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Mobile Applications and Agricultural Knowledge of Smallholder Famers in Kura Local Government, Kano State, Nigeria

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Abstract— *This study was to investigate the relevance of mobile applications in enhancing the agricultural knowledge of smallholder farmers in Kura local government, Kano State - Nigeria. These are guided by assessing the relevance of mobile phones applications in agriculture to smallholder farmers. The study found that smallholder farmers use mobile phones mostly for making calls (85%), entertainment (50%), making transactions (45%), and social media (40%). Also, the study found that mobile phones seem to be relevant to smallholder farmers to research about market prices (65%), making calls to customers and other farmers (50%), and to get information about the market and availability of different commodities (50%). The study concluded that mobile phones could help smallholder farmers in Kura local government to improve their agricultural productivity by giving them access to basic financial services, new agricultural techniques, and new markets, in turn helping them to secure better prices for crops and better return on investments. As their income improves with each harvest, they can invest in better seeds, fertilizers, and chemicals*.

Keywords— *Cell Phone, Contact, Production, Smallholder farmers*.

I. INTRODUCTION

Nigeria with over 84 million hectares of arable land, the Nigerian agricultural sector has huge potential to engender economic diversification, provide jobs, guarantee food security, dampen inflation and earn foreign exchange. The sector contributed an average of 40 percent to the GDP in 2013-2014, contributed 47.17 and 45.49 per cent to non-oil GDP in 2013 and 2014 respectively and employed about two-thirds of the country's labour force. The Nigerian government recently crafted an Agricultural Transformation Agenda (ATA) focusing on the key agricultural value chains for rice, cassava, sorghum, cocoa, and cotton. Overall, the ATA added 20million MT to domestic food supply in 2015, including rice (2million MT), cassava (17million MT) and sorghum (1million MT); created over 3.5 million jobs in the sector from value chains and provided over USD2 billion of additional income for Nigerian farmers (Chete and Fasoyiro, 2015).

The government is also implementing a Growth Enhancement Scheme (GES) designed to replace the enormously corrupt agricultural service delivery system, especially in the seeds and fertilizer distribution sector. This has resulted in reaching 1.5 million farmers with subsidized seeds and fertilizers via mobile phones within 120 days of development and deployment of the e-wallet system; increase in percentage of farmers that accessed subsidized seeds. While the fertilizers from 11 percent under the old system to 70 percent under the e-wallet system; growth of the number of seed companies from 11 in 2011 to 82 in 2014; scrapping of contracts for supply of fertilizer and seeds and sale of fertilizer and seeds directly to farmers by accredited companies instead of government and registration of 10 million farmers in a farmers' database out of an estimated 14 million farmers in the country. Nigeria had a teledensity of 88.12 per cent from over 120 million active telephone lines in 2014, 97.5 percent of which were mobile phones (Chete and Fasoyiro, 2015).

Small-holder farmers are defined as those marginal and sub-marginal farm households that own or/and cultivate less than 2.0 hectare of land (Ali and Deininger, 2014). According to Okello (2010), the term "smallholder farmers" is widely understood to include small farmers who do not own or control the land they farm. One of the main characteristics of production systems of smallholder farmers is simple, outdated technologies, low returns, high seasonal labour fluctuations and women playing a vital role in the production. Smallholder farmers differ in individual characteristics, farm size, resource distribution between food and cash crops, livestock and off-farm activities, their use of external inputs and hired labor, the proportion of food crops sold and household expenditure patterns.

In Kura local government, lack of reliable markets has been found to be one of the main constraints faced by smallholder farmers. Many of these farmers receive low prices for their products by selling them at their farm gate or local markets. However, these smallholder farmers could receive much higher prices by selling their goods if they have marketing knowledge and selling skills as well as little recognition of opportunities for product diversification or the limits between market research and product development. Furthermore, the smallholder farmers in Kura local government are also faced with the challenge of human capital. This is because they are often illiterate with poor technological skills, which can be serious obstacles in accessing useful formal institutions that disseminate technological knowledge. The majorities of smallholder farmers are not capacitated with financial and marketing skills and is unable to meet the quality standards set by fresh produce markets and food processors. Lack of production

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knowledge leads to lower quality in production (Kano State Agricultural and Rural Development Authority, 2015).

Furthermore, more than 78% of the smallholder farmers in Kura local government does not have adequate agricultural knowledge such as modern farming, types of farm diseases, market price, weather changes or availability and use of improved seeds (Kano State Agricultural and Rural Development Authority, 2015). This could be attributed to the high illiteracy rate which stands at 72% in Kura local government (National Demographic Household Survey, 2013). The lack of substantive agricultural knowledge has always left most farmers in Kura in losses since they do have adequate information access capacity. Several studies have been done to assess the relevance of mobile phones in enhancing information access and increasing the market knowledge of smallholder farmers in different parts of Africa (Muto and Yamano 2009; Shaffril *et al.*, 2013; Aker 2011; Ilahiane 2014). The purpose of this study was to investigate if mobile phones usage could be helpful to smallholder farmers in Kura local government in accessing agricultural information so that they are knowledgeable.

II. Materials and Methods

The study used a multi-stage sampling method. The first stage included using purposive sampling to sample eight out of eleven constituencies in Kura local government. (i.e. Garun Mallam, Madobi, Kumbotso, Municipal, Karaye, Gwarzo, Kabo, Kiru, Shanono, Tudun Wada and Doguwa). The second stage involved the use of stratified sampling where the farmers from each of the selected eight constituencies were selected based on their agricultural activities into two different strata (i.e. crop husbandry and animal farming). 384 questionnaires were distributed, but only 280 questionnaires were correctly filled and answered. This gave a retrieval rate of 73%, according to Amin (2005), if the response rate is more than 70%, this is enough to carry on and continue with data analysis.

III. Result and Discussion

A. Personal and Socio-Economics Characteristics of farmers

Table IA: revealed that majority, 60% of the respondents were male while 40% were female. This implies that most of the farmers are male because they have the capacity to own or inherit land, unlike their female counterparts who are limited by tradition with regard to land inheritance hence limiting their participation in farming. Furthermore, the table revealed that majority, 35% of the respondents were within the age group of 20-29 years, followed by those within the age group of 40-49 years who were represented by 30% and those within the age group of 30-39 years who were represented by 15%. Similarly, respondents who were less than 20 years of age and between 50-59 years were represented by 10% respectively. The dominance of the young people participating in agricultural activities could be because of government programs such as National Poverty Eradication Programme – NAPEP intended to support the youth and try and eliminate poverty in the region. In addition to that, the findings presented in Table IA revealed that majority, 35% of the respondents were university graduates, followed by 25% who were primary level dropouts and 20% who were educated up to secondary level. On the other hand, 15% of the respondents were not educated while only 5% were educated up to tertiary level. Similarly, the results presented in Table IA revealed that majority, 60% of the respondents were married, followed by 15% who were Single and Divorced. Only 10% of the respondents were widowed. Furthermore, the results presented in table I revealed that majority, 25% of the respondents earned between ₦10,000-₦20,000 and greater than ₦40,000 respectively. On the other hand, respondents who earned between ₦21,000-₦30,000 were represented by 20% while respondents who earned less than ₦10,000 and between ₦31,000-40,000 were present as 15% respectively. Lastly, the table IA revealed that majority, 70% of the respondents owned ordinary phones while only 30% owned Smart Phones.

TABLE IA. Personal and socio-economics characteristics of farmers.

Gender	Frequency	Percent (%)
Male	168	60.0
Female	112	40.0
Total	**280**	**100.0**
Age		
20-29 years	98	35.0
40-49 years	84	30.0
30-39 years	42	15.0
Less than 20 years	28	10.0
50-59 years	28	10.0
Total	**280**	**100.0**
Education level		
University	98	35.0
Primary	70	25.0
Secondary	56	20.0
None	42	15.0
Tertiary	14	5.0
Total	**280**	**100.0**
Marital Status		
Married	168	60.0
Single	42	15.0
Divorced	42	15.0
Widowed	28	10.0
Total	**280**	**100.0**
Income Level		
Between ₦10,000-₦20,000	70	25.0
Greater than ₦40,000	70	25.0
Between₦ 21,000-₦30,000	56	20.0
Less than₦ 10,000	42	15.0
Between ₦31,000-₦40,000	42	15.0
Total	**280**	**100.0**
Type of phone		
Ordinary phone	196	70.0
Smartphone	84	30.0
Total	**280**	**100.0**

B. Use Mobile Phones Applications In Agriculture To Smallholder

The first objective was to assess the relevance of mobile phones applications in agriculture to smallholder farmers in Kura local government. Where SD=strongly disagree;

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D=disagree; N=Not sure; A=agree; and SA=strongly agree. Table IIA revealed that majority, 238 (85%) of the respondents strongly agreed that they use their mobile phones to make calls. Similarly, 112 (40%) strongly agreed that they use their mobile phones for social media communication and accessing news. Furthermore, 140 (50%), 126 (45%), and 84 (30%) of the respondents respectively agreed that they use their mobile phones for entertainment, making transactions, and receiving alert services. However, the majority, 126 (45%) and 112 (40%) of the respondents respectively disagreed that they use their mobile phones for content delivery and marketing services. Furthermore, 98 (35%) of the respondents also respectively strongly disagreed that they use their mobile phones for getting location services and research information.

TABLE IIA. Use mobile phones applications in agriculture to smallholder.

Use of Mobile Phones	SD	D	N	A	SA
Making Calls	14 (5%)	0 (0%)	0 (0%)	28 (10%)	238 (85%)
Using social media	14 (5%)	28 (10%)	42 (15%)	84 (30%)	112 (40%)
For Entertainment	14 (5%)	42 (15%)	14 (5%)	140 (50%)	70 (25%)
Accessing News	28 (10%)	42 (15%)	42 (15%)	56 (20%)	112 (40%)
Making Transactions	56 (20%)	14 (5%)	14 (5%)	126 (45%)	70 (25%)
Alert services	56 (20%)	14 (5%)	70 (25%)	84 (30%)	56 (20%)
Content Delivery	126 (45%)	28 (10%)	14 (5%)	28 (10%)	84 (30%)
Marketing services	112 (40%)	14 (5%)	14 (5%)	84 (30%)	56 (20%)
Location services	98 (35%)	28 (10%)	28 (10%)	70 (25%)	56 (20%)
Research of Information	98 (35%)	28 (10%)	42 (15%)	84 (30%)	28 (10%)

C. Cross Tabulation Results Between Gender and Phone Communication

Table IIB revealed that out of 168 male respondents, 91.7% use their mobile phones for making calls while 75% out of 112 female respondents use their mobile phones for making calls. This result shows that more male smallholder farmers use their mobile phones for making calls than their female counterparts. Overall, at least 85% of 280 respondents use their mobile phones for making calls.

TABLE IIB. Cross tabulation results between gender and phone communication.

Gender	Making Calls			Total
	strongly disagree	agree	strongly agree	
Male	0 (0%)	14 (8.3%)	154 (91.7%)	**168 (100%)**
Female	14 (12.5%)	14 (12.5%)	84 (75%)	**112 (100%)**
Total	**14 (5%)**	**28 (10%)**	**238 (85%)**	**280 (100%)**

*D. Age * Using Social Media Cross tabulation*

Table IIC revealed that all (100%) of 98 smallholder farmers within the age group of 30-39 years use social media, followed by 50% of 84 smallholder farmers within the age group of 50-59 years. Surprisingly none of the respondents less than 20 years of age use social media. This could be because affordability of smartphones which have social media platforms such as Facebook, WhatsApp, Instagram, Twitter, Imo etc. however their elderly counterparts were found to use social media. This could be because they have the money to buy smartphones. Overall at least 40% of 280 respondents use their mobile phones for social media purposes.

TABLE IIC. Age * using social media cross tabulation.

Age	Using social media					Total
	strongly disagree	disagree	I am not sure	Agree	strongly agree	
Less than 20 years	0 (0%)	0 (0%)	28 (100%)	0 (0%)	0 (0%)	**28 (100%)**
20-29 years	14 (14.3%)	14 (14.3%)	14 (14.3%)	28 (28.6%)	28 (28.6%)	**98 (100%)**
30-39 years	0 (0%)	0 (0%)	0 (0%)	0 (0%)	42 (100%)	**42 (100%)**
40-49 years	0 (0%)	0 (0%)	0 (0%)	56 (66.7%)	28 (33.3%)	**84 (100%)**
50-59 years	0 (0%)	14 (50%)	0 (0%)	0 (0%)	14 (50%)	**28 (100%)**
Total	**14 (5%)**	**28 (10%)**	**42 (15%)**	**84 (30%)**	**112 (40%)**	**280 (100%)**

*E. Educational Level * Research of Information Cross tabulation*

Table IID revealed that only 42.9% of 98 university graduates use their mobile phones for researching information, followed by 50% of 56 secondary schools' dropouts and 20% of 70 primary school dropouts. However, none of the educated and those from tertiary institutions use their mobile phones for researching information. This implies that the higher a smallholder farmer is educated, the most likely he/she will use his/her mobile phone for research purposes. This is because they want to stay informed of the agricultural related information such as weather changes, market prices, improved seeds, fertilizers, chemicals, etc. overall, only 10% of 280 respondents use their mobile phones for research purposes.

TABLE IID. Educational level * Research of information cross tabulation.

Educational Level	Research of Information					Total
	strongly disagree	disagree	I am not sure	agree	strongly agree	
None	28 (66.7%)	0 (0%)	14 (33.3%)	0 (0%)	0 (0%)	42 (100%)
Primary	42 (60%)	14 (20%)	0 (0%)	14 (20%)	0 (0%)	70 (100%)
Secondary	28 (50%)	0 (0%)	0 (0%)	28 (50%)	0 (0%)	56 (100%)
Tertiary	0 (0%)	0 (0%)	14 (50%)	0 (0%)	0 (0%)	14 (100%)
University	0 (0%)	14 (14.3%)	14 (14.3%)	42 (42.9%)	28 (10%)	98 (100%)
Total	**98 (35%)**	**28 (10%)**	**42 (15%)**	**84 (30%)**	**28 (10%)**	**280 (100%)**

*F. Income Level * Making Transactions Cross tabulation*

Table IIE revealed that majority, 80% out of 70 smallholder farmers who earn between ₦10,000-₦20,000 use their mobile phones for transactional purposes. In addition to that, 66.7% out of 42 smallholder farmers who earn less than ₦10,000 use their mobile phones for transactional purposes. Furthermore, 50% out of 56 smallholder farmers who earn between ₦21,000-₦30,000 use their mobile phones for

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transactional purposes. Last but not least, 40% out of 70 smallholder farmers who earn more that ₦40,000 use their mobile phones for transactional purposes. The above results imply that irrespective of one's income, one can use their mobile phones for transactional purposes as long as they can afford recharge cards and pay for call tariffs.

TABLE IIE. Income level * Making transactions cross tabulation.

Income Level	Making Transactions					Total
	strongly disagree	disagree	I am not sure	agree	strongly agree	
Less than ₦ 10,000	0 (0%)	0 (0%)	0 (0%)	28 (66.7%)	14 (33.7%)	**42 (100%)**
Between ₦ 10,000- ₦ 20,000	14 (20%)	0 (0%)	0 (0%)	56 (80%)	0 (0%)	**70 (100%)**
Between ₦ 21,000- ₦ 30,000	0 (0%)	14 (25%)	14 (25%)	0 (0%)	28 (50%)	**56 (100%)**
Between ₦ 31,000- ₦ 40,000	28 (66.7%)	0 (0%)	0 (0%)	14 (33.7%)	0 (0%)	**42 (100%)**
Greater than ₦ 40,000	14 (20%)	0 (0%)	0 (0%)	28 (40%)	28 (40%)	**70 (100%)**
Total	**56 (20%)**	**14 (5%)**	**14 (5%)**	**126 (45%)**	**70 (25%)**	**280 (100%)**

G. Mobile Phones Applications in Enhancing Agriculture Knowledge

The second objective of this study was to find out the relevance of mobile phones applications in enhancing agricultural knowledge among smallholder farmers in Kura local government. Table IIIA revealed that majority (50%) of the respondents agreed that they use their mobile phones to make calls to customers and other farmers. Furthermore, 65% and 50% of the respondents respectively agreed that they use their mobile phones to research about market prices and get information about market and availability of different commodities. In addition to that, (35%) of the respondents agreed that they use a mobile phone to market their commodities on social media. Similarly, 30% and 35% of the respondents respectively agreed that they use their mobile phones to get world news in the agricultural sector and access basic financial services. However, 40% of the respondents said they were not sure if they use their mobile phones to access information about new agricultural techniques. On the other hand, 45% of the respondents disagreed that they use their mobile phone to receive alerts about farmers' training, workshops or seminars while 40% of the respondents disagreed that they use their mobile phones to get weather information. Similarly, 30% of the respondents disagreed that they use their mobile phones only for music, radio, and movies.

TABLE IIIA. Mobile phones applications in enhancing agriculture knowledge.

Relevance of Mobile Phones	SD	D	N	A	SA
I use my phone to make calls to customers and other farmers.	14 (%)	42 (15%)	0 (0%)	140 (50%)	84 (30%)
I use my phone to research about market prices of my products.	0 (0%)	0 (0%)	56 (20%)	182 (65%)	42 (15%)
I use my mobile phone to get information about the market and availability of different commodities.	84 (30%)	0 (0%)	28 (10%)	140 (50%)	28 (10%)
I use my mobile phone to receive alerts about farmers' trainings, workshops or seminars.	14 (5%)	126 (45%)	56 (20%)	70 (25%)	14 (5%)
I use my mobile phone to access information about new agricultural techniques.	56 (20%)	28 (10%)	112 (40%)	56 (20%)	28 (10%)
I use my mobile phone to get weather information.	84 (30%)	112 (40%)	14 (5%)	42 (15%)	28 (10%)
I use my mobile phone to market my commodities on social media.	70 (25%)	84 (30%)	0 (10%)	98 (35%)	28 (10%)
I use my mobile phone only for music, radio and movies.	70 (25%)	84 (30%)	56 (20%)	42 (15%)	28 (10%)
I use my mobile phone to get world news in the agricultural sector	70 (25%)	42 (15%)	70 (25%)	84 (30%)	14 (5%)
I use my mobile phone to access basic financial services.	70 (25%)	14 (5%)	70 (25%)	98 (35%)	28 10%)

*H. Gender * Information about the Market Cross tabulation*

Table IIIB revealed that majority, 66.7% out of 168 of the male respondents agreed that they use their mobile phones to get information about the market and availability of different commodities. Only 25% out of 112 female respondents agreed on the same matter. This implies that the male smallholder farmers use their mobile phones for getting information about the market than their female counterparts. Overall, 50% out of 280 respondents agreed on the matter.

TABLE IIIB. Gender * Information about the market cross tabulation.

Gender	I use my mobile phone to get information about the market and availability of different commodities.				Total
	strongly disagree	I am not sure	agree	strongly agree	
Male	14 (8.3%)	14 (8.3%)	112 (66.7%)	28 (16.7%)	**168 (100%)**
Female	70 (62.5%)	14 (12.5%)	28 (25%)	0 (0%)	**112 (100%)**
Total	**84 (30%)**	**28 (10%)**	**140 (50%)**	**28 (10%)**	**280 (100%)**

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*I. Age * Access Information about New Agricultural Techniques Cross tabulation*

Table IIIC revealed that majority 33.3% out of 42 respondents within the age group of 40-49 years use their mobile phones to access information about new agricultural techniques. However, 50% out of 28 respondents within the age of 50-59 years do not use their mobile phones for accessing information about new agricultural techniques. On the other hand, the majority of the respondents within the age group of fewer than 20 years and between 20-29 years were not sure of the matter.

TABLE IIIC. Age * Access information about new agricultural techniques cross tabulation.

Age	I use my mobile phone to access information about new agricultural techniques.					Total
	strongly disagree	Disagree	I am not sure	agree	strongly agree	
Less than 20 years	0 (0%)	0 (0%)	28 (100%)	0 (0%)	0 (0%)	**28 (100%)**
20-29 years	28 (28.6%)	0 (0%)	42 (42.9%)	28 (28.6%)	0 (0%)	**98 (100%)**
30-39 years	14 (33.3%)	0 (0%)	0 (0%)	14 (33.3%)	14 (33.3%)	**42 (100%)**
40-49 years	0 (0%)	28 (33.3%)	28 (33.3%)	14 (16.7%)	14 (16.7%)	**84 (100%)**
50-59 years	14 (50%)	0 (0%)	14 (50%)	0 (0%)	0 (0%)	**28 (100%)**
Total	**56 (20%)**	**28 (10%)**	**112 (40%)**	**56 (20%)**	**28 (10%)**	**280 (100%)**

*J. Educational Level * Research about Market Prices of Products Cross tabulation*

Table IIID revealed that all (100%) out of 14 respondents who had a tertiary level of education use their mobile to research about market prices of their products. Furthermore, all (100%) out of 70 respondents with primary education also agreed that they use mobile phones for the same purpose. Overall, 65% out of the 280 respondents agreed they use their mobile phones to research about market prices of their products.

TABLE III D. Educational level * Research about market prices of products cross tabulation.

Educational Level	I use my phone to research about market prices of my products.			Total
	I am not sure	Agree	strongly agree	
None	28 (66.7%)	14 (33.7%)	0 (0%)	**42 (100%)**
Primary	0 (0%)	70 (100%)	0 (0%)	**70 (100%)**
Secondary	0 (0%)	56 (100%)	0 (0%)	**56 (100%)**
Tertiary	0 (0%)	0 (0%)	14 (100%)	**14 (100%)**
University	28 (28.6%)	42 (42.9%	28 (28.6%)	**98 (100%)**
Total	**56 (20%)**	**182 (65%)**	**42 (15%)**	**280 (100%)**

IV. CONCLUSION

The general conclusion, mobile phones can help smallholder farmers in Kura local government to improve their agricultural productivity by giving them access to basic financial services, new agricultural techniques, and new markets, in turn helping them to secure better prices for crops and better return on investments. As their income improves with each harvest, they can invest in better seeds, fertilizers, and chemicals.

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