users discover their position, access information, and take pictures and videos (Athirah, et al., 2020). Numerous facets of farming, including as crop management, animal management, irrigation management, market data, farm accounting, weather forecasting, GPS tracking, and more, use these applications. One of the issues the agricultural sector suffers globally is a lack of information. Widespread usage of Android phones in agricultural production should be implemented in order to close this gap (Khan, et al., 2020).

Android phone is a powerful, high-tech smart phone that runs on the android operating system (OS) developed by Google (Krithikashree, 2018). Android phones have powerful processing power, an array of sensors, and customization options that enable the development of several useful programs (apps). Smart phones can also make it easier for farmers to access government benefits, land records, crop survey requirements, and other information. Android phones are a promising game-changer for smallholder farmers in developing nations because of these features, as well as their high computing power, variety of sensors, and customization capabilities, which enable the creation of a wide range of useful applications (apps). These characteristics, along with the cost-effectiveness and portability that Android phones provide, make them potentially revolutionary for smallholder farmers in underdeveloped nations. Smart phones can also make accessing government benefits, land records and crop survey requirements etc. more convenient for farmers (Bajpai & Beriya, 2022). The provision of information through smart phone-enabled agricultural information services has the potential to revolutionize agriculture and significantly improve smallholder farmers' livelihoods in Africa thereby facilitating farmers' access to financial services and sourcing agricultural information about input use, practices, and market prices (Castelo, 2014). Information about policies, good agricultural practices, market prices of commodities, current demand of commodities and various useful agriculture schemes are helpful to farmers for reaping good profits. Thus, it is important for farmers to have all such information on their doorsteps (Anupam & Maruthamuthu, 2018).

In recent years, the use of android phones has revolutionized weather forecasting in agriculture by providing farmers with easy access to real-time weather data and forecasts. Through various applications and technologies android phones have become valuable tools for farmers to make informed decisions regarding irrigation, planting, harvesting, pest control, and overall crop management (Khan, et

al., 2020). The changing agro-economic scenario drew attention of researchers on diffusion of technological innovation in agriculture. With fast increasing pressure of population, urbanization and industrialization on agricultural land, old methods and techniques of farm production cannot cope with the growing demand. Consequently, technology innovation and commercial crops are adopted to develop agro-economy (Singh & Ashraf, 2012).

The essence of adopting an innovation such as mobile phone technology applications for agricultural purposes hinges on its ability to transform an existing way of doing things into a better and more efficient one (Ogbeide & Ele, 2020). The application of android phone in agriculture has enhanced the provision increased and quality output to the market and guaranteed income for farmers. The adoption of mobile phone technology in agricultural production as a farming tool for contact and business transactions will enhance rural development (Mhlanga, 2024). Developing countries can enhance their agricultural production by the use of android phones. Nevertheless, in certain instances, farmers encounter more obstacles which might result to their inability to access the most recent agricultural technologies (Ahmad, et al., 2016). One crucial aspect of farming is efficient water usage. Android apps designed for irrigation management provide real-time data on soil moisture levels and weather conditions. This data helps farmers adjust their irrigation schedules accordingly, leading to reduced water wastage and improved crop health. Livestock farmers can also benefit from android applications that assist in managing feeding schedules, healthcare routines, breeding programs, and overall livestock health. GPS technology integrated into these apps allows farmers to track the location of their animals easily (Kumar & Karthikeyan, 2019).

Farmers' transition to agro-ecology is an ambitious challenge requiring a concerted effort to upscale adoption. Information communication technology (ICT) plays a significant role in improving smallholder farmer's livelihoods by linking them to markets, access to weather forecasts, agricultural techniques and other essential services. Hence, application of android phones in agroecology could address the challenges in agro-ecological transition (Emeana, 2018). Android applications offer features that help farmers monitor and manage their crops effectively. They provide information on soil quality, weather patterns, pest control strategies, and even use machine learning algorithms to predict crop yield. By utilizing these apps, farmers can make informed decisions to optimize their crop production. However, agricultural sector is hampered by many challenges. These challenges include farmers' lack of knowledge on appropriate agricultural practices, lack of knowledge on how to identify and treat crops' diseases, inefficient production and sales processes (Matiyabu, 2019).

Information is an important ingredient in agriculture; farmers often suffer the problem of lacking access to agricultural information. Promisingly, mobile phone technology has become the most valued infrastructure which gives people access to information and services they need (Su, 2020). The challenges of lack of improved technologies and cultivars can be solved through the adoption of android phones in farming. According to Nyamba (2022), to overcome farmer's problem in the field, many android-based apps are being developed and the use of these applications will help in solving complex decision-making process.

Similarly, disseminating agricultural related information to the farmers will be made easier with the help of mobile phones. When farmers in Nigeria aren't given sufficient knowledge and information, middlemen who have no interest in farming can occasionally take control of the agricultural input like fertilizer and either sell them to farmers at excessive rates (Ogbeide & Ele, 2020). Many apps have given new direction and approach to farmers to communicate directly and share their problems with government officials, extension workers, and subject matter specialist. Farmers who use android phones get access to information and also speed up pre-exchanged process. This study therefore, examine number of farmers using android phones for agriculture purposes, agricultural operations android phones can be utilized, and the challenges faced by farmer using android phone in agriculture.

Methodology

Survey research design was adopted for the study and data collection through the administration of questionnaire to 810 farmers. The study was conducted in the Cross River State of Nigeria which politically has 18 Local Government Areas (LGAs). Cross River State is divided into three ecological zones namely; South, Central, and North. A multi-stage sampling procedure was adopted to select the respondents for the study. Firstly, a random sampling was used to select three LGAs from each of the ecological zones giving a total of nine LGAs (Akamkpa, Calabar South, Odukpani, Abi, Ikom, Boki, Obanliku, Obudu and Ogoja). Secondly, purposive sampling technique was used to select five communities from

each of the LGA making a total of 45 communities. These communities were among those connected to the various mobile phone networks. Thirdly, purposive sampling technique was used to select 18 farmers from each of the community based on ownership of android phones and engagement in agricultural production. The list of respondents from each community was compiled by the community leaders. The data collected was analyzed using mean to answer the research questions and independent t-test to test the hypotheses at 0.05 level of significant. The hypothesis of no significant difference was accepted when the p-value is equal or greater than 0.05 and rejected when the p-value is less than 0.05.

Results and Discussion

Research Question 1: What is the number of farmers with android phones for agricultural production?

Table 1: Frequency and percentage of responses on the number of farmers with android phones for agricultural production in Cross River State n=764

S/No	Number of farmers with android phones for agricultural production	Frequency	Percentage (%)
1	Akamkpa	87	11.4
2	Calabar South	82	10.7
3	Odukpani	84	11.0
4	Abi	86	11.3
5	Ikom	82	10.7
6	Boki	88	11.5
7	Obanliku	89	11.6
8	Obudu	85	11.1
9	Ogoja	81	10.6
	Total	**764**	**100**

Source: Field Work (2024)

The result of the analysis of the respondents with respect to research question one is shown in Table 1. The number of farmers with android phones for agricultural production in Cross River State is as follows: 87 (11.4%) farmers in Akamkpa, 82(10.7%) farmers in Calabar South, 84 (11%) farmers in Odukpani, 86(11.3%) farmers in Abi, 82(10.7%) farmers in Ikom, 88(11.5%) farmers in Boki, 89(11.6%) farmers in Obanlinku, 85 (11.1%) farmers in Obudu and 81(10.6%) farmers in Ogoja.

Research Question 2: What are the agricultural operations android phones can be utilized for?

Table 2: Mean and standard deviation of responses on the agricultural operations android phones can be utilized for n=764

S/No	Agricultural operations android phones can be utilized	X	SD	Remark
1	Use mobile phone to coordinate access to agricultural inputs	2.46	0.996	Disagree
2	Use mobile phone to access market information	2.51	1.005	Agree
3	Use mobile phone for financial transactions	2.67	0.896	Agree
4	Use mobile phone to seek agriculture emergency assistance	2.47	1.045	Disagree
5	Use mobile phone to obtain expert advice	2.69	0.870	Agree
6	Use android phone to link my products to distant Markets	2.34	0.963	Disagree
7	Use android phone to facilitates access to technical and financial services	2.60	1.030	Agree
8	Use android phone to connect with other farmers for more effective collective action as producers, traders and buyers	2.69	0.937	Agree
9	Use android phone to enable faster response to Situational changes	2.85	0.892	Agree

10	Use android phone to get advance warning of Weather risks	3.22	0.525	Agree
11	Use android phone to increase social networks	2.48	0.997	Disagree
12	Use android phone to empower negotiations with wholesalers, traders and transport providers	2.47	1.045	Disagree
	Cluster Mean	**2.62**	**0.933**	**Agree**

Source: Field Work (2024)

The results from Table 2 showed that items 1, 4, 6, 11 and 12 had mean ratings of 2.46, 2.47, 2.34, 2.48 and 2.47 respectively, which were below 2.50. This implies that respondents disagree that they: use mobile phone to coordinate access to agricultural inputs; use mobile phone to seek agriculture emergency assistance; use android phone to link products to distant markets; use android phone to increase social networks and use android phone to empower negotiations with wholesalers, traders and transport providers. Items 2, 3, 5, 7, 8, 9 and 10 had mean ratings of 2.51, 2.67, 2.69, 2.60, 2.69, 2.85 and 3.22 each, which were above 2.50. This implies that respondents agree that they: use mobile phone to access market information; use mobile phone for financial transactions; use mobile phone to obtain expert advice; use android phone to facilitates access to technical and financial services; use android phone to connect with other farmers for more effective collective action as producers, traders and buyers; use android phone to enable faster response to situational changes and use android phone to get advance warning of weather risks. An overall mean of 2.62 was achieved for all the items, which implies that respondents agree on the agricultural operations android phones can be utilized for.

Research Question 3: What are the challenges faced by farmer in using android phone for agricultural production?

Table 3: Mean and standard deviation of responses on the challenges faced by farmer in using android phone for agricultural production n=764

S/N	Challenges faced by farmer in using android phone for agricultural production	X	SD	Remark
1	Inability to operate android phone discourages farmers to use it	2.65	0.883	Agree
2	Cost of buying android is high	2.70	0.830	Agree
3	Fragile nature of android phone make me not to use it	2.43	1.062	Disagree
4	Charging of phones is a major problem of farmers using android phones	2.74	0.887	Agree
5	Cost of buying data is high	2.67	0.928	Agree
6	Network discourages farmers from using android phones	2.81	0.891	Agree
7	Inability to read and write affect farmers usage of android phone	2.78	0.904	Agree
8	Difficulty of understanding knowledge via robo calls	2.51	1.005	Agree
	Cluster Mean	2.66	0.923	Agree

Source: Field Work (2024)

The results from Table 3 showed that only item3 had mean ratings of 2.43, which was below 2.50. This implies that respondents disagree that fragile nature of android phone make them not to use it. Items 1, 2, 4, 5, 6, 7 and 8 had mean ratings of 2.65, 2.70, 2.74, 2.67, 2.81, 2.78 and 2.51 each, which were above 2.50. This implies that respondents agree that to the following challenges of using android phones for agricultural production: inability to operate android phone discourages farmers to use it, cost of buying android is high; charging of phones is a major problem of farmers using android phones; cost of buying data is high; network discourages farmers from using android phones; inability to read and write affect farmers usage

of android phone and difficulty of understanding knowledge via robocalls. An overall mean of 2.66 was achieved for all the items, which implies that respondents agree on the challenges faced by farmer in using android phone for agricultural production.

Hypothesis 1: There is no significant mean difference between male and female respondents on the number of farmers with android phones for agricultural production

Table 4: Independent t-test statistic to determine the mean difference between male and female respondents on the number of farmers with android phones for agricultural production n=764

Variable	N	$\bar{x}$	SD	t-cal	p-value	Remark
Male farmers	493	12.82	3.607			
				.199	.433	NS
Female farmers	271	12.77	3.557			

NS = Not significant at .05 level; df = 762

Data presented on Table 4 shows a calculated t-value of .199 with its p-value of .433 was greater than 0.05 level of significance at 762 degree of freedom. With this result, the null hypothesis was retained. This implies that there is no significant mean difference between male and female respondents on the number of farmers with android phones for agricultural production and the respondents did not vary significantly in their responses.

Hypothesis 2: There is no significant mean difference between male and female respondents on the agricultural operations android phones can be utilized for

Table 5: Independent t-test statistic to determine the mean difference between male and female respondents on the agricultural operations android phones can be utilized for n=764

Variable	N	$\bar{x}$	SD	t-cal	p-value	Remark
Male farmers	493	31.48	7.965			
				.114	.088	NS
Female farmers	271	31.42	7.668			

NS = Not significant at .05 level; df = 762

Data presented on Table 5 shows a calculated t-value of .114 with its p-value of .088 was greater than 0.05 level of significance at 192 degree of freedom. With this result, the null hypothesis was retained. This implies that there is no significant mean difference between male and female respondents on the agricultural operations android phones can be utilized for and the respondents did not vary significantly in their responses.

Hypothesis 3: There is no significant mean difference between male and female respondents on the challenges faced by farmers in using android phones for agricultural production.

Table 6: Independent t-test statistic to determine the mean difference between male and female respondents on the challenges faced by farmers in using android phones for agricultural production n=764

Variable	N	$\bar{x}$	SD	t-cal	p-value	Remark
Male farmers	493	21.44	4.934			
				1.141	.501	NS
Female farmers	271	21.02	4.743			

NS = Not significant at .05 level; df = 762

Data presented on Table 6 shows a calculated t-value of 1.141 with its p-value of .501 was greater than 0.05 level of significance at 192 degree of freedom. With this result, the null hypothesis was retained. This implies that there is no significant mean difference between male and female respondents on the challenges faced by farmers in using android phones for agricultural production and the respondents did not vary significantly in their responses.

Conclusions and Recommendations

Due to the tremendous difficulties in getting information to farmers worldwide, android phone-based consulting services have emerged as a useful substitute that has altered the conventional approach to extension knowledge transmission. The results of this study demonstrate the many advantages that these digital tools have for the agriculture industry, especially in developing nations. It is more likely that mobile apps in the agricultural and related industries will become more integrated and dependent. The production-consumption interface has changed significantly as a result of the employment of information technology tools in agriculture that are widely available, affordable, and friendly to farmers. These android phones enable farmers to make well-informed decisions far in advance, increasing productivity and reducing risk in agriculture to a greater extent as it concerns crop management, animal management, irrigation management, market data, farm accounting, weather forecasting, GPS tracking, and more, use these applications.

The current study also recommends that before launching ICT-based programs in such remote places, experts in the field of electronic extension take farmers' digital literacy into account. A capacity-building strategy is also required, as this will lead to the acquisition of the skills required to improve the utilization of the content that is delivered.

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