
Use of Mobile Phone Applications by Farmers in North West Nigeria.

<https://dx.doi.org/10.4314/jae.v23i3.16>

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Abstract

This study investigated extent of use of mobile phone applications among farmers in North-West Nigeria. A multi-stage sampling procedure was used to select 385 respondents for the study. Data were collected through the use of pre-tested structured questionnaire and summarized using frequency counts, percentages, mean and standard deviation. The Tobit regression model was used for inferential deductions. The results show that the majority (96%) owned a mobile phone; awareness of the call app and SMS app were 100% and 97% respectively; while all other mobile phone apps recorded very low awareness and use. The prominent call and SMS mobile phone apps were used to contact family members and friends, respectively; whereas only 70% used call app to facilitate the purchase of farm input and 65% used it to get market-related information. Tobit regression analysis results showed that years of farming experience, awareness and knowledge of apps usage positively influenced the use of the mobile app. Farmers' awareness of mobile apps was low and they minimally used these apps for farming activities. Agricultural extension agencies and other relevant stakeholders should facilitate avenues to encourage the use of mobile phone apps for agricultural purposes among farmers and be circumspect in the bang-wagon effect of e-extension approaches.

Keywords: Mobile phone, Awareness, Phone apps.

Introduction

Farmers have access to information through various sources that have been identified to include mobile phone, radio and television, video shows, web portal, rural telecasters, farm call centres, E-mails, offline multimedia compact discs (CDs), open distance learning, contact databases (Okeke, Hyacinth and Uzuegbunam, 2015). These listed tools constitute information and communication technology (ICT) tools commonly in use in agriculture and have proven to be effective and reliable in facilitating information processing, storage, retrieval and transmission. Their reliability as sources of information was further stressed by Okeke *et al.* (2015), as veritable tools with which a network of interactions can be stimulated among individuals such that they overcome the physical barriers of distance and social standings to become integrated in the global knowledge system.

Several studies (Siwel and Malongo, 2012; Xiaolan and Shaheen, 2012; Bjorn, 2017) have shown that the mobile component of ICTs has the highest usage in the agricultural information system worldwide. The exceptional speed of adoption and consumption of mobile technologies have raised the generally universal hope on its prospective contributions to the diffusion of innovative and modern farming technologies promptly with appreciably impressive speed (Xiaolan and Shaheen, 2012). Mobile technologies are strong tools that can support farmers to boost their yields by connecting them through text messages and helplines to agricultural market information, finest practices and consultative services designed to meet their local needs (African Private Equity and Venture Capital Association [AVCA], 2011). According to Jaji, Abanigbe and Abass (2017), the mobile phone progressively increases low-cost access and sharing of information and also eases interactive involvement in the creative utilization of information.

Several rural communities in various parts of the world, most specifically in developing nations are currently witnessing an unprecedented revolutionary trend in agricultural development occasioned by the evolution and widespread adoption of contemporary mobile phone technologies (Khidir, 2019). For instance, Ashoka and Ashoka (2016:16:42) gave practical instances where farmers affirmed the high efficacy potential of mobile phone technologies in improving their agricultural production. These include remarkable success recorded by the SMS-based M-shamba and the Musoni Services—Microfinance join the cloud in Kenya, Myanmar, Tanzania, Uganda, and Zimbabwe. Similarly, Yusuf, Abdullahi and Haruna (2015), amongst other authors, have documented the effectiveness of the e-wallet scheme – a mobile phone-based initiative of the Federal Government of Nigeria in ensuring more equitable access to and distribution of inputs, particularly, fertilizers to farmers in Nigeria.

The deployment of cell phone technology has not been optimized to its fullest potentials in the Northwest zone of Nigeria as unveiled by Khidir (2019) in a study to ascertain the awareness and usage status of mobile phone apps by farmers in the region. Despite the fact that the zone is recognized as an agricultural centre of the nation, with the majority of people from the zone engaging primarily in farming as their main source of livelihood (Olapojo, 2012; Ekpa, 2017; Ekpa, Oladele and Akinyemi, 2017), the zone is acknowledged

to be the poorest compared to other geopolitical zones of the nation (NBC, 2013; Ekpa, Abayomi and Denis, 2017). Anecdotal evidences that the extent of farmers' awareness and use of cellular phone-based technologies are commensurate to the degree of desirable growth and transformation of farming activities achievable in an area, and given the correlation between mobile phone technology adoption and improved agricultural productivity as earlier on enunciated, this study sought to empirically investigate the extent of mobile phone apps' usage amongst farmers in North-western Nigeria. Specifically, the study examined level of awareness, use and purpose of use of mobile phone applications amongst farmers in the study area.

Methodology

This study was carried out in the North-western part of Nigeria located between latitude $9^{\circ}10'$ and $13^{\circ}50'$ to the North; and longitude $3^{\circ}35'$ and $9^{\circ}00'$, covering a land area of about 168.719km^2 equivalent to about 18% of the country's land mass. The zone comprises seven states namely: Kano, Kaduna, Katsina, Sokoto, Zamfara, Jigawa and Kebbi States. Every farmer from farming households of states in the zone constitutes the population of the study. The size of farming households in the zone was estimated to be over 9,000,000; while for the selected states was 6,895,014; with 1,361,094 for Katsina State, 4,316,100 for Kano State and 1,217,821 for Kaduna State (National Agricultural Extension Research and Liaison Services [NAERLS] and Federal Department of Agricultural Extension [FDAE], 2015).

A multi-stage sampling procedure was employed in the selection of farmers for the study. This includes purposive selection of three states from the geopolitical zone namely, Katsina, Kano and Kaduna States. This was due to the fact that these states are known to be predominantly agrarian in nature. In each of the states, three LGAs were randomly selected from each state; and this in turn led to the random selection of five (5) communities from each LGA in Katsina and Kaduna States and ten (10) from Kano State (giving a total of sixty (60) communities). Katsina state has 34 local government areas from where 15 communities with 76 farming households were selected randomly; while Kano state has 44 local government areas from which 30 communities with 241 farming households were selected randomly and from Kaduna state with 23 local government areas, 15 communities with 68 farming households were selected randomly. The total sample size is 385.

Data for the study were collected using a structured, pre-tested interview schedule. Data collected included mobile phone technologies related characteristics of the respondents and farmers' perception about the extent of usage of mobile phone apps. The dependent variable is the use intensity of the apps measured through perceptual responses of the farmers on 30 mobile apps on a 3 point Likert-type scale as follows: use for 'all activities' (AA) – 3, 'most activities' (MA) – 2 and 'few activities' (FA) – 1.

The data collected were sorted and analyzed using the Statistical Package for the Social Sciences (SPSS 14.0) while STATA 13 was used for the Tobit regression. The data were summarized using frequency counts, percentages, a mean and standard deviation. The

Tobit regression model was used to compute factors that influence the rate at which the farmers use mobile phone apps at their disposal. The Tobit model is specified as follows:

$$Y^* = X_i\beta + \varepsilon \dots\dots\dots (1)$$

Where Y^* is the dependent variable, which is the extent of use index of the apps generated as follows;

$$\bar{X}_W \text{ (Weighted Mean Score) for each app} \dots\dots\dots (2)$$
$$\frac{\{S_{\max} + S_i + \dots\dots\dots S_{\min}\}}$$

Where $\{S_{\max} + S_i + \dots\dots\dots S_{\min}\}$ is the sum of the scale points

β is a vector of unknown coefficients; X_i is a vector of independent variables, and in line with Olumuyiwa and Kayode (2016), the independent variables used include the socio-economic variables of the farmers as well as perceptual status of the farmers on usage rate of the apps in the area; implying that $X_1 =$ age, $X_2 =$ marital status, $X_3 =$ nature of education etc; and ε is an error term that is assumed to be independently and normally distributed with zero mean and a constant variance of S^2 .

Y^* is a latent variable that is unobservable, however, it can only be observed as a continuous variable when the data of the dependent variable is above the limiting factor, in this case, zero, implying that if Y is at the limiting factor, it is held at zero. Mathematically:

$$Y = Y_o \text{ if } Y_o > Y_o \dots\dots\dots (3)$$

$$Y = 0 \text{ if } Y^* \leq Y_o \dots\dots\dots (4)$$

Where, Y_o is the limiting factor. Equations 3 & 4 represent a censored distribution of the data.

The expected value E_y of the extent of use of mobile phone apps is:

$$E_y = X_i\beta F(z) + \sigma f(z) \dots\dots\dots (5)$$

Where X_i represents vector of explanatory variables and $F(z)$ the cumulative normal distribution of z ; $f(z)$ is the value of the derivative of the normal curve at a particular point (i.e. the unit normal distribution); z is given as $X\beta / \sigma$; B is the vector of Tobit maximum likelihood estimates whose coefficient sign will indicate the direction of influence or effect; and σ is the standard error of the model.

Results and Discussion

Table 1 shows that the majority (96.1%) of the farmers had mobile phones out of which 95.8% used theirs. This finding, which indicates high diffusion rate of apps in the area, agrees with those of Yusuf *et al* (2015) that 96.7% of farmers using E-wallet in Kano State owned mobile phones; and Ekpa (2017) who showed that 55% used the Global System for Mobile Communications (GSM), and thus posited that GSM was the most acceptable means of communication in the area. The findings further show that farmers whose phones did not having more than five apps were more in number (36.1%); followed by those whose phones had between 6-10 apps (23.6%). This suggests that the majority of the farmers are using very simple analogue phones (Caroline, 2015) that may not be usable for online information sourcing and sharing via platforms like WhatsApp, e-mail and Facebook. This implies that farmers may not be able to maximally explore the technology of mobile ICT in enhancing their farming and day to day activities.

Table 1: Possession and use of mobile phone by respondents

Variables	(%) (n=385)
Possession of a mobile phone	
Yes	96.1
No	3.9
Use mobile phone	
Yes	95.8
No	4.2
Apps in farmers' phone	
1 – 5	36.1
6 – 10	23.6
11 – 15	17.4
16 – 20	10.6
Above 20	8.1

Source: Field survey, 2019

Awareness and Use of Mobile Phone Apps

The findings in Table 2 show the usage details of mobile phone apps among farmers in North western Nigeria. It was revealed that the adoption of mobile phone apps among farmers in the area was still very low as only two apps (voice call and SMS apps) out of the 14 apps considered were prominently put to use by farmers in the area. The results depict also that all the farmers were aware of the call app, out of which 95% adopted it with the majority of the users (65.7%) having usage experience that spanned between 7-12 years. In addition, the results show that the majority (97%) of the respondents were aware of SMS app, 78% of the respondents are using the app and the majority (61.8%) having usage experience in the range of 7-12 years. These findings are supported by some related studies (Sirajul and Ake, 2011; Caroline, 2015; Asa and Uwem, 2017). For instance, Caroline (2015) empirically established that the majority of the farmers (89.5%) in Ghana have had awareness knowledge of mobile phone apps that spanned between 6-10 years. This suggests that farmers in the area use apps that are not net-dependents because the phones they own and can operate well are the simple analogue phones generally lacking internet explorer.

Table 2: Respondents' awareness and use of mobile phone apps

Apps	Awareness (%)	Use (%)	Years of awareness (%)			
			0 year	(1-6)years	(7-12)years	>12years
Voice call	100	95.0	0.2	10.6	65.7	23.1
SMS	97.0	78.0	3.6	13.8	61.8	20.8
Facebook	41.0	32.0	59.2	26.2	14.3	0.3
WhatsApp	30.9	23.1	69.1	22.9	8.1	0.0
Opera	22.3	16.0	77.7	11.2	10.4	0.8
Flashare	14.5	11	85.5	10.1	4.4	0.0
Bluetooth	26.8	22	73.2	4.1	14.8	2.9
IMO	1.3	0.5	99.5	0.5	0.0	0.0
E-mail	11.2	9.0	88.8	8.6	2.3	0.3
Instagram	2.3	1.3	97.7	2.3	0.0	0.0
E-wallet	3.6	3.0	96.4	3.4	0.3	0.0
MBA	2.3	1.3	97.7	2.3	0.0	0.0
BPC	2.9	2.0	97.1	2.6	0.3	0.0
BTC	1.3	0.8	98.7	1.3	0.0	0.0

Source: Field survey, 2017

Further analysis (Table 3) revealed that prominent mobile phone apps used by farmers in the study area were voice call app which the majority (96%) used to maintain close ties with family members and associates. Second to use of this app to maintaining mutual coexistence amongst family members was its use to facilitate the purchase of farm inputs. The finding reveals that 70% of the respondents used the app to facilitate the process of farm input procurement. Other purposes for which farmers used this app included marketing/general information (MGI), spreading of vital information (SVI) and coordination of farm activities [CFA] were being accounted for over 40% of the respondents; bill payments[BP] (2%), reading weather condition[RWC] (3.6%) and getting an update on the Agric newsletter[GNL] (8.6%). Osadebamwen and Ideba (2015) and Jaji, Abanigbe and Abass (2017) in Nigeria and Isaac (2016) in Kenya reported a similar trend. Furthermore, the reason for the dominance of voice call app was best explained by the findings of Anselme, Romeo, Faustin and Desire (2012) whose study also showed that the majority (97.1%) of the farmers affirmed that information via voice call app is timely; 94% affirmed the reliability of the information received through the app; 85.3% of the respondents affirmed to the ease of use of information accessed through the app as 56% considered the cost of using the call app lower to what they are used to prior to the adoption of the app, stressing that these reasons might have advanced the success and dominance of the app. The findings thus suggest that, though mobile phone apps were mostly used to maintain social circles/relationships, however, the use of the apps in agriculture is more centred on input purchase, marketing/general information and spread of vital information to fellow farmers in the study area.

Furthermore, findings reveal that the short message service (SMS) app was the second most prominent used app amongst the farmers which was used by 59% of the respondents. Purposes for which respondents used the SMS included purchase of farm inputs (27%), extension advisory services (24.4%) and marketing/general information (32%), read weather condition (3%), bill payment (4%) and getting an update on Agric newsletter (6%). This is similar to results obtained by Jaji *et al.* (2017) wherein only 15.2% of the farmers used SMS app for accessing market information, as 13.2% used the app for input sourcing. In a similar trend, Anselme *et al.* (2012) also made a similar observation with rice farmers in Benin who reported that only 10% of the farmers used the SMS app. For obtaining update on weather conditions via mobile app, the finding of Osadebamwen and Ideda (2015) also supported this study's findings that one of the areas of farming farmers in Sub-Saharan Africa least take advantage of mobile phone technologies is getting weather updates (mean value of 2.088 out of 7). The inference here is that, as in the case of call app, SMS is also used by the majority of the farmers for none agricultural purpose in the region stressing the importance attached to mutual coexistence by the farmers, a characteristic that is embedded in the cultural values of the people and could be assumed to be a key factor responsible for the acceptability and widespread use of cell phone by the sodbusters. The failure of the app in other areas, particularly ineffective extension activities could be as a result of the perceived difficulty in the use of the app as well as perceived unreliability of information via the app as observed by Anselme *et al.* (2012) in Benin, Nigeria. The authors also observed that farmers were not comfortable with the cost of accessing information through the app which invariably affected the frequency and scope of its usage.

Findings further unveil that other apps that include Facebook, Whatsapp, Instagram, Opera, Bluetooth, e-mail, e-wallet, Flashare, Radio for all farmers [RAF], TV for all farmers [TVAF], Facebook Youth and Educated Adults [FYEA], Whatsapp Youth and Educated Adult [WYEA], FarmerHelpLine [FHL], mobile phone banking app [MBA], bank transfer codes [BTC] and bill payment code [BPC] were not popular among the farmers as the findings reveal that all the apps were used by less than 50% of the farmers for all the parameters assessed. These findings are supported by Anselme *et al.* (2012) who showed that only 3.2% of the rice farmers use the e-mail app and mobile apps related to radio programmes in Benin. The inference from the generally poor usage of most apps could be that the majority of these apps require internet facilities which function only in android/digital phones and most farmers could not afford and operate as most of them owned and use analogue phones. These findings also imply that, though very few use these apps, however, they are used to foster the success of farming in the region; and as such, the need to encourage and expand their usage potential becomes imperative given the fact that the usage is domicile in the agricultural domain among the farmers.

Table 3: Respondents' purpose of use of mobile phone apps

Apps	Contacting family/friends (%)	Purchase farm input (%)	Extension advisory services (%)	Marketing/general info	Read weather condition (%)	Rill Spread vital info (%)	General agric news (%)	Coordination of farm activities (%)
Call app	96.0	70	39	65	4.0	2.0	53	41.0
SMS	59.0	27	24	32	3.0	4.0	30	18.0
Facebook	26.0	2.3	7.0	6.0	2.0	0.0	7.5	1.3
Whatsapp	22.0	3.4	8.0	5.0	0.8	0.0	6.5	4.0
Instagram	0.8	0.0	0.5	0.0	0.0	0.0	0.8	0.0
Opera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Bluetooth	0.0	0.0	0.0	0.0	0.0	0.0	22.0	0.3
E-mail	0.5	0.0	2.0	0.3	0.0	0.0	3.4	4.4
E-Wallet	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Flashare	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0
RAF	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.3
TVAF	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.5
YYEA	0.3	0.0	0.3	0.3	0.0	0.0	0.0	0.3
WYEA	0.3	0.0	0.3	0.3	0.0	0.0	0.0	0.3
FHL	0.0	0.0	0.5	0.3	0.0	0.0	0.0	1.0
MBA	0.0	0.5	0.0	0.0	0.0	1.0	0.0	0.0
BTC	0.0	0.3	0.0	0.0	0.0	2.3	0.0	0.0
BPC	0.0	0.3	0.0	0.0	0.0	0.8	0.0	0.0

Source: Field survey, 2017

Factors Influencing the Use of Mobile Phone Apps by Farmers in Northwest Nigeria.

Table 3 reveals that the likelihood ratio statistics as shown by the chi-square value are highly significant ($p < 0.05$) indicating that the model has a strong illustrative influence. Eight factors were found to significantly influence the extent of mobile phone apps' usage by the farmers. These variables were: age ($B = -0.002$); nature of education ($B = -0.039$); years of farming experience ($B = 0.002$); housing materials ($B = -0.023$); nature of occupation ($B = 0.028$); attitude ($B = 0.001$); awareness ($B = 0.021$); and knowledge ($B = 0.006$).

The coefficients of years of farming experience, nature of occupation, attitude, awareness and knowledge was positive implying a direct relationship with the dependent variable. These indicate that as the farmers advance in years of farming, adopt farming as their primary occupation, express favourable attitude towards the use of mobile phones, display good awareness level of the available mobile phone apps and possess high knowledge level of use of mobile phones the higher the likelihood of them to use mobile phone apps more frequently. These results agree with the findings of Abdul-Aziz, Haruna and Jamilu (2015) as well as Anselme *et al.* (2012) that established direct relationship between farmers' years of farming experience and usage level of mobile phone apps, suggesting that as the farmers' years of farming increases, their scope of operation would have also increased meaning more demand for inputs and more outreach for output disposal, a situation that is very likely to increase rate of contacts using mobile phone apps.

Additionally, the relationship established with farming as primary occupation suggests that as more respondents take farming as their occupation, the need to communicate for inputs and marketing will obviously increase translating to increase in use intensity of the apps engaged for such communication or contacts. More so, the more favourable the attitude of the farmers is toward mobile app, the more they will engage the apps for their day to day activities. What this outcome informed with respect to awareness is that as the farmers, being majorly youths, become aware of an app and how it is being operated as well as its benefits, they tend to exhibit their youthful nature of always wanting to explore and try new things. Finally, the relationship with knowledge reflects the position of Osadebamwen and Ideba (2015) who discovered that one of the factors influencing the use of mobile phone technologies by farmers in Sub-Saharan Africa is their knowledge of mobile phone usage and as such posited that acquisition of knowledge of mobile phone functionalities and usage is very important as more agricultural assistance and services can now be accessed online through mobile phone; implying that one of the ways to enhance the use intensity of apps among farmers in the region is to come up with a comprehensive training programmes aimed at impacting technical skill on how to use phones, particularly smartphones that are known to be well furnished with many apps, particularly apps with net exploratory potential.

On the other hand, the coefficients of age, nature of educational attainment and housing material was negative implying an inverse relationship with the dependent variable. This indicates that an increase in the parameters of these variables decreases the likelihood of the farmers' frequency of mobile phone apps' usage. Xiaolian and Shaheen's (2012) study in India and that of Abu Salem *et al.* (2017) in Bangladesh similarly showed an inverse relationship between farmers' age and extent of mobile phone apps usage. This suggests that as farmers in rural areas become aged, the usage level of apps in the area will reduce, possibly because as the farmers advance in age their financial burden widens, perhaps due to increase in household size (i.e. increasingly higher dependency ratio), needs for expansion in housing needs and increased in farm production requiring additional expenditure etc, all of which would expectedly usurp the financial capability of these poverty-ridden farmers to maintain their apps-use intensity; and Surabhi and Mamta (2016) equally reported negative and significant relationship between education and use of mobile phone technologies, indicating that as the farmers go deep in acquiring Arabic education in the area, the less they are likely to use mobile phone apps which implies that educational status is a factor influencing the use of mobile phone technologies by farmers (Osadebamwen and Ideba, 2015). Furthermore, the outcome of this finding with respect to housing materials in use by farmers is in line with the a priori expectation, indicating that as more farmers adopt muddy dwellings, there is likelihood for decrease in the use intensity of mobile phone apps in the study area perhaps because farmers who are entangled by the clutches of abject poverty find it difficult or even impossible to afford homes made of modern housing material, and poverty-ridden farmers cannot frequently upset the cost implications of frequent use of mobile phone apps.

Table 3: Factors influencing the use intensity of mobile phone apps by farmers in North West Nigeria.

Description	B (SE)	t-stat	
Location	-0.002 (0.00263)	-0.73	
Age	-0.002 (0.001)	-2.32*	
Gender	0.002 (0.0338)	0.05	
Education	-0.039 (0.0111)	-3.51*	
Marital status	-0.003 (0.0124)	-0.25	
Experience	0.002 (0.001)	3.32*	
Housing materials	-0.023 (0.0103)	-2.27*	
Nature of Occupation	0.028 (0.0114)	2.46*	
Attitude	0.001 (0.0004)	1.77*	
Constraint	0.001 (0.0004)	1.50	
Awareness	0.021 (0.0019)	11.12*	
Knowledge	0.006 (0.0008)	7.06*	
(Constant)	0.042 (0.0642)	0.65	
Sigma	0.083 (0.0031)	Mean VIF	1.73
Number of Observation	385		
Pseudo R ²	-0.7953		
LR chi ² (20)	342.87		
Prob > chi ²	0.0000		
Log-likelihood	386.99172		

*P≤0.05. Source: Field survey, 2017

Conclusion and Recommendation

Farmers' awareness of mobile apps was low and they minimally use these apps for farming activities. Agricultural extension agencies and other relevant stakeholders should facilitate avenues to encourage the use of mobile phone apps for agricultural purposes among farmers through the creation of user-friendly mAgric platforms that are premised on technical ability of the farmers and in collaboration with mobile service providers (MSPs) in terms of providing low-cost tariff and services for users (the husbandmen) of such platforms/apps. MSPs are critical stake holders that should be involved through enabling policies to evolve mobile applications like the newly created *iska* by 9mobile for the use of farmers. The government can go further by making skill possession in the use of mobile phone technology a criteria for promotion for extension agents; as well as a means of identifying farmers' eligibility for government support mAgric platforms/apps like the popular e-wallet initiative.

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