

GENDER ANALYSIS OF MOBILE PHONES UTILIZATION FOR AGRICULTURAL SERVICES AMONG FARMERS IN KWARA STATE, NIGERIA

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ABSTRACT

The study analyzed the use of mobile phones for agricultural services among farming household in Kwara State Nigeria through the gender lens. These objectives were analyzed using descriptive statistics, and multivariate Probit model. Data were obtained from 181 respondents, comprising 96 male farmers and 85 female farmers using a multi-stage sampling procedure. Results reveal the mean age of the male farmers and female farmers as 45 years and 36 years respectively; their average annual income for male and female farmers were ₦307,057.97 and ₦256,057.69 respectively. Although, male farmers have greater access to land, extension contact, and vast experience in farming than their female counterparts it was confirmed from the results that the level of usage of mobile phones for agricultural services among both gender is high with a mean score of 2.1 for males and 2.0 for females. Male farmers use phones for access to timely and reliable information to support farmers decision making, while majority of the female farmers prefer using their mobile phones in cutting down on travel cost. It was concluded age, household size, years of schooling, income per annum, years of farming experience, and farm size of each gender was a critical factor that influence positively the level of utilization of mobile phones for agricultural services. Policies that address access to the use of mobile phones and other digital technologies for agricultural services should be gender smart.

Keywords: Agricultural services; Gender analysis; Mobile phones; Multivariate probit model; Utilization.

INTRODUCTION

The agricultural sector is critical to the economic sustainability and growth of developing countries which includes Nigeria, as well as the primary source of food, income, and employment (Khanna, 2021). Agricultural services are market and non-market activities required to improve the performance of agricultural and allied industries. It is important to note that information and communication technologies (ICT), in particular the mobile phone, have greatly impacted every aspect of life, including business, commerce, and agriculture. The use of mobile phone-based communication has increased significantly recently, surpassing all other ICTs as the most popular form of communication. According to recent data, 4.68 billion people on the planet own a mobile phone, or 62.9% of the world's population (Statista, 2019). Mobile phones are widely used by people due to its accessibility, affordability, flexibility, usefulness, and simplicity; as a result, though gradually, it has been embraced by the rural poor (Ng'ethe, 2010).



The Sustainable Development Goals (SDGs, Goal 1 and 5), adopted in 2015 recognize that in order to reduce gender inequalities which is still deep rooted in Nigeria due to some cultural and social norms equal representation to control, productive resources would be required. However, gender disparities in access and use of mobile phones for agricultural services remain a major concern, especially in low-income nations which Nigeria is not an exception. Most men and women farmers, in developing countries have less access to technology such as mobile phones which is the commonest technology in contemporary era. It was also noted that as mobile phones reach larger proportions of the global population, gender differentials in terms of use and access have begun to emerge.

In Nigeria, it has been reported that mobile ownership is 91% for men and 86% for women representing a 5% gender gap. For mobile internet, 56% for men and 34% for women (Omoruyi, 2023). Several factors such as gender discrimination, cultural norms, affordability and limited access to education contributes to the gender gap. Moreover, women often experience lower access to phones due to their lack of key resources such as money, electricity, and phone credit (Summers, 2019) as well as due to social and cultural constraints (FAO, 2018). A better understanding of both male and female perceptions of the use of mobile phones for agricultural services could help to design more effective technology-based agricultural interventions targeting both men and women farmers.

Rural farmers in developing countries such as Nigeria have reported a variety of benefits from using mobile phones in agricultural business, including reduced travel costs, time savings, and increased market access (Martin & Abbott, 2010). The use of a mobile phone also leads to an increase in "contacts and opportunities," "market access," and "efficiency resulting in greater output." The use of a mobile phone also saves energy and time for farmers by allowing them to communicate directly with market brokers and consumers in order to sell their products at good prices (Chhachhar & Hassan, 2013). Mobile devices have the potential to deliver vast amounts of information to rural populations in a timely, thorough, and economical manner, raising their standard of living. Mobile phones can deliver information, knowledge, and skills for sustainable agriculture. In rural areas, men are more powerful economically than women and are typically the head of the farming household (Afolayan *et al.*, 2015). Due to these, men are probably more likely than women to have access to mobile phones.

However, there is a strong connection between gender and agriculture because both men and women actively participate in every aspect of the agricultural sector, regardless of their gender. Interestingly, numerous studies in Nigeria focused more on the utilization of Mobile Phones for Agricultural Purposes by Farmers in Nigeria (Asa *et al.*, 2017). Determinants of mobile phones usage for agricultural purposes among arable crop farmers in Iwo zone of Osun state (Ajayi *et al.*, 2021; Chhachhar & Hassan 2013; Ogunniyi *et al.*, 2016; Asa *et al.*, 2017; Barnabas *et al.*, 2019; Khan *et al.*, 2019). More so there is a limit to learning on the use of mobile phones for agricultural services, from a gender perspective in Kwara state, Nigeria

Given this, it is pertinent to analyze the use of mobile phones for agricultural services among farming households on gender basis. The broad objective of the study is to analyse gender disparities in the utilization of mobile phones for agricultural services among farming household in Kwara State Nigeria. Specifically, the study aimed to ascertain the level of utilization of mobile phones for agricultural services among male and female farmers, and examined the benefits of using mobile phones for agricultural services.

METHOD

The study was carried out in Kwara State, Nigeria. The state has two main climate seasons (the wet and dry seasons) with an average daily temperature that

ranges between 29°C and 37°C and annual rainfall which ranges between 1100 and 1500 mm. These climatic conditions, as well as the vast expanse of arable land and fertile soils, make the state favorable for agricultural production. The well-known crops cultivated in the state include rice, cassava, maize, sorghum, millet, onions, beans, sugarcane, and cotton (Omotesho *et al.*, 2021).

The population for this study consisted of all farming household in Kwara State, Nigeria. A three-stage random sampling procedure was used for the study. The first stage was the random selection of 25% of the 16 Local Government Areas in the state, to give four (4) LGAs. The second stage involved the random selection of four (4) villages from each of the selected LGAs giving a total of sixteen (16) villages. The third stage involved obtaining a list of registered farmers from Kwara state Agricultural development program and a snowball sampling technique was used for the selection of 20% of the respondents in the registered list. The justification for the selection was based on the use of Android phones for agricultural services (i.e. farmers that used android phones), which gave 96 males and 85 females across the 16 villages which are Fufu, Elerinjare, Afon, Ile Apa, Osin, Idofian, Araorin, Ajasse, Share, Alla, Centu, Obbolle, Oke-Opin, Eleko, Elewure and Apado. A total sample size of 181 respondents was used for the study. The selection was done with the aid of extension workers in the four LGAs and it was done in 5 days.

The instrument for data collection was a structured interview schedule. The interview schedule was used to elicit information on the socio-economic characteristics of the respondents. It was also used to generate responses on the various level of use of mobile phones for agricultural purposes. Benefits derived from the use of mobile phones in Agricultural services and constraints associated with the use of mobile phones for agricultural purposes among the male and female farming households. Multivariate probit model was used to determine factors influencing the utilization of mobile phones for agricultural services.

Empirical model of the multivariate probit model

The multivariate probit is a generalization of the probit model used to estimate several correlated binary outcomes jointly and is generally specified as :

$$Y_1 = \beta x_1 + \varepsilon_1 \dots\dots\dots (1)$$

Where Y1 are the underlying latent variables that index the Agricultural services options on a given plot of land, x1 is a (kx1) vector of explanatory variables, β is a (kx1) vector of the parameters to be estimated, and ε1 is the stochastic error term. The empirical model that was used to estimate the factors that influence the use of mobile phone is specified as follows :

$$y = \alpha + \beta_1x_1 + \beta_2x_2 + \dots + \beta_6x_6 + \varepsilon \dots\dots\dots(2)$$

Where :

- y = Agricultural services (Advertisement, customers feedback, marketing, transportation, and value addition)
- x₁ = Age of respondent (years)
- x₂ = Household size (hectares)
- x₃ = Education of the farmer (years of schooling)
- x₄ = Income per annum (Naira)
- x₅ = Years of experience (years)
- x₆ = Farm size (hectares)
- ε = The random error term, and
- β₁₋₅ = The coefficients to be estimated.

RESULTS AND DISCUSSION

Socioeconomic characteristics of male and female farmers

Result in Table 1 above shows the mean age of the male respondent as 45 years while that of the female was 36 years. Farmers in this age bracket are more productive and likely to possess the necessary strength to carry out farming operation (Ibitoye & Onimisi, 2013). Majority of both male and female respondents were married with the average household size of 7 persons for males and 6 persons for females. Further analysis of the study revealed that the average years of formal education was found to be 10 years for the males and 6 years for the females.

Table 1. Distribution of male and female farmers based on socio-economic characteristics
n=181

	Male n=96			Female n=85		
	Fre- quency	Percen- tage	Mean	Fre- quency	Percen- tage	Mean
Age (Years)						
≤20	4	4.2		0	0	
21-30	20	21.1		27	31.4	
31-40	27	28.4	45.2	37	43.0	36.0
41-50	32	33.7		21	25.6	
51-60	11	10.5		0	0	
≥61	2	2.1		0	0	
Marital Status						
Married	81	85.2		63	73.2	
Otherwise	15	14.8		22	26.8	
Household Size						
1-5	26	27.4		12	13.9	
6-10	42	43.1	6.5	47	54.8	6.2
11-15	28	29.5		26	31.3	
Years of Formal Education						
0	6	6.4		15	17.6	
1-6	34	35.7	9.9	42	49.4	6.1
7-12	48	50.5		18	21.2	
>12	8	7.4		10	11.8	
Annual Income (₦)						
≤100,000	20	21.0		30	34.9	
100,001-300,000	42	44.2	307,057.97	40	46.5	256,057.69
300,001-500,000	28	29.5		4	4.7	
Above 500,000	6	5.3		11	13.9	
Years of farming Experience						
1-5	19	19.8		31	36.4	
6-10	30	31.3		41	48.4	
11-15	28	29.2	10.5	7	8.2	8.7
Above 15	19	19.8		6	7.1	
Farm Size (Hectares)						
≤1	46	48.5		40	46.6	
2	37	38.9	1.8	35	40.6	0.9
3	12	12.6		11	12.8	
Extension Services (No of Contact in the past 6 month)						
1 – 3	46	47.9		53		
4-7	29	30.2	3.2	10	2.0	
8-10	21	21.9		12		

Source: Field Survey, 2022

The average credit obtained by the males in the last farming season was ₦307,057.97 while that of the female was ₦256,057.69. The findings as presented in the table shows that male respondents had more profit than the female respondents in the study area. This translates to the males having higher income as opposed to the females (Salami *et al.*, 2020). The average farming experience was found to be 11 years for the males and 9 years for the females. The mean farm size for male farmers in the study area is 1.8 and that of female is 0.9. Majority of farmers in Africa are smallholder farmers, who have small farm holdings ranging from 0.5 hectare to 4 hectares. This indicates that on average, male had larger farm size than female in the study area (Kayode *et al.*, 2019).

Level of Utilization of Mobile Phone

Table 2 Shows the distribution of respondents based on the level of usage of mobile phones. The results shows that male farmers in the study area used their phones to obtain agricultural services such as information on crop production (2.91), storage (2.65), marketing (2.64) and livestock production (2.30) more than female farmers, while more female than male used their phones to get customers feedback on agricultural services (2.21), value addition (2.02), farm management practices (1.98) and processing of farm produce (1.87) in the study area. This implied that male farmers in the study are more concerned about production (crop and livestock production), storage and direct marketing of their products while female farmers are more concerned on processing their product, adding values to it through branding and advertisement and transportation. This may likely be due to the fact that branding their product with mobile phone can be attributed to the fact that branding go along with advertisement. This align with the finding of Martin & Abbott (2011) who reported that men use mobile phone for action information taking advantage of much GSM than what farmers are concerned had been prior to the introduction of this innovation.

Table 2. Distribution of male and female respondents based on the usage of mobile phones

Agricultural services	Male		Female	
	Mean (\pm SD)	Rank	Mean (\pm SD)	Rank
Advertisement	1.44 \pm 0.93	11 th	1.96 \pm 0.61	10 th
Agricultural Input	2.94 \pm 1.09	2 nd	2.94 \pm 0.90	2 nd
Branding	1.26 \pm 0.85	12 th	1.69 \pm 0.21	12 th
Crop Production	2.91 \pm 1.06	3 rd	2.46 \pm 0.66	4 th
Customer's feedback on agricultural services	1.88 \pm 1.07	8 th	2.21 \pm 0.89	6 th
Farm Management Practice	1.64 \pm 1.09	10 th	1.98 \pm 0.70	9 th
Livestock Production	2.30 \pm 1.03	6 th	2.27 \pm 0.18	5 th
Marketing	2.64 \pm 0.71	5 th	2.60 \pm 0.61	3 rd
Processing of Farm Produces	1.78 \pm 0.71	9 th	1.87 \pm 1.14	11 th
Storage	2.65 \pm 0.02	4 th	2.10 \pm 0.08	7 th
Transportation	3.01 \pm 1.12	1 st	3.08 \pm 0.73	1 st
Value Addition	1.96 \pm 0.09	7 th	2.02 \pm 1.01	8 th

Source: Data processed, 2022

Categorization of the level of usage of mobile phones among male and female respondents

Results in table 3 shows the categorization of the level of usage of mobile phones among male and female farmers in the study area. The result revealed that among male farmers, majorities (56.5%) of male farmers used mobile phone at high level, The mean score (2.1) shows that the level of usage of mobile phones among male respondents is high. While among female farmers the result revealed that above average (55.3.2%) of female farmers used mobile phone at low level, The result shows

a mean score of (2.0) which also indicates a high level of usage of mobile phones among the female respondents.

Table 3. Categorization of the level of usage of mobile phones among male and female respondents (n= male 96; female 85)

Level	Frequency		Percentage		Mean	
	Male	Female	Male	Female	Male	Female
Low (< 2.0)	31	47	32.3	55.3		
High (2.0-3.0)	59	30	61.4	35.3	2.11± 0.91	2.02± 0.76
Very high (> 3.0)	6	8	6.3	9.4		

Source: Data processed, 2022

Benefits of using mobile phones for agricultural services

Result in table 4 revealed that among male farming households, access to timely and reliable information to support farmers decision making (MS =2.17) for agricultural service is the most beneficial among other advantages. This is followed by the use of mobile phone in cutting down on travel cost (MS =2.13). The result agrees with the findings of Salia *et al.* (2011) that farmers benefitted from mobile phone use by getting better market information through which they were able to make informed decisions, enjoy reduction in transportation cost, have enhanced marketing activities and get increased income. Among the female farmers using mobile phone to cut down on travel cost (MS=2.17), followed by performing banking transaction (MS =2.02). This result agrees with the findings of Ratnadiwakara *et al.* (2008) that the use of mobile phones have helped farmers to reduce transaction costs in agribusiness from the planting decision to the final selling point of the farm produce.

Table 4. Benefits of the use of mobile phones for agricultural services for Male and Female

Benefits of the use of mobile phones for agricultural services	MS (Male)	MS (Female)
Easy access to credit	1.64	1.83
Access to insurance cover for agricultural services	1.07	1.42
Access to timely and actionable information to support farmers decision making	2.17	1.87
Cutting down on travel cost	2.13	2.17
Easy access to agricultural extension and outreach	1.23	1.60
Increasing the effectiveness of farming	1.88	1.79
For Performing banking transaction	1.55	2.02
For Record Keeping	1.23	1.64
Strengthening networking	2.09	1.71
Transparency in agribusiness	1.65	1.67

Source: Data processed, 2022

The implication of this results is that larger proportion of male farmers prefer using their phones for access to timely and reliable information to support farmers decision making, cutting down on travel cost and strengthening networking while majority of the female farmers prefer using their mobile phones in cutting down on travel cost and performing banking transaction. While large proportion of male prefer using their phone in Strengthening networking, only few numbers of female farmers prefer using their phone for same purpose and while large number of female farmers prefer using their mobile phones in performing banking transaction, only few numbers of male prefer using their phone for same purpose.

Constraints to the Use of Mobile Phones for Agricultural Services among Male and Female Respondents

Results in Table 5 is a multiple response of the constraints to the use of mobile phone for agricultural service by male and female farmers. Poor internet connectivity

(MS= 2.46) was considered as the major problem mitigating the use of mobile phones for Agricultural services among the male respondents in the study area. followed by unavailability of phone accessories was ranked next (MS= 2.36). Also, among the female farmers. Electricity problem (2.42) is considered the major constraint mitigating against the use of mobile phones for Agricultural services in the study area. This results is in line with Burrell (2010) which explains that effective use of mobile phones depends largely on the availability of electricity. This was followed closely by theft (MS=2.35) is considered a major constraint after electricity problem, respondents say their inability to use mobile phone for Agricultural services is caused by losing their phones to thieves.

Table 5. Constraints to the Use of Mobile Phones for Agricultural Services (Male and Female)

Constraints	Male	Female
Cost of recharge voucher	1.91	2.15
Cultural barriers	1.86	1.69
Electricity Problem	2.29	2.42
Fluctuating Service	2.25	2.27
High cost of maintenance	1.87	2.25
High cost of mobile phones	1.90	2.14
Lack of Mobile Servicing Centre	2.23	2.10
Lack of willingness to learn	1.94	1.62
Low perception on the value of mobile phones	1.86	1.50
Low technical literacy	2.09	1.83
Mobile phone operating problem	1.93	1.96
Network coverage problem	1.99	2.15
Poor internet connectivity	2.46	2.29
Technical problem of phone	2.10	2.14
Theft	1.84	2.35
Unavailability of phone accessories	2.36	2.29

Source: Data processed, 2022

Factors Influencing Use of Mobile phones for Agricultural services

The estimates of the determinants of use of mobile phones for each separate category were given in Table 6. The results of this study show the estimation results and significance values of several variables that affect the use of Mobile Phones for Agricultural services.

Advertisement Model

The utilization of mobile phones among the male farmers is influence positively by household size of the farmer and income per annum. The positive relationship indicates that a unit increase in both of either household size and income of the respondents will likely influence the use of mobile phones for advertisement among the male farmers while among the female farmers the use of mobile phone for this purpose is been influenced positively by their age and household size in the study area. This implies that the older the female farmers are, the more likely they use their mobile phones for advertisement of their agricultural products. This is in line with the findings of Heang & Khan (2015) which states that most farmers and agricultural cooperatives advertise and distribute their agricultural products using e-commerce platforms via their mobile phones. Agricultural business activities can contribute more to increasing assets including the use of Mobile Phones by Nigerian farmers when there is increased involvement in agribusiness activities such as marketing, including product advertising (Komolafe *et al.*, 2022).

Customer's feedback Model

Using mobile phones to get feedback from customers is positively associated with years of schooling and income per annum of the male farmers. This implies that

the more educated the male farmers are, the more they make use of their mobile phones to get feedback from customers on their products. Increase in the household size of the female farmers will likely increase feedback from customers. This may be due to the fact that other member of the household may also be involved in the receiving feedback. This research has strengthened the statement of Hoffman & Fodor (2010) that using a cell phone is very effective in increasing interaction with customers, so that it can increase farmers' income. Social media platforms accessed via mobile phones have become the main channel to communicate with their target audience in the agricultural sector (Carvalho & Fernandes, 2018).

Table 6. Multivariate Probit Model Showing Significant Relationship between socio economic factors and the level of use of mobile phones among Male (M) and Female (F) farmers

Variables	Advertisement		Customer's feedback		Marketing		Transportation		Value Addition	
	M	F	M	F	M	F	M	F	M	F
(Constant)	1.596 (0.011)	1.563 (0.107)	1.843 (0.006)	0.661 (0.452)	2.837 (0.001)	0.120 (0.902)	3.292 (0.000)	2.277 (0.004)	1.647 (0.013)	0.922 (0.321)
Age	0.022 (0.144)	0.007 (0.004)*	0.025 (0.116)	0.033 (0.317)	0.013 (0.502)	0.067 (0.068)	0.010 (0.426)	0.044 (-0.028)*	0.036 (0.023)*	0.032 (0.346)
Household size	0.107 (0.001)*	0.222 (0.002)*	0.008 (0.822)	- 0.129 (0.037)*	0.078 (0.071)	0.042 (0.529)	0.006 (0.830)	0.047 (0.360)	0.042 (0.208)	0.025 (0.699)
Years of schooling	0.016 (0.517)	0.031 (0.433)	0.053 (0.001)*	0.067 (0.064)	0.046 (0.154)	0.110 (0.008)*	0.060 (0.005)*	0.059 (0.056)	0.004 (0.875)	0.108 (0.006)*
Income per annum	0.001 (0.000)*	0.393 (0.696)	0.014 (0.000)*	0.829 (0.412)	0.051 (0.158)	0.067 (0.947)	0.011 (0.621)	0.838 (0.407)	0.056 (0.049)*	0.051 (0.037)*
Years of experience	-0.030 (0.084)	0.019 (0.592)	0.017 (0.343)	-0.047 (0.152)	-0.009 (0.697)	-0.083 (0.025)*	0.011 (0.460)	-0.012 (0.665)	-0.038 (0.036)*	-0.016 (0.643)
Farm size	0.023 (0.836)	-0.121 (0.594)	-0.064 (0.578)	0.042 (0.842)	0.007 (0.028)*	-0.023 (0.920)	-0.199 (0.037)	-0.093 (0.601)	0.092 (0.425)	0.414 (0.065)

Source: Data processed, 2022

Note: (*) denotes sig. at 5%

Marketing Model

The male farmers' choice to use mobile phones for marketing was found to be significantly related with the farm size. This is an indication that the more farm size the male farmers have, the more they use mobile phones to sell their produce. while years of schooling and years of experience may positively be associated with the use of

mobile phones for marketing among the female farmers which is an indication that that an increase in years of formal education bring about an increase in the use of mobile phones for marketing among female farmers in the study area. This is in line with findings of Poushter (2016) on smart phone ownership and internet usage, where he found that “those with more education are more likely to own a smart phone and use the internet than those with less education. Also Ilahiane (2007) who reported that farmers use mobile phones to contact markets brokers and near cities for sell their product and search for up-to-date market information from social and business networks.

Transportation Model

The male farmers' decision to use mobile phones for transportation services (i.e., transporting of farm produce) is significantly related to the years of schooling of the respondents while among the female respondents, age had a negative coefficient of -0.028 and is significant. This implies that an increase in age of female farmers bring about a decrease in the use of mobile phones in the study area, which means the use of mobile phone for transportation is common among young females than old female farmers in the study area. This supports the findings of Rathore & Sharm (2012), Ogutu *et al.* (2014), and Khan *et al.* (2019), which states that the use of mobile phones reduces travel costs and increases the productivity of agricultural communities living in remote areas. Substituting phone calls for travel ensures safety and reduces farmers' time, cost and perishability of the farm produce (Muto & Yamano, 2009).

Value Addition Model

The use of mobile phone to access information on value chain among male farmers is positively associated with age, years of experience and income realized per annum. The implication of this result is that an increase in the age of respondents will likely increase the use of mobile phones for value addition information. This contrast the findings of Abdulazeez (2014) that younger farmers are more innovative and better adopters than older farmers besides. Among the female respondents the use of mobile phone is significantly related to years of schooling and income per annum. This implies that the more years spent in school by the female farmers, the more likely mobile phones are used to get information on value addition, this may be because of the knowledge they have acquired on the importance of value addition. This support Porter (2001) who argues that the basic tool for understanding the impact of information technologies, such as the Internet, on companies is the value chain.

CONCLUSION

This study, concludes that male farmers used mobile phones more for production activities while the female farmers use mobile phones more to get information on processing activities. Although male farmers in the study area had high level use of mobile phones, their female counterparts also used mobile phones effectively. The study also revealed that the effect of use of mobile phones has significant impact on the agricultural services of both male and female farmers. Also, based on these findings, the study, therefore, recommended that alternative source of power to recharge mobile phones should be made available to the farmers and also. Policies that address access to the use of mobile phones and other digital technologies should be gender smart.

Some challenges and limitations were encountered in the course of data collection and writing-up of the research. Also, the challenge of high incidence of illiteracy specifically among women farmers made it difficult to administer self-completion questionnaires so the researcher had to translate each question into the local language and help farmers choose from a set of multiple-choice options which apply to them.

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