

## CONSTRAINTS TO USE OF MOBILE TELEPHONY FOR AGRICULTURAL PRODUCTION IN ONDO STATE, NIGERIA

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### *ABSTRACT*

*This study identifies the factors affecting the use of mobile telephony by small-scale farmers in Ondo State, Nigeria. Specifically, the study describes the socio-economic and demographic characteristics of the farmers, examines their access to telecommunications services, determines their frequency of using mobile telephony for agricultural activities as well as the factors affecting the use of the technology by the farmers. The study made use of 170 randomly selected farmers across the state. Descriptive statistics, likert scale and multivariate logit model were the analytical tools adopted for the study. The findings revealed that non-membership of agricultural society, inadequate extension services, fluctuating telecommunication services, inadequate access to mobile services and lack of electric power supply are the constraints to the use of mobile telephone services by the farmers. Therefore, the study calls for provision of stable services by mobile telecommunications service providers, regular electric power supply, training of the farmers by extension agents and agricultural development agencies as well as formation of agricultural societies by the farmers.*

**Key words:** *Constraints, mobile telephony, frequency, farmers and telecommunications service providers*

## INTRODUCTION

The potential role of mobile telephony in agricultural production cannot be underestimated. Mobile telephony can enhance, enlarge and contribute to the efficient sharing of agricultural information on weather reports; farming decisions such as which crop to grow at a particular time of the season, when to plan, what to plant, which agrochemical to use and when to harvest. Newly discovered agricultural practices on timely soil preparation and planting, irrigation methods, weeding methods, cultivation, harvesting and methods of storage that will help farmers improve their productivity can be sent through texts (SMS) or even through direct calls on the mobile phone without the need for travelling down to where these farmers are to deliver face-to-face teaching.

Mobile telecommunications technology can help deliver prices and trading information (Aker, 2008). Baye *et al.* (1999) observed that mobile services can facilitate transactions by connecting farmers with various buyers and traders. It can help them in deciding where and what price to sell their produce, and can reduce search costs associated with locating outlets (Abraham, 2007). This in turn will have increased efficiency, increased yields and reduced wastage and have an overall positive effect on farmers' earning and livelihood. In addition, transportation costs, accident, theft, perishability and frustration among farmers can be reduced through mobile telephony in

that farmers can obtain their supplies such as fertilizer, herbicides, improved varieties, etc at their door steps with just a simple Short Message Service (SMS) to producers and suppliers without the need to travel.

Farmers can be helped through mobile telephony to strengthen their capabilities to participate and represent their constituencies when negotiating input and output prices, land claims and resource rights. Mobile technology can enable them to interact with stakeholders thus reducing social isolation. Thus, it can widen the perspective of local communities in terms of national or global development.

Farmers with relevant information are better able to assume responsibilities for themselves and their activities. According to IICD (2009), individuals who acquire the ability to access information often find their social status improved. Gough and Grezo (2005) revealed that mobile telephony opens up new business opportunities and allows easy contact with farmers' friends and relatives. All these point to the various areas of relevance of mobile telecommunications services to agricultural operations.

There has been a long tradition of economic research on the impact of mobile telephony on economic growth. Previous studies have successfully measured the growth dividend of investment in telecommunications infrastructure in developed economies (Hardy, 1980; Norton, 1992; Roller and Waverman, 2001). Recently, considerable attention has focused on the use of mobile telephony and other forms of ICTs by farmers and other agricultural agents in the

function of market economies (Aker, 2009; Goyal, 2009; Jensen, 2009; Muto and Yamano, 2009; Svensson and Yanagizawa, 2009). However, just little attention has been paid to examination of the factors affecting the use of the technology for agricultural activities among the small-scale farmers, who are the chief food producers in developing countries. Therefore, given the importance of telecommunications to modern agriculture, this study sought to identify the factors affecting use of mobile telephony for agricultural production in Ondo State, Nigeria. The specific objectives are: to describe the socio-economic and demographic characteristics of the farmers, examine their access to telecommunications services, determine the frequency of using mobile telephony for agricultural activities as well as the factors affecting the use of the technology by the farmers. This study provides policy-makers with techniques on improving agricultural production in Nigeria through mobile telecommunications services.

## METHODOLOGY

### Study Area

The study was conducted in Ondo state, Nigeria. The state is located within the south-western part of the country. The state covers an area of 14,788.723sq.km at 120 kilometres North of the ocean. It lies in-between longitude 4<sup>0</sup>31' and 6<sup>0</sup>00' East of the Greenwich Meridian and latitude 4<sup>0</sup>15' and 8<sup>0</sup>15' North of the Equator. The state is made up of eighteen Local Government Areas (LGAs) [SOSG 2010].

Agriculture is the mainstay of the state with majority of the farmers operating on small-scale basis (Ondo State Ministry of Information, 2009). The main food crops produced in the area are maize, cassava, yam, plantain and cocoyam while cocoa, oil palm, kola nut, cashew, rubber and timber form the major cash crops. Livestock is a minor component of agricultural system in the area. Animals found in the study area include sheep, pig, goat and chickens. They are held as a source of income and are also used to fulfill social and religious obligations (Ondo State Ministry of Information, 2009).

There is the presence of mobile telecommunications services in the state. Some the telecommunications services providers in the state are MTN Nigeria, Globacom, Airtel, Etisalat, Cisco, Intercellular, Visafone, multilinks, Mtel, Rainbownet, Reltel, Starcomms, VGC Communications, among others (Ondo State Ministry of Information, 2010).

### Data Collection

The target population for this study was the farm households in the state. The study sample comprised a three-stage sampling procedure involving random selection technique. The first stage involved random selection of three Local Government Areas (LGAs) in the state; the second stage comprised random selection of six farm communities from each LGA while the third stage was the selection of 10 farm households from each of the selected

communities. In all, one hundred and eighty farm household respondents were selected and interviewed for the study. Information was obtained from the respondents with the use of structured questionnaires coupled with personal interview. However, one hundred and seventy of the respondents provided adequate information and were used for data analysis.

### Analytical Techniques

The tools of analysis employed for the study were: the descriptive statistics, the likert scale and multivariate logit model. Simple descriptive statistics such as percentages, frequency distribution, mean, mode and ratios were used to show a precise description of the socio-economic and demographic characteristics of the respondents as well as their access to telecommunications services.

The frequency of using eight mobile phone facilities for agricultural operations was placed on a 5 point likert scale where seldomly used = 1, used occasionally = 2, used monthly = 3, used weekly = 4, and 5 was daily. Each respondent had a minimum score of 8 points and maximum score of 40 points. The frequency was therefore judged by the mean of the usage.

Multivariate logit model was used to assess the determinants of the usage of mobile telephony for agricultural production in the study area. Following Gujarati and Sangeetha (2007), the logistic (logit) probability function is represented as:

$$P_i = \frac{1}{1 + e^{-Z_i}} = f(Z_i)$$

$$\text{Log} (P/1-P) = f(Z_i)$$

$$\text{But } Z_i = X_i \delta U_i$$

$$\text{Therefore, } \log (P/1-P) = ( X_i \delta U_i)$$

Log (P/1-P) = 1, if mobile telephony is used while

Log (P/1-P) = 0 if otherwise.

Implicitly, the model is stated as

$$Y = f(X_1, X_2, \dots, X_8, \varepsilon_i)$$

Where

Y = Usage of mobile telephony for agricultural production (1 if used; 0 if otherwise).

$X_1$   $\delta$  Farm income of household (₦),  $X_2$   $\delta$  Education (years),  $X_3$   $\delta$  Location factor (physical setting of the household),  $X_4$   $\delta$  Sex of household head: 0 if male and 1 if female,  $X_5$   $\delta$  Age of household head (years),  $X_6$   $\delta$  Household size,  $X_7$   $\delta$  Farm size (ha),  $X_8$   $\delta$  Membership of association: Yes = 1; No = 0,  $\varepsilon_i$   $\delta$  Error term, assumed to be uniformly distributed, with zero mean and constant variance.

## RESULTS AND DISCUSSION

### Demographic and Socio-economic Characteristics of the Respondents

Tables 1 and 2 show the demographic and socio-economic characteristics of the respondents as these can determine adoption of innovations, such as the use of mobile telephony for agricultural production by farmers. The modal age group of the respondents was 41  $\delta$  50 years while the average age was 45 years. Seventy-seven per cent of the respondents had one form of education or the other. Household size of the respondents ranges from 1 to 25 persons. members while average household size was

The modal group is made up of 6 ó 10 seven persons. The average number of years of farming experience of the respondents is 15 years, indicating farming as their age-long occupation. About 75% of the respondents have farming as their main occupation. The few that were engaged in farming on part-time basis were mainly school teachers, bricklayers, carpenters, traders, drivers, tailors and painters.

Over half of the farmer households (57.1%) do not belong to any agricultural society. The implication of this is that exchange of relevant information on sound agricultural production techniques through mobile telecommunication services among the farmers in the study area is minimal. Seventy-three per cent of the farmers do not have access to extension services. This implies that majority of the farmers have no adequate training on the use of mobile telephony for farm operations.

### **Usage of Mobile Telephony by the Respondents**

Table 3 describes the respondents with respect to their access to mobile services and the use for farm operations. Majority of the respondents live in the rural area. About 61% of the farmers use mobile telephony for their farm operations. Also, none of the respondents use the fixed line as source of telecommunications services. Table 3 also shows that use mobile telephony for agricultural production by the respondents increases over the years. This likely explains the rapid spread of the technology in Nigeria

and the increasing awareness of its use for farming activities.

Majority of the farmers do not use more than 3 minutes on telephony per week. Further analysis of the findings revealed that an average of N37.00 is spent weekly by the users of mobile telephony on farming operations in the study area.

### **Rate of Using Mobile Telecommunications Services by the Respondents**

Table 4 shows the rate at which mobile telecommunications facilities are used for agricultural production in the study area. This was obtained with the aid of five-point likert scale where an average of 1, 2, 3, 4, and 5 represents where the facility is used seldomly, occasionally, monthly, weekly, and daily respectively. The mean rate of making calls is about 4, suggesting that an average respondent used mobile telephony for agricultural operations on weekly basis. The mean value of 3 for receiving calls on agricultural activities indicates that the respondents used this facility monthly. Also, the average rates of 2 for using mobile telecommunications services through text messages, calculating, and setting alarm, imply that these facilities are used occasionally while browsing, saving information, and taking pictures for documentary were seldom used by the respondents as indicated by the mean rate of 1.

The findings revealed that the respondents used call-making most while taking pictures for documentary activities

least. Analysis of the results further showed that the mean frequency of using the mobile

telephone services for agricultural production by the respondents was 2. This implies that an average farmer uses all the mobile facilities occasionally for farming activities.

### **Factors Affecting Use of Mobile Telephony for Agricultural Operations by Respondents**

The factors affecting the use of telecommunications services for farming by the respondents are shown in Table 5. Farm income, age, household size, membership of association, and education, are each separately significantly related to phone usage by the farmers. Farm income is positively related to mobile telephony. This is logical, as mobile phones are expensive and only the small-scale farmers with much farm income are likely to consume them.

The household size is also positively related with the use of mobile by the farmers. This could result from the need to invite household members for farming operations, as an average farmer would like to exhaust his family labour before hiring labour in order to save cost.

The age of household head is negatively correlated with mobile usage, as one would expect younger generations to be more familiar with and accepting new technologies like mobile telephony, even though it may be the households with older heads that are better able to afford them.

Membership of association is significantly and positively related to mobile usage for agricultural production activities in the study area. This likely suggests the use of mobile by farmers to share information, ideas and experience with occupational groups.

Education has a positive effect on mobile usage, probably because more educated people are more aware of mobile technology, how to operate it, how to obtain it, and how to use it.

### **Problems Encountered in Using Mobile Telecommunications Services**

The problems faced by the respondents vary, depending on their locations. Some of the farmers complained of no access to mobile telecommunications services. Others complained about fluctuating mobile services. They regretted that these prevent them from taking advantage of the services for their farming activities.

Some of the respondents complained of lack of access to electricity. They lamented that though they had mobile services, they had no power supply to recharge their mobile batteries.

### **CONCLUSION AND RECOMMENDATIONS**

This study reveals that mobile telephony is used for agricultural activities by the farmers in the study area. However, non-membership of agricultural society, inadequate extension services, fluctuating telecommunication services, inadequate access to mobile services and lack of electric power supply, hinder the farmers from enjoying the inherent benefits of the use of mobile telephony for agricultural production. This is unfavourable to the farmers and the economy as a whole.

Therefore, based on the findings of this study, there is need for provision of stable services by telecommunications service providers. The services should be extended



to the rural area where majority of the small-scale farmers are usually found. Besides, non-governmental organizations and agricultural agencies should provide the farmers with relevant training on the use of mobile telephony for farm operations. Agricultural development officers should also intensify extension services in this regards. In addition, the farmers should form agricultural cooperative societies to facilitate such training programmes. There is also the need by the government at all levels to provide the rural area with stable electric power supply. This would make the farmers recharge their mobile phones when necessary for exchange of relevant agricultural information for optimum production.

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**Table 1: Demographic Characteristics of the Respondents**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age (years)</b>		
20 ó 30	16	9.4
31 ó 40	42	24.7
41 ó 50	61	35.9
51 ó 60	48	28.2
> 60	3	1.8
Total	170	100
<b>Level of Education</b>		
No formal education	39	22.9
Primary	58	34.1
Secondary	52	30.6
Tertiary	21	12.4
Total	170	100
<b>Household Size</b>		
0 ó 5	61	35.9
6 ó 10	90	52.9
11 ó 15	13	7.6
>15	6	3.5
Total	170	100

Source: Field Survey, 2011

**Table 2: Socio-economic Profile of Respondents**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Primary Occupation of the Household Head</b>		
Farming only	126	74.1
Formal	26	15.3
Non-formal	18	10.6
Total	170	100
<b>Farming experience</b>		
1 - 5	36	21.2
6 -10	47	27.6
11 - 15	20	11.8
16 -20	27	15.9
> 20	40	23.5
Total	170	100
<b>Membership of Association</b>		
Cooperative	17	10.0
Farmers Association	56	32.9
Nil	97	57.1
Total	170	100
<b>Access to Extension Services</b>		
Yes	46	27.1
No	124	72.9
Total	170	100

Source: Field Survey, 2011

**Table 3: Telecommunications Characteristics of Respondents**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Location Factor</b>		
Peri-urban	47	27.6
Rural	123	72.4
Total	170	100
<b>Phone Usage for Farming Activities</b>		
Yes	104	61.2
No	66	38.8
Total	170	100
<b>Sources of Mobile Telephone</b>		
Owned phone	78	75.0
Borrowed phone	4	3.8
Owned and borrowed	22	21.2
Total	104	100
<b>Years of using mobile telephone usage for agric</b>		
0	66	38.8
1	41	24.1
2	30	17.6
3	15	8.8
4	11	6.5
5	4	2.4
6	3	1.8
Total	170	100
<b>Average Time Spent on Mobile Telephone/Week (mins)</b>		
0	66	38.8
1 ó 3	59	34.7
4 ó 6	38	22.4
7 - 9	7	4.1
Total	170	100
<b>Weekly expenditure on mobile telephone on farm operations (₦)</b>		
0	66	38.8
10 - 50	67	39.41
60 - 100	23	15.88
110 ó 150	9	5.29
160 - 200	3	1.76
> 200	2	1.18
Total	170	100

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Source: Field Survey Data, 2011

**Table 4: Frequency of Use of Mobile Phone Facilities for Farm Operations**

Mobile Facilities	Daily		Weekly		Monthly		Occasionally		Seldom		Mean	Rank
	Frq	%	Frq	%	Frq	%	Frq	%	Frq	%		
Making calls	48	46.2	18	17.3	6	5.8	31	29.8	1	1.0	3.78	1st
Receiving calls	37	35.6	12	11.5	1	1.0	46	44.2	8	7.7	3.23	2nd
Sending messages	2	1.9	11	10.6	17	16.3	48	46.2	26	25.0	2.18	3rd
Browsing	1	1.0	2	1.9	3	2.9	2	1.9	96	92.3	1.17	7th
Calculating	6	5.8	5	4.8	3	2.9	12	11.5	78	75.0	1.55	4th
Saving information	5	4.8	1	1.0	2	1.9	13	12.5	83	79.8	1.38	6th
Setting alarm	6	5.8	5	4.8	1	1.0	14	13.5	78	75.0	1.53	5th
Taking pictures for documentary	1	1.0	-	-	1	1.0	6	5.8	96	92.3	1.12	8th

Source: Field Survey, 2011

\*Frq ó Frequency of use of the facility by respondents.

**Table 5: Determinants of Use of Mobile Telephony for Agricultural Production**

Variable	Coefficient	Standard error	z ó value	P óvalue
Farm income	0.0744*	0.0440	1.69	0.091
Age	-2.4980***	0.7706	-3.24	0.001
Household size	0.7868**	0.3534	2.23	0.026
Farm size	0.2070	0.2904	0.71	0.476
Association	0.5436*	0.3087	1.76	0.078
Education	0.1953***	0.0320	6.10	0.000
Location factor	0.0549	0.3197	0.17	0.864
Sex	-0.0702	0.3105	-0.23	0.821
Constant	6.1751	2.7553	2.24	0.025

\*\*\*, \*\*, \* Parameter significant at 1%; 5% and 10% respectively

Source: Field Survey Data, 2011