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ANALYSIS OF FACTORS INFLUENCING USAGE OF INFORMATION AND COMMUNICATION TECHNOLOGIES AMONG SMALL HOLDER CASSAVA FARMERS IN BENUE AND NASARAWA STATES, NIGERIA

Adanu, D. O., Odiaka, E. C., Mbah, E. N. and Kughur, P. G.
Department of Agricultural Extension and Rural Development, Joseph Sarwuan Tarka University, Makurdi, Benue State, Nigeria

Email: Dorcasoadanu@gmail.com. **07031870988**

Abstract
The study analysed factors influencing usage of information and communication technologies among smallholder cassava farmers in Benue and Nasarawa States, Nigeria. All registered cassava farmers in Benue and Nasarawa States formed the population of the study. Primary data were collected using structured questionnaire administered through interview. Data collected were analyzed using descriptive statistics. Findings showed that majority (63.08%) of the respondents were male, 48.16 % were between the ages of 31 - 40 years,70.97 % were married, 38.35 % had formal education, 47.31 % of the respondents had household size of between 1- 5 persons, about 37 % were farmers. The findings further revealed that 94.0 % of the respondents used mobile phones, 64.16% used radio. Results of factor analysis indicated that the factors that influenced usage of information and communication technologies among the respondents were socio-economic factors such as sex (63.08%), age (48.16%), education (38.35%), household size (47.31%), farming experience (32.26%), annual income (40.14%), farm size (86.38%), farming experience (32.26%), marital status (70.97%) and major occupation (36.86%). Administrative factors such as electricity outage and search of business-related information and infrastructural cum technical factors such as poor network coverage, skills on internet operation, poor internet connection, network interruption and information and communication technology facilities were highlighted. Based on the findings of this study, it was concluded that the respondents were educated enough to use information and communication technologies. Information and communication technologies mostly used were mobile phone and radio. The respondents made profit by selling their products using marketing information, thereby leading to increase in income and improvement in their standard of living among others. It is recommended that farmers be trained to enhance their technical knowledge. Information and communication technology devices should be subsidized for farmers and they should be trained on how to use them.
Keywords*: Analysis, factors, Influencing, Usage, Information and communication technologies*

1.0 Introduction

Agricultural sector is the backbone of majority of sub-Saharan African countries' economies, providing food, employment, foreign exchange and raw materials for industries (World Bank, 2014). It accounts for 24% of the gross domestic product (GDP) in sub-Saharan Africa. Studies have shown that growth in GDP which originates from agriculture is about four times more effective in raising the incomes of a country's poorest people as opposed to GDP growth derived from other sectors such as manufacturing (Fan *et al*., 2013). According to the International Fund for Agricultural Development (IFAD, 2011) cited in Adanu *et al.* (2019), 70% of the world's very poor people live in rural areas in developing countries and usually depend directly or indirectly on agriculture for their livelihoods. According to Mdlalose (2016), the agricultural sector remains the mainstay of most developing countries of the African continent. The sector plays a vital role in poverty alleviation and human development and contributes significantly to the Gross Domestic Product (GDP) of these countries (Temba *et al*., 2016). It also provides a reliable platform for rural development through many small-scale producers who supply mainly the informal markets (Nkukwana, 2018).

In Nigeria, small-scale farmers form the bulk of farming community and for agriculture to really develop, the small-scale farmers need to know and understand what constitute progress in agriculture. The extent of the farmers' progress is hinged largely on their access to accurate and reliable information of improved technologies. Dissemination of farm information can be said to be as critical as the development itself (Ajayi *et al*., 2016). Any technology, no matter how promising, if it does not reach the farmer, can be perceived as useless by the farmer. Information is considered as a

resource that must be acquired and used by individuals in order to make informed decision (Muhammed *et al*., 2018). It is obvious that individuals who receive appropriate and timely information will make better decision. However, agricultural sector like any other sector is information intensive and information and communication technologies (ICTs) play a very vital role in facilitating information exchange among people. ICT provides a platform for increased amount of information that can be transmitted to all participants in the agricultural sector as well as decrease the cost of dissemination of information (Ali *et al*., 2015). Oladele (2015) defined ICT as all technologies that allow for the efficient and cost-effective flow of information. According to Ologundudu and Eniola (2021), ICTs can be interpreted broadly as technologies that facilitate communication, processing and transmission of information by electronic means. The World Bank (2011) defines ICT as any device, tool or application that permits the exchange, or collection of data through interaction or transmission. ICT encompasses both the Internet-enabled sphere as well as the mobile sphere, which is powered by wireless networks (Pawar and Yadav, 2021), and it includes technologies such as radio, television, mobile phone, computer and other information technologies.

According to Food and Agriculture Organization (2017), the performance of smallholder cassava farmers is of immense importance in most developing countries where agriculture remains the engine of growth. Africa produces over 59% of world's cassava, with Nigeria taking the lead globally with a production of about 57.8 million metric tonns as at 2017. Cassava has increasingly gained prominence, economically and nutritionally over the years because of the multi-uses of its starch rich roots (Olaniyi *et al*., 2013). Cassava has been transformed from being a staple food to a source of income

as well as potentials of being valued as a major foreign exchange earner that can impact positively on the economic fortune of Nigeria. Aboajah *et al.* (2018) observed that cassava is primarily a product for food, especially in the form of garri, tapioca and fufu for human consumption. The crop can be processed into several secondary products for industrial market value such as chips, pellets, flour adhesives, alcohol and starch which are vital raw materials in the livestock feed, alcohol/ethanol, textile, confectionary, wood, food and soft drinks industries. They are also tradable in the international market. There is no gainsaying the fact that smallholder cassava farmers need to shift from subsistence production system to market oriented production system. The production shift is expected to systematically bridge the yield gap from the current average yield of 10 tonns per hectare to 40 tonns per hectare, Federal Ministry of Agriculture and Rural Development (FMARD, 2021). In order to shift from subsistence production system, cassava farmers need adequate information using ICT tools. Farmers in the rural areas are to benefit from the use of ICTs in order to obtain information to improve cassava production. Balderama (2009) pointed out that, there is a dearth of knowledge and information in agriculture that is yet to be exploited, especially in most of the developing countries of which Nigeria is inclusive. It is expected that, there should be a flow of knowledge and new information from various research institutes to the farmers, especially cassava farmers.

In order for cassava farmers to function effectively and efficiently, they need good information on a variety of subjects such as production, processing, storage and marketing. It is expected that modern ICT can play a role in bridging information gap and reduce the information asymmetry that exists between the large and the small cassava farmers by making the content precise, timely and localized and thus enhance

dissemination of knowledge and information on technologies, inputs, markets and prices. This high use of ICT is likely to stimulate economic development (Mittal, 2012). Hence, use of ICT may contribute to a well-functioning agricultural market which would lead to increase in rural incomes and hence contribute to cassava production.

2.0 Objectives of the Study

The broad objective of the study was to analyse factors influencing usage of information and communication technologies among small holder cassava farmers in Benue and Nasarawa States, Nigeria and the specific objectives were to:

i. describe socioeconomic characteristics of smallholder cassava farmers in Benue and Nasarawa States, Nigeria;
ii. identify types of information and communication technologies used by the respondents; and
iii. ascertain factors influencing usage of information and communication technologies by the respondents.

3.0 Methodology

The study was conducted in Benue and Nasarawa States, Nigeria. The States are located in North Central Zone of Nigeria, commonly referred to as the North central region or the Middle-Belt region.

Benue State lies within the lower river Benue in the Middle –Belt region of Nigeria. Its geographic coordinates are longitudes 6° 31 E and 10°E of the Greenwich Meridian, and latitudes 6° 30' N and 8° 10' N of the equator [Benue State Agricultural and Rural Development Authority (BNARDA, 2005]. Benue State has a land mass of about 33,955km with 23 local Government Areas. The State is divided into three

agricultural zones, namely; North Eastern Zone, North Western Zone and Southern Zone. Benue State has a projected population of 6,120,524 in 2020 based on the world Bank annual population growth rate of 2.1 % for Nigeria (Wold Bank, 2020). The State has favorable agro-climate ecologies for arable crops, tree crops and livestock production and enjoys two distinct seasons, namely; wet and dry seasons. Annual rainfall record varies from 1700mm in the Southern part to 1250mm in the Northern part with annual temperature variations of 30^{o}C - 38^{o}C (BNARDA, 2005). These features create favorable conditions for the cultivation of crops such as yam, cassava, sweet potato, maize, millet, rice, soybean, groundnut and beniseed. Citrus, sugar cane, oil-palm and banana are other crops grown in the state. Livestock rearing such as cattle, sheep, goats, pigs and poultry are also practised in the State.

Nasarawa State is located between latitudes 7^{0} N and 9^{0} N, and logitudes7^{0} E and 11^{0} E, and a total land mass area of about 27,137.8 Sqkm. The State has an estimated population of 4,786,575 based on the World Bank annual population growth rate of 2.1 %. The State has 13 Local Government Areas. Nasarawa State lies within the Guinea Savannah region and has tropical climate with moderate rain fall. The State is made up of plain lands and hills measuring up to 300ft above sea level at some points, with annual mean rain fall of 1311.75cm and daily temperature range of 25- 37. The major economic activity carried out in Nasarawa State is agriculture and crops produced include cassava, rice, yam, maize, beans, guinea corn, acha and millet. Processing of salt is another major economic activity in the State, Nasarawa produces a large proportion of the salt consumed within the country. The State is blessed with precious mineral resources like columbite, coal and aquamarine and hence the name 'home of solid minerals'.

The population of the study consisted of all smallholder cassava farmers in

Benue and Nasarawa States, Nigeria. A sample size of 279 respondents was selected using stratified, purposive and simple random sampling techniques. At the first stage, two States were purposively selected from North Central region of Nigeria due to high concentration of smallholder cassava farmers. The States were Benue and Nasarawa States; Secondly, the population was stratified based on the agricultural zones in the States. At the third stage of sampling, two Local Government Areas were selected from each of the agro-ecological zones of the States using a simple random sampling technique. The selected Local Governments Areas from Benue State were Vandeikya and Ushongo from Northern-Eastern zone, Gboko and Guma from North- Western zone and Oju and Ohimini from Southern zone. In Nasarawa State, Keana and Lafia were selected from Southern zone, Nasarawa and Toto from Western zone while Nasarawa Eggon and Keffi were selected from Central zone. The fourth stage of sampling involved purposive selection of two rural communities from each of the selected LGAs due to high concentration of smallholder cassava farmers. In Vandeikya; Mbagbera and Mbajor were selected; Ikov and Utange from Ushongo; Mbaanku and Gboko East from Gboko; Mbadwem and Nyiev from Guma; Oju and Adokpa from Oju while Ochobo and Awule from Ohimini. Iwagu and Aloshi were selected from Keana; Shabu and Chiroma from Lafia; Kokona and Doma from Nasarawa; Umaisha and Gadagwa from Toto, while Wakama and Alizaga from Nasarawa Eggon and Angwan-Iya and Limon-Abaji were selected, from Keffi. A sample frame was generated, 3% of the respondents were randomly selected which resulted to a sample size of 279 respondents.

4.0 Results and Discussion

4.1 Socio – economic Characteristics of the Respondents

Table 1 shows that majority (63.1%) of the respondents were predominantly

males. This implies that there was male domination in cassava production among smallholder cassava farmers in the study area. This domination could be that cassava production is labour demanding. This is in tandem with Oke *et al*. (2019) who found that most farmers in Oyo State, Nigeria were males, a factor associated with the tedious nature of cassava farming and land is predominantly own by males in Nigeria. For age pooled result depicted that 48.16 % were between 31 and 40 years This implies that the farmers were basically youths or young adults that were still active to undertake farming activities. This reveals that this group of people can easily learn and use ICTs. The use of information and communication technologies is often associated with the younger generation. It is also an indication that the respondents will have the strength required to be involved in cassava production for a long period of time. This is in tandem with Muhammad *et al*. (2019) that majority of small-scale farmers in Federal Capital Territory (FCT), Abuja, Nigeria were within the age range of 31 and 40 years. For marital status pooled result shows that majority (70.97 %) of the smallholder cassava farmers in Benue and Nasarawa States were married, therefore, married people dominated the population. This is an indication that a stable farming population may not likely abandon their families and farming activities as marriage confers some level of responsibility and commitment on individuals who are married. This finding is in line with Olaniyi *et al*. (2016) that most maize farmers in Ondo State Nigeria were married.

Table 1 (Pooled) indicated that 38.35 % of the respondents had secondary education and 34.05 % had tertiary education. This implies that a small (38.35 5) proportion of the respondents had formal education. Possession of formal education means that the respondents were enlightened and better positioned to use ICTs. Education exposes farmers to more information and enables them to accumulate

knowledge about new technologies. This finding confirms the work of Samson (2019) who stated that educational level of an individual is one of the most essential factors to receive and utilize innovation and for productive approach to be more efficient and effective. Pooled result on household size indicated that 47.31 % of the respondents had a household size of between 1 - 5 persons. About 47.31 % of the respondents had large household size. The implication is that relatively large household size may serve as a source of family labour that could help to reduce cost of production. Muhammad *et al*. (2019) found that majority of their farmers in Federal Capital Territory Abuja Nigeria had household size of between 6 - 10 persons. Pooled result on major occupation depicted that 36.86 % of the respondents had farming as their major occupation. This indicates that the study area is an agrarian in nature. This environment requires agricultural information to enable smallholder cassava farmers to carry out their farming activities at the right time using the right technologies. The result is in line with Khidir (2020) who stated that most people in North-central Nigeria were smallholder farmers

Pooled result shows that 32.26 % of the respondents had farming experience of between 6 - 15 years. This implies that a small (32.21 %) proportion of the respondents had high level of farming experience. This is in contrast with Samwel (2019) that majority of rice farmers in Ethiopia were with less than 10 years of farming experience. Pooled result on farm size reveal that 86.38 % had farm size of between 1 - 3 hectares. This implies that farmers in the study area were actually small-scale farmers. This finding is in line with the work of Suleiman (2017) that most farmers in Niger State were smallholder farmers operating at a subsistence level which could affect their usage of ICTs. On annual income, the pooled result revealed that 40.14 % of the respondents

earned N250,000 per annum. This means that the income of the respondents in the study area was generally low. This corroborates the finding of Mustapha *et al.* (2023) that farmers in central Nigeria earned low incomes. Such income would discourage the farmers from purchasing and using ICT tools, especially those that are expensive. For number of extensions visit, pooled result showed that majority (84.95%) of the respondents were visited at least 3 times by extension workers. This implies that smallholder cassava farmers were not visited regularly. This means that visits by extension agents were inadequate.

Table 1: Socio-economic Characteristics of the Respondents (n= 279)

	Benue (n= 141)		Nasarawa (n= 138)		Pooled		
Variables	**F**	**%**	**F**	**%**	**F**	**%**	**Mean**
Sex							
Female	60	42.55	43	31.16	103	36.92	
Male	81	57.45	95	68.84	176	63.08	
Age (years)							
18-20	1	0.72	1	0.75	2	0.74	
21-30	22	15.83	9	6.77	31	11.40	
31-40	38	27.34	93	69.92	131	48.16	42.02
41-50	32	23.02	23	17.29	55	20.22	
51-60	28	20.14	7	5.26	35	12.87	
61 and above	18	12.95	0	0.00	18	6.62	
Marital Status							
Single	14	9.93	15	10.87	29	10.39	
Married	105	74.47	93	67.39	198	70.97	
Widow/widower	19	13.48	15	10.87	34	12.19	
Divorced z	3	2.13	15	10.87	18	6.45	
Level of Education							
Non- formal	27	19.15	15	10.87	42	15.05	
Primary	21	14.89	14	10.14	35	12.54	
Secondary	52	36.88	55	39.86	107	38.35	
Tertiary	41	29.08	54	39.13	95	34.05	
Household Size (Persons)							
1-5	56	39.72	76	55.07	132	47.31	
6-10	64	45.39	58	42.03	122	43.73	
11-15	18	12.77	4	2.90	22	7.89	7
16-20	2	1.42	0	0.00	2	0.72	
21 and above	1	0.71	0	0.00	1	0.36	
Major Occupation							
farming	53	37.86	50	37.31	101	36.86	
Public Service	0	0.00	1	0.75	1	0.36	
Petty trading	1	1.71	0	0.00	0	0.00	31.34
Civil Service	1	0.71	12	8.96	12	4.38	
Farming Experience (Years)							
1-5	5	3.55	62	44.93	67	24.01	
6-10	30	21.28	60	43.48	90	32.26	14.34
11-15	35	24.82	6	4.35	41	14.70	
16 and above	71	50.35	10	7.25	81	29.03	
Annual Income (N)							
≤250,000	52	36.88	60	43.48	112	40.14	
250,001-500,000	24	17.02	63	45.65	84	31.18	
500,001-750,000	15	10.64	11	7.97	26	9.32	**115,57**
750,001-1,000,000	15	10.64	0	0.00	15	5.38	
1, 000,001 and above	35	24.82	4	2.90	39	13.98	
Farm Size (hectares)							
1 – 3	120	85.11	121	87.68	241	86.38	
3 – 5	7	4.96	17	12.32	24	8.60	2.58
5 – 7	2	1.42	0	0.00	2	0.72	
8 and above	12	8.51	0	0.00	12	4.30	
Number of Extension Visits							
1-3	109	77.30	128	92.75	237	84.95	
4 and above	32	22.70	10	7.25	42	15.05	2.27

4.2 Types of Information and Communication Technologies used by Smallholder Cassava Farmers

Pooled result in Table 2 revealed that 94.0 % of the respondents used mobile phone and 64.16 % used radio. This implies that mobile phone was one of the ICTs mostly used by the respondents. Mobile phones are relatively cheap, portable and easy to maintain. This has encouraged its use by farmers in all ramifications as a means of sending and receiving important information for cassava production and processing. The finding confirms Ogbonna and Agwu (2013) who stated that the most commonly used ICTs among cassava farmers was mobile phone.

Table 2: Types of ICTs Used by Smallholder Cassava Farmers (n=279)

States	**Benue**		**Nasarawa**		**Pooled**	
Variables	Frequency*	%	Frequency*	%	Frequency*	%
Mobile phones	132	93.62	131	94.93	263	94.0
Posters	27	19.15	72	52.17	99	35.49
Radio	109	77.30	70	50.72	179	64.16
Television	52	36.88	59	42.75	111	39.78
Newspaper	25	17.73	69	50.00	94	33.69
Computers	26	18.44	36	26.09	62	22.22
Digital Cameras	8	5.67	23	16.67	31	11.11
DVDs	13	9.22	12	8.70	25	8.96
MP3 Players	58	41.13	15	10.87	73	26.16

Multiple responses

4.3 Factors influencing usage of ICTs among smallholder cassava farmers in Benue and Nasarawa States.

Table 3 reveals that there were 19 variables which yielded three factors, namely socio-economic (1), administrative (2) and infrastructural and technical factors (3). Factor 1; socio-economic factors, variables with significant effects included perception of effects of ICTs (0.770), age (0.734) and computing knowledge (0.728) among others. For instance, perception of effects of ICTs (0.770), farmers perception of effects of ICTs may vary across age, sex and level of education. Aged farmers may perceive ICTs as time consuming and may choose not to apply ICTs in searching for information on cassava production. In contrast young farmers may perceive ICTs as strategic especially for sharing and receiving information on cassava production.

In Factor 2: The significant administrative factors included search of business-related information (0.732) and electricity outage (0.722). Search of business-related information was most significant. Search of business-related information has a significant influence on ICTs usage. farmers with ICT tools such as mobile phones often use them to search for information that is relating to their farming activities from land preparation to marketing of their products. This finding is in line with Oduwale *et al*, (2009) who indicated that search of business-related information had significant influence on ICTs usage on agribusiness.

Table 3: Factors Influencing Usage of ICTs among smallholder cassava farmers in Benue and Nasarawa States

Variables	Factor 1	Factor 2	Factor 3
Sex	-0.3311*	0.6703 E-02	0.1003
Age	-0.734*	0.0574	0.2132
Education	0.3353*	0.1944	0.2951
Household size	0.3573*	0.0045	0.5361 E-02
Annual income	0.3171*	0.0548	0.4622 E-02
Farm size	0.6179*	0.0329	0.2537
Farming experience	0.6161*	0.1207	0.2724
Marital status	0.4720*	-0.0237	0.2541
Major occupation	0.5192*	0.1946	0.2599
Electricity outage	0.0149	0.7224**	-0.0292
Poor network coverage	0.0053	0.0663	0.6948***
Skill on internet operation	-0.0836	0.0864	0.6635***
Poor internet connection	0.0428	0.011	0.7195***
Network interruption	-0.0598	0.0208	0.7056***
Computing Knowledge	0.7285*	0.0242	0.0613
ICT facilities used	0.0112	0.0829	0.7392***
ICT skills	0.6702	0.0829	0.0613
Search of business-related information	0.0126	0.7323**	-0.0139
Perception of effects of ICTs	0.7701*	0.0415	0.0344

Method: Varimax with Kaiser Normalization
*Factor 1: Socio-economic Factors
**Factor 2: Administrative Factors
***Factor 3: Infrastructural cum Technical Factors

5.0 Conclusion and Recommendations

The findings indicated that the respondents were educated enough to use ICTs for communication. The ICTs mostly used by the respondents were mobile phone and radio which were used to obtain agricultural information such as production and marketing

information that will enable them carry out agricultural practices at the right time to prevent loses. Sex, age, electricity outage, ICT facility used by the respondents among others significantly influenced usage of ICTs. It is therefore recommended that Farmers should be trained by non-governmental organizations to enhance their technical knowledge. Government at all levels should put on ground all the necessary infrastructure to enable farmers access and use ICTs.

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