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ANALYSIS OF FARMERS' USE OF DIGITAL COMMUNICATION TOOLS IN CASSAVA PRODUCTION IN OSUN STATE

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ABSTRACT

This study examined the use of Digital Communication Tools (DCTs) among cassava farmers in Osun State, Nigeria, with emphasis on socioeconomic characteristics, access to agricultural information, innovation adoption, and constraints. A multistage sampling approach was used selecting 280 respondents, averaging 51±12.45 years in age. Most were male (64.2%) and married (57.1%), with a mean household size of 8±2.03 and 93.4% cultivating small farms (≤5 hectares). Their mean annual income was ₦354,724.27±101,012.25. WhatsApp (259.1) and Facebook (235.1) emerged as widely accessed DCTs, supporting production activities. DCTs usage was low among 50.8% of respondents, while 55.0% faced high constraints, primarily due to the high cost of internet subscriptions (136.7), high cost of DCTs devices (124.1), and limited internet access (115.9). Factors such as marital status ($\chi^2 = 67.101$), age ($r = -0.245$), years of experience, and cooperative membership ($\chi^2 = 0.226$) significantly influenced DCTs use. Recommendations included, providing affordable internet access, implementing DCTs skills training, and strengthening cooperative networks to support adoption and enhance productivity.

Keywords: *Digital Communication Tools (DCTs), Cassava Farming, Agricultural Innovation*

INTRODUCTION

Cassava (*Manihot esculenta Crantz*) serves as a staple food source and income generator for millions of Nigerians, contributing significantly to food security and the agricultural economy. Cassava provides approximately 500 calories daily to the average Nigerian diet and has substantial potential as a cash crop across sub-Saharan Africa (Amadi *et al.,* 2019). However, cassava farmers encounter several barriers, including limited access to information, inefficient market structures, and insufficient agricultural extension services, all of which reduce their productivity and profitability.

In recent years, the rapid development and accessibility of Digital Communication Tools (DCTs) have revolutionized the way information is shared and utilized. Social media platforms, such as Facebook, WhatsApp, LinkedIn, Telegram, and Twitter, enable instant communication, providing cassava farmers with new channels to connect with agricultural experts, fellow farmers, suppliers and potential buyers. These tools allow farmers to access real-time data on crop prices, weather forecasts, pest outbreaks, and improved farming techniques, thus offering a pathway to address the limitations in traditional information sources.

Despite the benefits, the extent of DCTs adoption among cassava farmers remains limited, particularly in rural areas. Key barriers to adoption include, individual, institutional, and technological challenges. Individual factors, such as farmers' age, income, education, and prior exposure to technology, heavily influence their acceptance and use of DCTs. Studies indicate that younger, more educated farmers are generally more open to adopting new technologies, whereas older farmers may show reluctance (Hailegebreal *et al.,* 2022 and Marston *et al.*, 2019). Additionally, gender, farm size, and social networks influence technology adoption, with studies noting significant relationships between these demographics and technology use (Izuogu *et al.,* 2023).

Institutional factors also play a critical role, encompassing the support structures surrounding agricultural practices. A stable and conducive policy environment is necessary for effective technology adoption in agriculture, yet policy inconsistencies in Nigeria's agricultural sector hinder DCTs integration. Additionally, limited support from extension services and a lack of adequate training initiatives restrict farmers' access to digital tools (Ahmed *et al.,* 2020; Lencucha *et al.,* 2020). Institutional challenges, such as insufficient extension services, exacerbate farmers' difficulty in integrating these technologies.

Technological factors, including access to devices, reliable internet connectivity and the perceived cost of DCTs tools, further influence adoption. Studies suggest that affordability and the relevance of contents are pivotal in determining whether farmers adopt DCTs (Fielke *et al.,* 2020). A lack of digital literacy and low accessibility to compatible devices contribute to the rural digital divide, limiting many farmers' accesses to essential digital services (Gyata, 2019).

Given these barriers, understanding the utilization dynamics and impact of DCTs on cassava farming practices is crucial. This study assessed how DCTs influence cassava farmers' productivity and market access. The objectives of the study were to: describe the socioeconomic characteristics; determine how accessible agricultural information is to farmers through DCTs;

evaluate the extent of DCTs use in Cassava Production and investigate the challenges and barriers associated with DCTs use for cassava farming.

METHODOLOGY

This research was conducted in Osun State, southwestern Nigeria, an area known for its cultural and agricultural richness. The study area spans approximately 9,251 square kilometers between latitudes 7°05'N and 8°15'N and longitudes 4°20'E and 5°30'E. Its fertile soils, forest cover, and water availability support extensive agricultural activities, primarily involving smallholder farmers who grow crops such as cocoa, yams, cassava, and oil palm.

Data were gathered through structured questionnaire focusing on respondents' socioeconomic characteristics, access to agricultural information via DCTs, DCTs usage in cassava production, and challenges associated with DCTs use for cassava production. Descriptive statistics (frequency, percentage, standard deviation, and mean) and inferential statistics (Chi-square and Pearson Product Moment Correlation) were employed for data analyses.

A multistage sampling procedure was employed to select respondents for the study. In the first stage, simple random sampling was used to select 22% of Local Government Areas (LGAs) in Osun State, resulting in a total of seven LGAs. In the second stage, two villages were randomly chosen from each selected LGAs, yielding 14 villages. Finally, 20 cassava farmers were randomly selected from each village, resulting in a sample size of 280 respondents for the study.

Accessibility to agricultural information was determined by asking respondents to rate access to 10 agricultural information types through DCTs. Responses were scored on a scale of "very accessible" (2), "accessible" (1) and "not accessible" (0). A mean score was used to categorize accessibility as either high or low. The extent of DCTs utilization in cassava production was rated on a 3-point Likert-type scale: "not at all" (1), "to a lesser extent" (2), and "to a larger extent" (3). The mean score further classified utilization levels.

Challenges in DCTs use for cassava production were rated on a 3-point scale, with "not a constraint" (1), "minor constraint" (2), and "major constraint" (3). A weighted score identified the primary barriers to DCTs adoption for cassava production. Chi-square and correlation analyses determined relationships between specific socioeconomic characteristics and DCTs utilization levels.

RESULTS AND DISCUSSIONS

Socioeconomic Characteristics

The findings in Table 1 indicated that the average age of respondents was 51 ± 12.45 years, pointing to a predominantly middle-aged, active workforce, consistent with Egbetokun *et al.*, (2023). A majority of respondents were male (64.2%) and married (57.1%), which suggests a focus on family stability. The average education level was 14±4.98 years, indicating a moderate educational background that could aid in agricultural decision-making. Household size averaged 8 ± 2.03 persons, reflecting large families likely contributing to the reliance on family labor and limited involvement of younger farmers in cassava production.

The mean annual income stood at ₦354,724.27±101,012.25, showing economic diversity among respondents. The majority (93.4%) operated small farms of 5 hectares or less, with an average farm size of 4.74 hectares, implying cassava farming is largely small-scale and in need of support for smallholder farmers. This aligns with Olarinde *et al.*, (2020), who reported that Nigerian cassava farming is dominated by smallholders. Additionally, 81.4% of respondents were members of cooperative societies, which likely improved their access to resources and collective support. A reliance on informal savings and credit groups (67.9%) was evident, reflecting limited access to formal financing. Osuji *et al.*, (2024) reported that cooperative membership aids farmers in securing credit, information, and inputs. Finally, respondents averaged 20.1±5.74 years of farming experience, indicating a seasoned workforce with considerable practical knowledge, in line with findings by Osuji *et al.*, (2024)

Table 1: Socioeconomic characteristics of the respondents.

Age	Frequency	Percentages	Mean
≤ 30	86	30.8	51±13.45
31-40	63	22.5	
41-50	83	29.2	
51-60	35	12.5	
>60	14	5.0	
Sex			
Female	100	35.8	
Male	180	64.2	
Marital Status			
Single	78	27.9	
Married	160	57.1	
Widowed	26	9.2	
Divorced	16	5.8	
Years of Education			
1-10	58	20.8	14±4.98
11-20	215	76.7	
21-30	7	2.5	
Household size			
1-4	79	28.3	8±2.03
5-8	185	65.8	
9-12	16	5.8	
Annual Income			
≤ 250,000	68	24.3	₦354,724.27±101,012.25
250,001-400,000	132	47.1	
400,001-550,000	43	15.4	
550,000-700,000	26	9.3	
>700,000	11	3.9	
Farm size (ha)			
≤5	138	49.3	4.74±10.49
6-10	108	38.6	
>10	34	12.1	
Membership of cooperative society			
Yes	228	81.4	
No	52	18.5	
Source of finance			
Informal savings and credit groups	190	67.9	
Micro finance institution	38	13.6	
Relative and friends	52	18.5	
Years of experience			
1-10	114	40.7	20.1±5.74
11-20	128	45.7	
>20	38	13.5	

Source: Field Survey, 2024.

Accessibility of Agricultural Information through Digital Communication Tools

The result in Table 2 showed the agricultural information needs of cassava farmers in Osun state. Using the weighted score value to determine maximum agricultural information need of the cassava farmers, it was observed that the *market prices* were the most accessed type of information (260.8) through DCTs, underscoring its importance to farmers in shaping sales strategies and maximizing profits. Closely following was information on *produce demand* (256.7), allowing farmers to align production with buyers' needs for effective selling. Information on *new markets* (250.9) ranked third, helping farmers diversify their revenue sources, while *customer preferences* (246.8) highlight the need to meet consumer expectations. Lastly, *pest and disease control* (244.1) emphasize the importance of timely crop health management.

These findings demonstrated that DCTs provided critical, real-time insights that enabled cassava farmers to make informed decisions in production, marketing and crop protection. This prioritization suggests the potential for these tools to support sustainable agricultural practices and enhanced profitability among farmers.

Table 2: Distribution of Respondents by Accessibility of Agricultural Information through Digital Communication Tools

S/N	Agricultural information	Weighted score	Rank
1.	Market prices	260.8	1st
2.	Food processing and preservation	234.3	8th
3.	Produce demand	256.7	2nd
4.	New agricultural technologies	229.2	9th
5.	New Markets	250.9	3rd
6.	New agricultural practices	239.8	6th
7.	New production practices	235.7	7th
8.	Agricultural extension services	202.4	10th
9.	Customers preference for cassava product	246.8	4th
10.	Information on pest and diseases control	244.1	5th

Source: Field Survey, 2024.

Extent of utilization of DCTs for cassava production

The analysis showed that *WhatsApp* was the most widely accessed DCTs among respondents, with a weighted score of 259.1, underscoring its popularity for real-time messaging and ease of use. *Facebook* followed closely (235.1), reflecting its role in connecting farmers with broader agricultural networks and information sources. *Google*, third (153.5), often used for formal communication, while, *Weather App & alert* (171.7) and *Twitter* (145) provided valuable visual and instructional resources. The findings highlighted the importance of diverse digital tools in meeting cassava farmers' communication and information needs.

These insights suggested that integrating widely used platforms like WhatsApp and Facebook into extension programs could enhance access to agricultural information, helping farmers make timely and informed decisions.

The data furthered classified respondents into high and low levels of DCTs usage for agricultural innovation. The results indicated that 50.8% of respondents had a high level of DCTs usage, while 49.2% had a low level. This suggested that over half of the respondents actively employed DCTs for agricultural innovation. These findings align with Oladipo et al. (2024), who observed that most respondents were moderate users of ICTs for agricultural purposes, reflecting broad yet varied levels of engagement. Similarly, Nwankwo *et al.*, (2024) reported moderate DCT usage levels among poultry farmers in Abia State.

Table 3. Distribution of the Extent of Utilization of DCTs for cassava production

S/N	DCTs types	Weighted score	Rank
1.	Google	153.5	3rd
2.	Weather App & alert	171.7	4th
3.	Websites & Blogs	134.1	6th
4.	zoom	106.6	8th
5.	LinkedIn	92.0	9th
6.	Facebook	235.1	2nd
7.	WhatsApp	259.1	1st
9.	Twitter	145.0	5th
10	GPS &mapping Apps	119.0	7th
	Level of utilization	F	%
	Low	59	49.2
	High	61	50.8

Source: Field Survey, 2024.

Constraints faced by respondents in the use of DCTs

The result from Table 4, using the weighted score to determine the magnitude, revealed that the most significant constraint cassava farmers faced in using DCTs was the *high cost of internet subscriptions* (136.7), followed by the *high cost of DCT devices* (124.1) and *Limited access to internet* (115.9). These factors reflected financial barriers that limit access to digital tools. *Technical know-how* ranks fifth (107.5), showing the need for skills training, while *high poverty levels* (100.1) and *skill gap/illiteracy* (98.3) further hindered utilization. Lower-ranked constraints include *lack of electricity* (94.2) and *ignorance* (84.1).

The results were further categorized into the low and high constraints faced by the respondents in using DCTs. It revealed that 55.0% had high constraints to DCTs use and 45.0% had low level. These results showed that although the respondents reacted favorably towards the perception of DCTs, many of them were constrained to the effective use of the DCTs. These findings align with Alabi *et al.*, (2021), who reported that cassava farmers in Ekiti State identified a lack of technical experience with ICT (web tools) as a primary constraint in using technology for cassava production.

Table 4. Distribution of the constraints faced by the respondents in the use of DCTs

S/N	Constraint		Weighted score	Rank
1.	Ignorance		84.1	8th
2.	High level of poverty		100.1	5th
3.	High cost of internet subscription		136.7	1st
4.	Lack of electricity supply		94.2	7th
5.	Technical know how		107.5	4th
6	High cost of DCT devices		124.1	2nd
7.	Illiteracy		98.3	6th
8.	Limited access to internet		115.9	3rd
	Level of constraint		**F**	**%**
		Low	54	45.0
		High	66	55.0

Source: Field Survey, 2024.

Hypothesis Testing

Test of relationship between respondents' socioeconomic characteristics and level of DCTs use in the study area

Marital status showed a significant association with DCT usage ($\chi^2 = 67.101$; $p < 0.05$), suggesting potential differences in adoption based on marital differences. Age ($r = -0.245$; $p < 0.05$) was inversely correlated, indicating younger farmers tend to use DCTs more frequently, as noted by Otunaruke *et al.*, (2023). Additionally, years of experience was positively correlated with DCT usage ($r=0.310$; $p < 0.05$), implying that more experienced farmers tended to use these tools more effectively. Membership in cooperative groups also exhibited a statistically significant with DCT usage ($\chi^2 = 0.226$; $p < 0.05$), indicating that cooperative participation facilitated better access to resources, information, and markets, enhancing financial performance. This aligns with the findings of Okafor *et al.*, (2024).

Table 5.: Chi-square and correlation analysis between some selected socio-economic characteristics and level of utilization of Digital Communication Tools

Variable	Chi-Square value	df	p- value	r- value	Remark
Sex	2.411[a]	2	0.469		N.S
Marital status	67.101[a]	7	0.000		S
Membership of cooperative society	0.226	4	0.001		S
Years of experience			0.001	0.310**	S
Age			0.000	-0.245**	S
Years of formal education			0.934	0.008	NS
Household size			0.135	-0.137	N.S
Income			0.992	0.001	N.S
Farm size			0.575	0.052	N.S

Source: Field Survey, 2024

CONCLUSION AND RECOMMENDATION

The study revealed that digital communication tools (DCTs) were increasingly used among cassava farmers in Osun State, to access essential agricultural information, particularly regarding market prices, demand, and pest control. WhatsApp and Facebook were identified as the most popular platforms, facilitating real-time information sharing and networking. However, the high cost of internet and limited technical skills posed significant barriers to effective DCTs use. Socio-demographic factors like age, farming experience, and cooperative membership were found to impact DCTs usage, suggesting that targeted approaches could enhance adoption and productivity.

To increase DCTs usage, it is recommended that government agencies, private telecom providers, and NGOs consider providing subsidies or affordable internet packages tailored for rural farmers. Collaborations with tech companies could help supply affordable devices, while skills training in DCTs usage should be integrated into extension programs, focusing on marketing, crop management, and decision-making. Supporting cooperatives can improve resource access, and policies should address socio-economic disparities to assist younger and less-experienced farmers in adopting DCTs.

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