International J. of Ext. Educ. Vol. XVIII: 25-33, 2022 ISSN : 2319-7188

Capacity building needs of rural farmers on digital tools in Kwara State, Nigeria

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ABSTRACT

Digitalisation has brought about a total revolution in the history of digital agricultural development in Nigeria. This study therefore, examined the capacity building needs of rural farmers on digitalization in Kwara State, Nigeria. Purposive and random sampling techniques were employed to select 160 registered farmers from four communities within the study area. A well-structured questionnaire was used to elicit information from the respondents. The findings revealed that majority of the farmers were male (83.1%), middle aged (39.4%) with mean age of 46.7years. Majority of respondents (75.0%) were married with a mean household size of 7 persons. Preponderant (54.4%) had secondary education. The study indicated that farmers had farming experience of 11-20 years. Most (62.5%) of the farmers earned up to 51,000-100,000 on a monthly basis. Farmers got their information on the use of digital tools mostly from extension agents. The major areas where farmers did not need capacity building were sending messages on mobile phones (9.25) and use of interactive voice response on phones (7.07). The major constraints faced by farmers on the usage of digital tools were erratic power supply and poor network coverage and internet facilities. The results of the tested hypothesis revealed that there was a positive and significant relationship ($p < 0.05$) between the capacity building needs of farmers, their age and level of education. The study therefore recommended capacity building development for farmers in order to increase their productivity and income through available digital tools and technologies.

Key words: *Digital tools, Innovations, Training, Information, Extension services.*

INTRODUCTION

According to Food and Agriculture Organization, 'the world population is expected to reach the figure of 9.7 billion people in 2050, and to feed that population, global food production will need to grow by 70 per cent, and for Africa which is expected to be home to about 2 billion people, by then farm productivity needs to accelerate at a faster rate through the use of digitized farming to avoid mass hunger'. Ndubuisi (2017) stated that, 'For decades, African government have used many policy instruments to improve farm productivity and there has been significant growth in digitalization'. According to CTA (Technical Centre for Agricultural and Rural Cooperation) report in 2019, both the European Union-African Union Task for Food and Agriculture (TFRA) and the Communique from the Global Forum for Food and Agriculture (GFFA) highlighted the power of digitalization in transforming agriculture. The report also paints a clear picture of the recent emergence of more than 390 digital solutions in African agriculture.

Digitalization in agriculture has been defined in various ways. The definition of digitalization for agriculture according to the digitalization of African Agriculture report 2019, is the use of digital technologies, innovations and data to transform business models and practices across the agriculture value chain, including production, post-harvest handling, market access, finance and supply chain management (CTA, 2019). Young (2018) defined Digitalization as the use of data and advanced computational techniques to make more informed decisions about managing our crop and agronomic operations. It encompasses all the information in the agricultural ecosystem, including data about the crop itself, equipment data,

environmental data, operational and even market and logistics data.

Today, digitalization has brought about a total revolution in the history of digital agricultural development in Nigeria. Lena (2019) stressed that the importance of digitalization among rural farmers cannot be overemphasized as it offers small scale farmers a range of opportunities, such as the exchange of information, decision making, storing and recording of farm data for future use, and also to access information about market prices, weather conditions and also cultivation methods in order to enhance farm productivity. Lena (2019) further stated the examples of digitalization which includes the use of mobile phones, mobile apps, computers, radio, POS (Point of sale transactions), use of internet as a means to get more agriculture related information, aerial images taken from satellites or drones, weather forecasts, and soil sensors etc.

According to a report from Nigerian Investment Promotion Commission (NIPC) in 2016, Nigeria's first digital agricultural platform was launched and this platform enables rural farmers start and complete a farming cycle and also expanding farm operation by making use of the 50 million hectares of arable farmland in Nigeria that is currently underutilized. 'ZENVUS is also a Nigerian precision farming start-up which measures and analyses soil data like temperature, nutrients and vegetative health of crops. This process improves farm productivity and reduces input work by using analytics' (Ndubuisi, 2017).

However, we live in a digital society where Information and Communications Technology (ICT) plays a major role in the exchange of information from one person to another, from place to place and also in modern day agriculture. The internet, mobile phones, and related technologies that facilitate the collection, storage, analysis and sharing of data and information are changing many aspects of life among a growing share of the world's population (World Bank, 2019). Digitalization in agriculture is gradually becoming a trend which is being adopted by rural farmers and it has proven to be a very efficient and important method of improving farming systems which can help farmers enhance their productivity and also help them in making better decisions relating to the processing, packaging and marketing of their agricultural products.

Digital technologies have been spreading rapidly, even among the poorest 20% in developing countries, 70% have access to mobile phones. More than 40% of the global world population has internet access and there are major initiatives underway to connect those still unconnected with the great majority of them being in rural areas of developing countries (World Bank Group, 2016). However, through agricultural extension and advisory services, training based on use of new production technologies such as improved seed varieties, soil nutrient management, use of drones and satellites, global positioning system, pest control methods etc, need to be provided to rural farmers to enhance profitability of farming systems. According to Global Forum for Rural Advisory Services, (GFRAS) 2011, agricultural extension agents can provide necessary information to help rural farmers improve the little knowledge they already have on digitalization by various extension teaching methods such as exhibition, method demonstration, result demonstration, farm visits, and mass media. Boniface *et al.,* (2019) emphasized that digitalisation is improving the agricultural extension system by providing services at the right time and facilitating adoption of new agronomic practices resulting in yield improvements and higher incomes for farming households.

However, in emerging economies and rural areas, there are still some constraints which limits the use of digital technologies at farm level and this may be due to a lot of specified reasons and socio-economic factors which restrict the accessibility to resources needed to enlighten rural farmers on the prospects of digitalization. Based on a World Bank

Group, (2019) the authors acknowledged that adoption levels vary greatly and that digital technologies may have inherent risks, but the positive potential of digitalization certainly outweighs the risks.

In view of this, it is pertinent to carry out a study to examine the areas where rural farmers have knowledge short fall on the use of digital technologies in agriculture, so that agricultural extension agents will be able to provide appropriate training that will help to enhance their capacity in leveraging on the numerous benefits that digitalization in agriculture has to offer.

METHODOLOGY

The study was carried out in Ilorin, Kwara State, Nigeria. It is located between latitude 8^0 48'N and longitude $4^0$54' E. The local government shares a boundary with Ilorin South, Ilorin West, Moro and Ifelodun. The local government area has land area of about 36,825km^2 and a population of 2,365,353 (NBS, 2017). The annual rainfall ranges between 1000mm and 1500mm and it has two distinct seasons, rainy and dry season. Average temperature ranges between 30°C and 35°C.

The population for the study was the rural farmers in Ilorin East Local Government Area of Kwara state. The total population of registered farmers was 4,862. Purposive sampling technique was used to select Ilorin East local Government in the state, due to higher number of farmers according to the State Ministry of Agriculture and Natural Resources. Simple random sampling technique was used to select 4 communities from the local government namely Gambari, Zango, Oke-Oyi and Marafa. Then, forty (40) respondents were selected from each of the communities. The total sample size of 160 respondents was used for the study.

Measurement of Variables

The independent variables consist of the socio-economic variables which were measured as follows:

Source of information: A list of information sources was presented to the respondents and they were asked to state the one they utilised to gain knowledge on digitalization.

Access to digital tools: Respondents were asked if they had access to digital tools that could be used to improve farm productivity and this was carried out based on a dichotomous scale of Yes (1) or No (2).

Constraints to the usage of digital tools: A list of constraints items was presented to the respondents and their response on the severity of these items was measured on a 4-point Likert scale of Very severe (4), Severe (3), Moderately severe (2), Not Severe (1).

The dependent variable is the capacity building needs of rural farmers on digitalization and this was measured at Ordinal level. Farmers' areas of capacity building were determined by carrying out a task analysis on their ability to improve and retain skills and knowledge based on digitalization using the Difficulty, Importance and Frequency model including level of utilisation of digital tools. A benchmark score of 7 was recorded and this was gotten by adding all the mean scores based on level of difficulty, importance and frequency. Then, dividing by the total number of digital skills listed. A benchmark score below 7 implies that capacity building is needed while a benchmark score of 7 and above implies that capacity building is not needed.

Data collected were subjected to descriptive statistics such as frequency counts, percentages, mean(x), and ranking. The mean score was used as a benchmark to rank the variables in order. The null hypothesis formulated in the study was tested with Pearson's Product Moment Correlation (PPMC) to determine the relationship between selected socioeconomic characteristics and capacity building needs of rural farmers on digitalised tools.

RESULTS AND DISCUSSION

Table 1
Socio-economic Characteristics of the respondents (n=160)

Sl. No.	Variables	Frequency	Percentage	Mean
1	**Gender**			
	Male	120	75	
	Female	40	25	
2	**Age (years)**			
	26 – 40	46	28.7	46.7
	41 – 50	63	39.4	
	51 – 60	37	23.1	
	61 – 70	14	8.8	
3	**Household size**			
	0 – 5	14	8.8	7.0
	6 – 11	146	91.3	
4	**Level of Education**			
	No formal education	9	5.6	
	Primary education	29	18.1	
	Secondary education	87	54.4	
	Tertiary education	35	21.9	
5	**Farming experience (years)**			
	0 – 5	7	4.4	
	6 – 10	124	77.5	
	10 and above	29	18.1	
6	**Average monthly income from farming (Naira)**			
	10000 – 50000	25	15.6	
	51000 – 100000	100	62.5	
	101000 – 150000	29	18.1	
	151000 – 200000	6	3.8	
7	**Source of non-agricultural income**			
	Trading	46	28.7	
	Business owner	52	32.5	
	Government worker	25	15.6	
	Private employee	14	8.8	
	Artisan	23	14.4	
8	**Major crops grown**			
	Cassava	26	16.3	
	Maize	86	53.8	
	Soybean	19	11.9	
	Sorghum	19	11.9	
	Cowpea	10	6.3	
9	**Major livestock kept**			
	Goat	6	3.8	
	Sheep	16	10.0	
	Goat and Sheep	14	8.8	
	Ram	21	13.1	
	Rabbit	24	15.0	
	Poultry	60	37.5	
	Fishery	19	11.9	

Source: Field Survey, 2020

Table 1 shows that majority of the respondents (75.0%) were male while 25.0 per cent were female. This implies that agricultural activities in the study area were mostly carried out by male respondents. Meaning that farming maybe tedious for women and men has enough strength to do rigorous farming activities.

Most of the respondents (39.4%) were within the age category of 41-50 years with an average age of 46.7 years while 28.7 per cent were between 26-40 years. This implies that people involved in farming in the study area were in their productive years.

The result shows that higher percentage 75.0 per cent were married with mean household size of 7 persons while only 8.8 per cent were single. This suggests that there may be high demand for food and additional income as family size increases (Ogunlade, 2008). The household size is directly linked to the source of labour for that household. The larger the number of household size, the more helpful they will be to agricultural activities. The average farmer first exhausts all source of labour on family before hiring labour in order to reduce the cost of production (Olabanji and Ogunlade, 2020).

The level of education of farmers reveals that 54.4 per cent of farmers had secondary education and 21.9 per cent of the respondents had tertiary education. The ability of farmers to read and write may contribute to their information seeking behaviour (Dutta, 2009). A good educational background may also help facilitate farmers understanding and use of improved digital tools and technologies for improved farm productivity.

The results of the findings indicate that the majority of the respondents (77.5%) had 11-20 years of farming experience with an average monthly income of 51,000- 100,000. This shows that the farmers may have obtained some knowledge on digital tools which allowed them to adopt new methods that eventually translated to increase in their farm productivity. Most of them

were also business owners cum poultry keepers in order to earn more income.

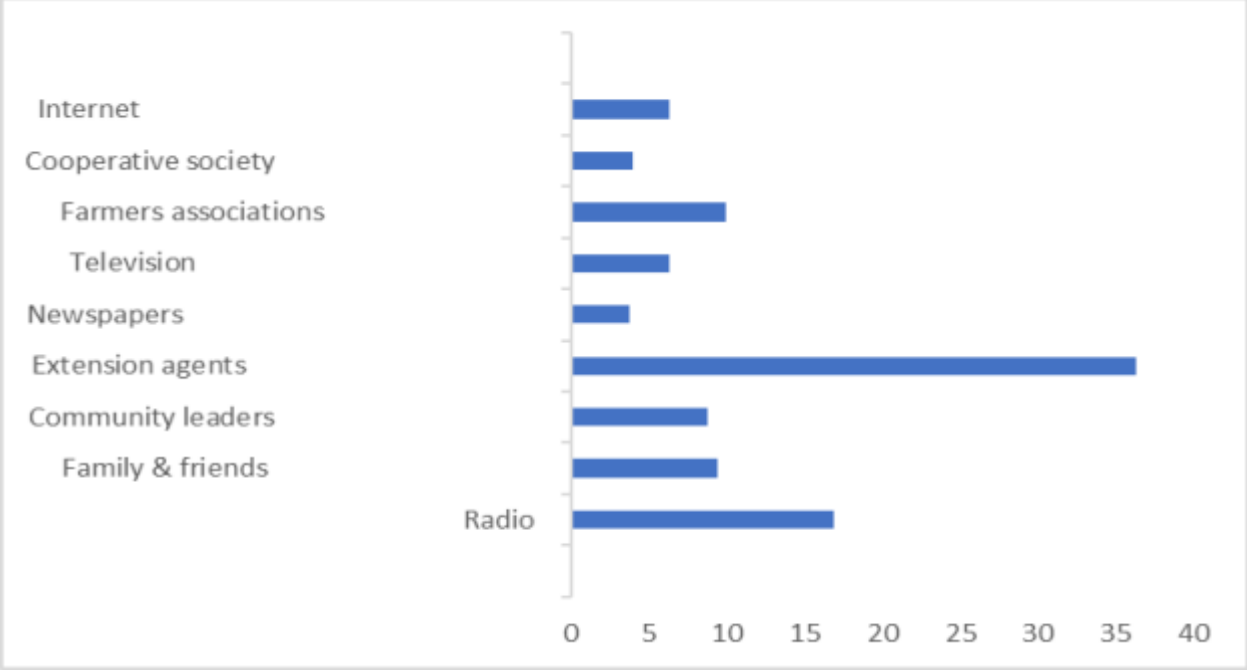

Figure 1: Sources of Information on Usage of Digital Tools

Figure 1 shows that 36.3 per cent of the respondents got information from extension agents, 16.9 per cent got information from radio while 9.4 per cent got information from family and friends. This finding reveals that majority of farmers got information on use of digital tools from extension agents, this implies that extension work was very effective in the study area and farmers were able to afford transistor radio set to get necessary information they need anywhere and at any time. Finding of this study is in congruent with the conclusion of USAID, 2017 that information delivery via digital channels allows extension workers to reach more farmers and provide more timely reminders and alerts, helping to prompt behavioural change and enhanced ways of learning by farmers and value chain actors.

Table 2
Types of Digital Tools Farmers Accessed

Sl. No.	Types of Digital Tools	Have access F (%)	Do not have access F (%)	Rank
1	Mobile phones	138 (86.2)	22 (13.75)	1
2	Smart phones	69 (43.1)	91 (56.9)	7
	SMS	138 (86.2)	22 (13.75)	2
3	WhatsApp	73 (45.6)	87 (54.4)	6
4	Facebook	78 (48.8)	62 (38.8)	4
5	E-mails	58 (36.2)	102 (63.7)	9
6	Computer / Laptop	16 (10.0)	144 (90.0)	13
7	Tablet	44 (27.5)	116 (72.5)	12
8	Decision support systems	119 (74.3)	41 (25.6)	3
9	Mobile apps for agriculture	57 (53.6)	103 (64.4)	11
10	Digital phone camera	78 (48.8)	62 (38.8)	5
11	Banking apps	57 (53.6)	103 (64.4)	10
12	Precision farming tools	12 (7.5)	148 (92.5)	14
13	Internet	69 (43.1)	91 (56.9)	8

Source: Field Survey, 2020

Table 2 above indicates the types of digital tools farmers were able to access. There were 14 digital tools and technologies to which farmers were asked for access. The results revealed that 86.2 per cent respondents had access to mobile phones as well as SMS, while 74.3 per cent had access to decision support system. Farmers access to digital tools such as use of WhatsApp (45.6%), Facebook (48.8%), Smartphones (43.1%), Internet (43.1%), Emails (36.2%), mobile apps for agriculture (35.6%), Banking apps, (35.6%), Computer/Laptops (10.0%), Tablets (10.0%), Precision tools (7.5%) were below average. Mobile phones ranked first as the most accessed digital tool in the study area and this implies that farmers can afford conventional mobile phones as it is inexpensive compared to other smartphones. Hence, SMS and decision support systems were also highly accessed and that is why they both ranked 2nd and 3rd among the digital tools. Meaning that farmers can call and receive messages on weather forecast, pest management, market linkage whenever they need help in getting agricultural information or sending feedback.

Farmers' access to other digital tools was low, it implies that these digital tools and technologies were not prominent in the study area particularly precision farming tools which was ranked 14th among all other digital tools and technologies. Pande and Deshmukh (2015), corroborate knowledge shortfall on the usage of ICT devices and applications that facilitate farming activities like radio, television, cellular phones, computer and tablets; Digital technologies such as internet, social media apps, hardware and software; Precision agriculture tools such as use of drones, satellite, GPS and aerial mapping.

Table 3
Level of Utilization of Digital tools and Capacity Building Needs on Digital skills

Sl. No.	Digital skills	Frequency	Importance	Difficulty	MS	Implication
1	Sending messages on mobile phones	4.93	2.96	1.36	9.25	C.B. Not Needed
2	Use of voice messages on WhatsApp	2.73	1.73	2.49	6.95	C.B. Needed
3	Creating groups and sending messages on WhatsApp	2.39	1.83	2.21	6.83	C.B. Needed
4	Snapping and uploading pictures on social media apps	2.35	1.83	2.21	6.39	C.B. Needed
5	Sending emails with attached files on phones and laptops	1.23	1.18	3.42	5.83	C.B. Needed
6	Downloading and viewing files from emails and mobile apps	1.94	1.58	2.97	6.49	C.B. Needed
7	Use of interactive voice response on phones	2.79	2.14	2.14	7.07	C.B. Not Needed
8	Use of internet to browse for weather forecast, seeds and fertilizers	2.28	1.76	2.34	6.38	C.B. Needed
9	Use of online banking apps, POS and USSD codes	2.31	1.79	2.33	6.43	C.B. Needed
10	Use of precision farming tools (GPS, Soil sensors)	1.61	1.69	3.11	6.41	C.B. Needed
11	Use of agricultural apps such as farm crowdy, zenvus	1.61	1.46	3.16	6.23	C.B. Needed

Source: Field Survey, 2020 ***MS = Mean Score, *C.B. = Capacity Building**

Table 3 above indicates the areas of capacity building and level of utilization of digital tools. The technique was analysed with the use of a total mean score to identify areas where training is needed. Using the mean score benchmark of 7. The findings indicate that the major areas where capacity building was needed by rural farmers in the study area were "Use of voice messages on WhatsApp" (6.95), Creating groups and sending messages on WhatsApp" (6.83), "Use of internet to browse for weather forecast, seeds and fertilizers" (6.38), "Sending emails with attached files on phones and laptops, (5.83), "Downloading and viewing of files from emails and mobile apps"(6.49), "Snapping and uploading pictures on social media apps"(6.34), "Use of online banking apps and USSD codes" (6.43), "Use of precision farming tools such as GPS, soil sensors" (6.41), "Use of agricultural apps" (6.23). This implies that the farmers skills on usage of digital tools and technologies were limited in the study area and this may have adverse effects on their farming businesses. This finding is in consonant with Nikola *et al.,* (2019) who opined that if rural farmers are given efficient training on new methods of digitalization, they may be able to obtain and gain the knowledge needed to increase their farm productivity and also adopt new methods of technology.

Table 4
Constraints to the use of digital tools

Sl. No.	Constraints	Very severe F (%)	Severe F (%)	Moderately severe F (%)	Not severe F (%)	Mean Score (MS)	Rank
1	Lack of skills and capacity to use tools	18(11.3)	104(65.0)	27(16.9)	11(6.9)	2.81	7th
2	High cost of technology and tools	105(65.6)	43(26.9)	0(0.0)	12(7.5)	3.51	3rd
3	Poor network coverage and internet facilities	132(82.5)	16(10.0)	1(0.6)	11(6.9)	3.68	2nd
4	Erratic power supply	131(81.9)	11(6.9)	18(11.3)	0(0.0)	3.71	1st
5	Lack of training on use of digital tools	78(48.8)	57(35.6)	25(15.6)	0(0.0)	3.33	4th
6	Limited access to available tools	25(15.6)	98(61.3)	29(18.1)	8(5.0)	2.88	6th
7	High cost of maintenance	34(21.3)	126(78.8)	0(0.0)	0(0.0)	3.21	5th
8	No time to spend on use of digital tools and technologies	29(18.1)	85(53.1)	10(6.3)	36(22.5)	2.67	8th

Source: Field Survey, 2020

Table 4 shows the constraints to the use of digital tools by farmers in the study area. The constraint mostly faced by farmers was erratic power supply with MS= 3.71. The 2nd ranked constraint faced by farmers was poor network coverage and internet facilities with MS= 3.68. High cost of technology and tools ranked 3rd with MS=3.5, Lack of training on digital tools ranked 4th with MS= 3.33. Although, farmers in the area may have access to smartphones, WhatsApp, Facebook, but may not be able to benefit from the full potentials of these digital tools and technologies due to some constraints in using them for advertising, marketing and selling their produce to other consumers. FAO, (2019) found these constraints to be dominant in many African countries but Nikola *et al,* 2019 indicated that access to digital tools, proper training on the usage of digital tools, low cost of digital tools and adequate infrastructure are the major solutions to these constraints.

Table 5
Result of Pearson's Product Moment Correlation

Sl. No.	Variables	r- value	p - value	Remarks
1	Gender	0.046	0.565	Not significant
2	Age	0.172	0.030*	Significant
3	Marital status	-0.090	0.256	Not significant
4	Household size	0.110	0.165	Not significant
5	Level of education	0.209	0.002*	Significant
6	Years of experience	-0.027	0.739	Not significant

Source: Field Survey, 2020 *Correlation is significant at 0.05 levels

As shown in Table 5 at p< 0.05, Age (r = 0.172) had positive and significant relationship with the capacity building needs on digitalization. This implies that the older farmers may have propensity to acquire more training on the use of digital tools and technologies for agricultural purposes than the

younger ones. It further reveals that there is a positive and significant relationship (r = 0.209) between level of education and capacity building needs of rural farmers on digitalization which implies that those farmers with higher level of education are the one who will be willing to learn new skills on digital tools and technologies in order to improve on their farm productivity and doubling income. However, those two significant variables (age and level of education) have meaningful impact on digitalisation in the study area than the others that are not significant.

CONCLUSION

Several digital tools and technologies such as decision support system, mobile phones, mobile apps for agriculture, digital phone camera, banking apps, precision farming tools and internet were introduced in this study for farmers' adoption in order to increase their farm productivity and income. This study systematically itemised those digital tools that were available to farmers, those that they were able to access or not. Their level of usage was limited and many factors constrained the farmers from having full use of the digital tools and technologies. Capacity building development was therefore recommended for farmers in order to increase their productivity and income through available digital tools and technologies. Age and level of education were the key variables that have significant influence on the capacity building needs of farmers on digitalisation.

Paper received on 25.07.2022
Accepted on 12.08.2022

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