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Determinants of Information and Communication Technology Usage Among Cassava Value Chain Actors in Southwest, Nigeria

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Abstract

This study investigated the determinants of information and communication technology usage among cassava value chain actors in Southwest Nigeria. The research focuses on identifying the factors influencing the use of ICT tools among cassava producers, marketers, and processors. Data were collected from 355 respondents using random and cluster sampling techniques and analysed through mean scores, frequency counts, percentages, and multiple regression. The most commonly used ICT tools among the actors are radio ($\bar{x}$= = 2.92), mobile phones ($\bar{x}$= = 2.80), and social media ($\bar{x}$= 2.55), while global positioning systems (GPS) ($\bar{x}$= = 0.34), and aerial drones $\bar{x}$= = 0.06) are among the least utilized. The finding revealed that the level of ICT usage

among CVCAs in the region is relatively low. The result of multiple regression analysis indicates that sex, education level, household size, years of CVC experience, extension contacts, and membership in social organizations significantly influenced ICT usage among CVCAs. The study recommends that the extension institutions and relevant stakeholders should design and implement training programmes focused on enhancing the skills and capacity of cassava value chain actors (CVCAs) in utilizing modern ICT tools and harnessing their power for an efficient, and sustainable cassava value chain in Nigeria.

Introduction

Information and communication technology (ICT) has become an integral part of modern societies, transforming various sectors, including agriculture (Tiwari, 2022). In many developing countries like Nigeria, where agriculture plays a crucial role in the economy, the effective adoption and utilization of ICT can significantly enhance agricultural productivity, improve access to information, and empower value chain actors (Smidt & Jokonya, 2022). ICT tools have revolutionized information dissemination and communication, breaking down barriers and connecting individuals across the globe. In the context of agriculture, ICT can facilitate the exchange of agricultural knowledge, provide timely market information, and enable remote sensing and monitoring of crops (Spielman et al., 2021). The use of information and communication technology in the advancement of agriculture in Africa, especially to transform the agricultural value chain in sub-Saharan Africa (Nigeria inclusive), is immense, but its realization requires an understanding of the factors influencing ICT usage among CVCAs (Adebayo & Silberberger, 2020). Cassava, a versatile food crop, is widely cultivated in Nigeria, as well as in other countries in West Africa and beyond.

It serves as a staple food for millions of people and has immense economic value (Immanuel et al., 2024). The cassava value chain encompasses various stages, including production, processing, and marketing, involving different actors such as cassava producers, processors, and marketers (Olaniyi & Enwelu, 2021). An agricultural value chain refers to a chain of activities and actors engaged in bringing an agricultural product or service from the initial conception stage through its production and final consumption (Nwobodo et al, 2023). Meanwhile, a value chain is described as the sequence of value-added steps and actors involved in the process from production to delivery of products to the market (Abah, 2019). These actors (producers, processors, and marketers) play crucial roles in the value chain, and their efficiency and productivity are key to the overall success of cassava-based industries.

Historically, cassava cultivation and value-chain activities have relied on traditional knowledge and practices. Consequently, the cassava value chain actors face numerous challenges, these challenges include limited access to information, inadequate infrastructure, low adoption of modern agricultural practices, and inefficient market linkages. These issues hinder the growth and development of the sector and limit the potential benefits that ICT can offer (Nugroho, 2021). However, with the advancement of ICT, there is a growing recognition of its potential to revolutionize agriculture and improve the livelihoods of farmers and other value-chain actors (Uche et al., 2024). ICT tools such as mobile phones, internet connectivity, radio, television, and data management systems can provide real-time information on weather patterns, market prices, pest and disease

management, and best agricultural practices (Panda, 2020). Access to such information can help CVCAs make informed decisions, increase their productivity, reduce post-harvest losses, and enhance their market competitiveness (Shikuku et al., 2023; Udoye & Dimelu, 2024).

Despite the potential benefits of ICT tools in Nigeria's agricultural value chain, their usage remains relatively low (Oyelami et al., 2022; Onyeneke et al., 2023). Various factors have been enumerated by scholars to influence the adoption and utilization of ICT in the agricultural sector, including socioeconomic characteristics, level of education, access to infrastructure, and institutional support (Achici et al., 2023). Understanding these determinants is crucial for designing effective strategies to promote ICT usage and address the challenges faced by CVCAs in accessing and utilizing ICT tools. The recent studies of Smidt & Jokonya (2022) and Onyeneke et al. (2023) highlighted the importance of ICT in agriculture and identified various determinants of ICT adoption and usage in different contexts. However, limited research has specifically focused on the cassava value chain actors in Southwest Nigeria. Therefore, this study filled this research gap by examining and identify the available ICT tools and its level of usage among cassava value chain actors and identifying the factors influencing ICT utilization among CVCAs.

Purpose of the Study

The overall objective of the study was to explore the determinants of ICT usage among cassava value chain actors in Southwest, Nigeria. Specifically, the study sought to:

i. identify the available ICT tools and the level of their usage among the actors and
ii. ascertain factors influencing ICT usage by the respondents.

Methodology

The study was carried out in southwestern Nigeria, which comprises six (6) states, namely Oyo, Osun, Ogun, Ekiti, Ondo, and Lagos states. The zone lies in the equatorial rainforest belt, and the rainfall varies from 1500mm to 1800mm per annum. It is located between Longitude 30° and 7°E and Latitude4° and 9°N. The total land area is about 191,843 square kilometers. Oyo and Ogun States were purposively selected out of six constituent states in Southwest Nigeria. This selection was based on high cassava production data of the selected states in southwest Nigeria from the FAO database (FAO, 2022).

A multi-stage sampling procedure was adopted in the selection of the respondents for this study. The first stage involved the random selection of two agricultural zones out of the total agricultural zones in each of the selected states (Oyo and Ogun States). There are four agricultural zones in Oyo and Ogun States respectively. These are Ibadan /Ibarapa, Oyo, Ogbomoso and Saki Agricultural Zones in Oyo State. In Ogun State we have Egba, Ijebu, Remo and Ilaro Agricultural zones. The selected agricultural zones in Oyo state are Ogbomoso and Oyo agricultural zones while Ijebu and Remo agricultural zones were randomly selected from Ogun State. At the second stage, a proportionate sample of 50% of the total blocks in each of the selected agricultural zones was carried out. Three blocks each were selected from Oyo and Ogbomoso agricultural zones in Oyo State respectively making six blocks in Oyo State. Also, five blocks were selected from Ijebu and Remo

Agricultural Zones, making a total of eleven blocks selected. In the third stage random sampling technique was used in the selection of 135 cassava farmers from the list of registered farmers in the two states. Cluster sampling techniques were used in the selection of two cassava processing centres and two markets from each of the selected blocks and finally, 5 processors and 5 marketers were randomly selected from each block respectively. Hence, one hundred and ten (110) cassava processors and one hundred and ten (110) cassava marketers respectively. The sampling frame gave a total sample of three hundred and fifty- five (355) respondents. Primary data were collected using a well-structured interview schedule; the data collected for this study were subjected to both descriptive and inferential statistical tools.

The dependent variable of the study was the level of ICT usage among the Cassava value chain actors (CVCAs), and this was measured on a 4-point rating scale of always = 3, sometimes =2, rarely = 1, and never = 0. There are ten ICT tools items and its usage was measured on a 4-point rating scale, hence the minimum and maximum usage scores were calculated as 0 and 30 respectively. The respondents were then categorized based on their ICT usage scores. Those with the usage scores of 0 to 10 were thus categorized as low users, while those with scores between 11 and 20 were categorized as moderate users and high users were within the score range of 21 – 30 .

Model specification for the determinants of Information and communication technology usage among the (CVCAs)

Multiple regression was used to determine the relationship between a selected variable and the level of ICT usage among the (CVCAs)

$Y = b_o + b_1X_1 + b_2X_2 + b_3X_3 + \ldots\ldots\ldots b_{11}X_{11}$

where:

Y is the predicted value of the dependent variable (level of ICT usage among the CVCAs. $X_1 \ldots\ldots X_{11}$- represents selected independent variables and b's – b_0 , $b_1 \ldots\ldots b_{11}$ are constants the estimated regression coefficients

Results and Discussion

Information and Communication Technology Tools Available to CVCAS

Table 1 shows that all (100%) of the farmers claimed that radio and mobile phones are the most widely available ICT tools followed by social media (98.5 %), television (93.3%), computer (86.7%) and video (85.2%). This finding shows that cassava farmers in the study area had the opportunity to a wide range of ICT tools as they are available for use. This finding implies that farmers could take advantage of the available ICT tools to access various value chain information for better operations in their farming enterprise. Similarly, entries in Table 1 reveal that all (100.0%) of the cassava processors claimed the availability of radio and mobile phones respectively while a higher percentage (98.2%) of social media, and computer (89.1%) are available ICT tools for communicating and sharing information among the actors.

Also, all (100.0%) of the marketers claimed that radio and mobile phones are the most widely available ICT tools to them. The majority (89.1%) of television, video (87.0%) and

computer (76.4%) reported the availability of these ICT tools for use. This finding implies that the availability of these ICT tools to marketers could give them the opportunity to access relevant value chain information which could also improve their competitive advantage as important actors in the Cassava value chain. These results show that a wide range of ICT tools are available for use by the value chain actors in the study area which could be of immense help to the actors to make them to have improved linkage among the actors.

However, the most available ICT tools are radio, mobile phone and social media compared to other tools. It had been earlier reported that radio and mobile phones are the most commonly used mediums for accessing information among agricultural value chain actors (Obayelu et al., 2022; Adediran et al., 2024; Ogunkunle et al., 2023). Social media is gaining popularity as a means of communication and information sharing among the cassava value chain actors (Alabi et al., 2021). Conversely, the least available ICT tools for accessing information were Global positioning systems and aerial drones. This may probably be due to the expense of these tools which the actors may not be afford.

Table 1: ICT tools available to CVCAs

ICT Tools Available	Farmers %	Processors %	Marketers %
Radio	100.0*	100.0	100.0
Television	93.3	95.5	89.1
Computer	86.7	89.1	76.4
Mobile phone	100.0	100.0	100.0
Internet	76.3	79.1	80.0
Social media	98.5	98.2	100.0
Global Positioning System (GPS)	30.4	30.0	12.7
Aerial drone	4.4	2.7	0.9
Video	85.2	90.9	87.0

*Multiple responses

Source: Field survey, 2023

ICT Usage among Cassava Value Chain Actors (CVCAs)

Table 2 presents the mean scores of ICT usage among cassava value chain actors (CVCAs). It was revealed that radio ($\bar{x}$ = 2.92), mobile phone ($\bar{x}$ = 2.68), and social media ($\bar{x}$ = 2. 3.4) were the most used ICT tools for accessing information and communication purposes by the farmers. Meanwhile, the least used ICT tools by the farmers are the Global Positioning System ($\bar{x}$ = 2.68) and aerial drone ($\bar{x}$ = 0.13). This finding implies that the most used ICT tools are those that are most readily available to the actors. From the same Table 2, it shows that radio ($\bar{x}$ = 2.54) is widely used be processors, followed by mobile phones($\bar{x}$ = 2.80) and social media ($\bar{x}$ = 2.55). Other ICT tools used by the processors include television ($\bar{x}$ = 1.97), internet ($\bar{x}$ = 1.88) and video ($\bar{x}$ = 1.85). Similarly, the most commonly used ICT tools by marketers are radio ($\bar{x}$ = 2.88), mobile phone ($\bar{x}$ = 2.65) and social media ($\bar{x}$ = 2.55). Others include television ($\bar{x}$ = 1.85), internet

($\bar{x}$ = 1.82) and video ($\bar{x}$ = 1.73). This finding shows that cassava marketers in the study area had access to a wide range of communication channels for better access to value chain information and for networking among the various actors.

Level of ICT Usage

A higher percentage (91.8%) of the farmers were categorized as moderate ICT users Table 2), 6.7% fell into the low ICT users category, and a small proportion (1.5%) were in the high category. The mean ICT tool usage for farmers was 15.2. In the same vein, it was revealed that the majority (96.4%) of the processors were in the moderate users category, while others (3.6%) were categorized as either low or high users, respectively. The mean ICT usage for processors was 15.8. Based on the information in Table 3, a higher percentage (90.9%) of the marketers were in the moderate category of users of ICT tools, and 9.1% of marketers were in the low category. The mean ICT usage score for marketers was 15.0.

This finding shows that the three actor groups exhibited relatively similar patterns in their ICT usage and adoption for accessing cassava value chain information, with the majority falling into the moderate category and smaller percentages in the low and high categories. The processors had the highest ICT usage mean score on average compared to farmers and marketers. This may probably be because they are the intermediary between farmers and marketers, and there is a need for them to communicate and share relevant information on the value chain.

Table 2: ICT Usage among cassava value chain actors CVCAs

ICT Tool	Farmers $\bar{x}$	SD	Processors $\bar{x}$	SD	Marketers $\bar{x}$	SD
Radio	2.92	0.28	2.87	0.34	2.88	0.32
Television	1.96	0.43	1.97	0.34	1.85	0.47
Computer	1.38	0.94	1.35	0.88	1.22	0.96
Mobile phone	2.68	0.51	2.80	0.42	2.65	0.52
Internet	1.73	1.24	1.88	1.25	1.82	1.27
Social media	2.34	0.74	2.54	0.70	2.55	0.60
Global positioning system (GPS)	0.32	0.69	0.34	0.73	0.21	0.56
Aerial drone	0.13	0.40	0.16	0.44	0.06	0.56
Video	1.73	0.78	1.85	0.62	1.73	0.85

ICT Usage score	category	Farmers %	Processors %	Marketers %
0 - 10	Low	6.7	1.8	9.1
11 - 20	Moderate	91.8	96.4	90.9
21- 30	High	1.5	1.8	0.0
Mean		15.2	15.8	15.0

Source: Field survey, 2023 SD= standard Deviation Mean cutoff = 1.50

Factors Determining Information and Communication Technology Usage among the CVCAs

Table 3 shows that some of the selected variables established significant relationships with the utilization of ICT . The coefficient of determination (R^2) was 0.640 which implies that about 64% of the variations in the utilization of ICT among CVCAs were explained by the explanatory variables. Nine out of ten variables included in the equation model (sex, years spent in schooling, household size, cassava value chain experiences, farm size, annual income, training on ICT, contact with the extension agents, and membership of social association) were statistically significant at different levels of significance. Some of the significant variables exhibited positive relationships, while others showed negative and significant relationships with the level of ICT usage for accessing agricultural information. The findings of the study imply that an increase in any of the significant variables will increase ICT utilization among the respondents. It is in tandem with the reports of Paul et al. (2021), Olaniyi and Enwelu (2021), and Bolarin et al. (2022) that the age of the respondents, years of education, CVC experiences, and training on ICT were important factors influencing the ICT usage among the respondents.

Table 3: Factors influencing the information and communication technology usage among the CVCAs

Model	Unstandardized Coefficient		Standardized Coefficient	T
	(β)	Standard Error	Beta	
Constant	12.811	0.961		13.328
Age	0.026	0.015	0.081	1.792
Sex	0.555	0.242	0.105	2.291
Years spent in schooling	0.181	0.042	0.205	4.362
Household size	-0.165	0.073	-0.103	-2.261
Cassava value chain experiences	-0.083	0.019	-0.207	-4.361
Farm size	-0.083	0.025	-0.159	-3.350
Annual income	-2.472E.7	0.000	-0.053	-.0.216
Training on ICT	-.0.877	0.408	-0.095	-.2149
Contact with extension Agent	1.402	0.340	0.222	4.126
Membership of social Association	1.909	0.294	0.346	6.500

Source: Field survey, 2023 P ≤ 0.05 level of significance,

Conclusion and Recommendations

The cassava value chain actors exhibited a similar pattern in ICT usage and the majority fell into the moderate category of ICT users. The most commonly used ICT tools among the actors are radio, mobile phones, and social media . Sex, education level, household size, years of CVC experience, extension contacts, and membership in social organizations significantly determined the use of extent of ICT tools for cassava value chain information. Therefore, to enhance the use of ICT tools among the actors and harness their power for efficient and sustainable cassava value chain development, the study recommends that the extension institutions and relevant stakeholders should design and implement training programmes focused on enhancing the skills and capacity

of cassava value chain actors (CVCAs) in utilizing modern ICT tools and harnessing their power for an efficient, and sustainable cassava value chain in Nigeria.

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