



EVALUATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) IN THE DISSEMINATION OF AGRICULTURAL INFORMATION AMONG MAIZE FARMERS IN THE CENTRAL ZONE OF PLATEAU STATE, NIGERIA

Dashik, L.C., Jibril, S.A. and Usman, H.

Department of Agricultural Extension and Rural Development, Faculty of Agriculture and Agricultural Technology, Abubakar Tafawa Balewa University Bauchi, Nigeria.

Corresponding Author's Email: dashiklekdukur@gmail.com, GSM: 08035987353

ABSTRACT

The study examined information communication technologies (ICTs) in disseminating agricultural information among maize farmers in the central zone of Plateau State, Nigeria. A multistage sampling technique was employed in selecting 120 respondents. Data were collected using a structured questionnaire and analysed using descriptive and inferential statistics. The results showed that the majority (93%) of the farmers were aware of ICT, and use mobile phones (51%) for the dissemination of agricultural information. Access to a mobile phone, television and computer was significant, with mean scores of 3.20, 3.65 and 3.42, respectively. The results also showed that the farmers' socioeconomic characteristics correlate with their access to and use of ICTs for disseminating agricultural information at $p < 0.05$ and $p < 0.1$. Factors that influence the use of ICTs include income level, price of ICT gadgets, inadequate power supply, and flexibility, among others. The constraints to the access and use of ICT gadgets include the high cost of the gadgets, poor farmer supply and level of knowledge on the use of the ICTs. The farmers were aware of the use of ICT. However, they were constrained by factors in the access and use for dissemination of agricultural information. Farmers should exploit credit institutions around them for credit facilities to enable them to access and use ICT gadgets to help them get information on agricultural innovations.

Keywords: ICTs, Evaluation, Dissemination, Extension, Maize

INTRODUCTION

Agricultural information dissemination plays a crucial role in the livelihoods and productivity of maize farmers. Access to timely, accurate, and relevant information can significantly enhance their decision-making processes, improve agricultural practices, and ultimately contribute to increased yields and income. Access to agricultural information enables maize producers to implement best practices in crop management, such as planting techniques, pest and disease control, soil fertility management, and irrigation systems (FAO, 2016). For example, timely information on weather patterns enables farmers to plan planting and harvesting activities more effectively, reducing losses due to severe weather conditions. Also, maize growing relies heavily on efficient resource utilisation, including seeds, fertilisers, and irrigation water. Agricultural data enables farmers to make informed decisions about optimal resource allocation based on soil conditions, market demand, and environmental considerations (De Brauw *et al.*, 2020). This reduces costs and promotes sustainable agriculture methods. Early warnings and preventive measures given by extension services and ICT platforms assist farmers in reducing crop losses and maintaining resilience in the face of agricultural uncertainty (Ouma *et al.*, 2019).

ICTs provide farmers with access to timely and relevant agricultural information, including weather forecasts, market prices, pest and disease management practices, and agronomic advice. Mobile phones, internet-based platforms, and agricultural applications (apps) enable farmers to make informed decisions in real time (Kumar *et al.*, 2020). Also, ICTs bridge the gap between farmers and markets by providing market information, connecting farmers directly to buyers, and facilitating online transactions. E-commerce platforms and mobile-based marketplaces enable farmers to access wider markets, negotiate better prices, and reduce post-harvest losses (Qureshi *et al.*, 2019). Furthermore, it facilitates agricultural extension services by delivering training modules, videos, and interactive content to farmers. Extension workers use mobile phones and tablets to reach remote areas,



disseminate best practices, and provide technical support, thereby enhancing farmers' skills and knowledge (Kariuki *et al.*, 2017). ICTs play a crucial role in climate resilience by providing early warning systems for extreme weather events, monitoring climate data, and supporting adaptive strategies. Farmers can adjust cropping patterns and practices based on climate forecasts to reduce vulnerability to climate change impacts (Deb & Kariyanna, 2021).

Maize (*Zea mays*) is one of Nigeria's most significant cereal crops, grown in a variety of agroecological zones due to its versatility and adaptation to changing soil and climatic circumstances. Maize farming is crucial for Nigerian food security as it is a staple crop that provides carbohydrates for millions of people. It is consumed in a variety of ways, including boiled and roasted maize, as well as flour for pap, cornmeal, and snacks (FAO, 2020). Maize is a key element in Nigerian animal feed production. Grain and byproducts such as maize bran and cornstalks are used to feed poultry, livestock, and fish, hence promoting livestock sector growth (Agboola *et al.*, 2017). Nigeria's maize output also helps to export revenue. The country exports maize to neighbouring nations and international markets, increasing its foreign exchange profits and trade balance (Adekunle & Fatuase, 2019).

Despite its significance, maize cultivation in Nigeria confronts numerous obstacles. Maize crops are vulnerable to pests such as stem borer and diseases such as maize rust and maize streak virus, which can affect yields if not handled adequately (Oladiran *et al.*, 2020). Also, climate change's unpredictable rainfall patterns and rising temperatures endanger maize production, reducing crop growth and yield (Balogun *et al.*, 2019). In addition, smallholder farmers frequently lack access to enhanced maize varieties, quality seeds, fertilisers, and agrochemicals, limiting production (Oladosu *et al.* 2018). Therefore, inadequate storage facilities and poor post-harvest handling techniques lead to large maize losses after harvest, compromising food security and farmer income.

Consequently, the evaluation of information and communication technologies (ICTs) in the dissemination of agricultural information among maize farmers in the Central Zone of Plateau State, Nigeria is a very important task that must be accomplished. However, few empirical studies on evaluation of information and communication technologies (ICTs) in the dissemination of agricultural information among maize farmers in the Central Zone of Plateau State, Nigeria were in place. Thus, the need for this study was to provide information on the adoption of improved broiler and layer chicken production practices among farmers in the state. This study aimed to;

- i. describe the awareness, use and accessibility of ICTs by the maize farmers;
- ii. determine the relationship between the socio-economic characteristics of maize farmers and their access to ICTs as a source of information on agricultural technologies;
- iii. determine the factors that influence maize farmers to use ICTs as a source of information on agricultural technologies; and
- iv. identify and describe the constraints to the use of ICTs in disseminating agricultural information.

METHODOLOGY

The Study Area

The study was conducted in the Central zone of Plateau State. Plateau State is located in the north-central zone of Nigeria and lies between Latitude 8° 30' and 10° 30'N, Longitude 7°30' and 13°37'E with a land mass covering 30,913 sq. kilometres. The monthly maximum and minimum temperatures are 20°C and 15°C, respectively. The mean annual rainfall is about 1450mm, and the relative humidity of 60%. The state has an estimated population of 3,178,712 (NPC, 2007 estimate) and 3.78 million (NPC, 2013 est). It is bounded by Kaduna and Bauchi states on the north, Taraba on the east, and Nasarawa on the south and west. The Jos Plateau rises to about 5,250 feet (1600m) above sea level in the north-central state's part and the Benue River-Valley stretches along the south-east border (Price, 2019). Although there are wooded valleys in the southeast, the vegetation is mostly open grassland, which is suitable for grazing and farming.

Based on soils, climate, and typical farming systems, the state is classified into three distinct agro-ecological zones, namely the lowland moist savannah, which falls within southern Guinea, and



the Savannah rain forest, having extensive low-lying flat land with high water holding capacity, favourable for the production of rice, yam, cassava, melon and groundnut. The mid-altitude zone (the area of study) falls within 500-1,500 meters above sea level, with soils that are sandy clay and heavy rains predominantly maize, Irish potato, and assorted vegetables are produced.

There is a high concentration of livestock and poultry, such as cattle, sheep, goats, layers, broilers, cross-bred local chickens and quails, and production of crops like millet, groundnut, sorghum, and cowpea. It has open grassland vegetation usually used for grazing and farming with notable steep-sloping mountains around the area (FAO, 2018). Global System Mobile (GSM) Network services like Globacom, Airtel, Etisalat, and MTN exist.

Sampling Procedure and Sample Size

The sampling method used is the multistage sampling technique. The first stage involved a purposive sampling of 3 LGAs from the Central zone of Plateau due to the intensity of maize production. The second stage involved a simple random selection of respondents from 3 districts each, making a total of 9 districts. In the third stage, a total of 2,420 respondents were randomly selected to make up the sampling frame, while 5% which is 120 respondents, represents the sampling size for the study.

Data Collection

Primary data were collected using structured questionnaires. The questionnaires had both closed and open-ended style of questions. It has sections such on socio-economic characteristics, awareness, use and accessibility of ICTs, the effectiveness of the use of ICTs, factors that affect the use of ICTs, factors that influence maize farmers to use ICTs, and lastly the constraints to the use of ICTs for disseminating agricultural information. The questionnaire was pre-tested and proofread by experts to guarantee accuracy and reliability. Extension agents were recruited and trained as data collectors under the supervision of the researchers. Data collected were edited both in the field and in the office before they were analysed.

Data Analysis

The inferential and descriptive-analytical tools were used to achieve the objectives of the study. Descriptive statistical tools such as mean values, percentages, frequency distributions and ranking were presented in tables and used to achieve objective i, iii and iv, which is to; describe the awareness, use and accessibility of ICTs by the maize farmers, to determine the factors influencing the adoption of improved broiler and layer chicken production practices among farmer, and identify and describe the constraints to the use of ICTs in disseminating agricultural information.

The correlation model was used to evaluate the relationship between the socio-economic characteristics of the maize farmers and their access to ICTs:

$$R = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}} \quad \dots(1)$$

Where:

X = socio-economic characteristics of the respondent

y = access to ICTs gadget

n = Sample size

\sum = sign of summation

RESULTS AND DISCUSSION

Awareness, Use and Accessibility of ICTs in Disseminating Agricultural Information

The study described the awareness, utilisation and accessibility of ICTs in disseminating agricultural information. The result is presented in Table 1.



Table 1: Awareness, Use and Accessibility of ICTs in Disseminating Agricultural Information by Maize Farmers

Variables	Local government areas			Total
	Mangu	Bokkos	Kanam	
Awareness of ICTs				
Yes	34 (87.20)	38 (97.40)	21 (95.50)	93 (93.00)
No	5 (12.80)	1 (2.60)	1 (4.50)	7 (7.00)
Possession and Use of ICTs				
Mobile phone	17 (43.60)	23 (59.00)	11 (50.00)	51 (51.00)
Radio	10 (25.60)	7 (17.90)	7 (31.80)	24 (24.00)
Television	11 (28.20)	8 (20.50)	3 (13.60)	22 (22.00)
Accessibility to ICTs gadgets				
Mobile phone	3.15	3.28	3.18	3.20
Radio	2.56	2.03	2.36	2.32
Television	3.62	3.69	3.64	3.65
Computer	3.62	3.13	3.50	3.42

Source: Field Survey, 2023

Threshold: 2.50

The results in Table 2 revealed that most (93.00%) of the respondents affirmed being aware of information and communication technologies, while only 7.00% of them claimed were not aware of the ICTs. The results also revealed that 51.00% of the respondents had and use mobile phones, while 24.00%, 22.00% and 3.00% had a radio, Television and computers, respectively.

The results further revealed that the respondents had access to radio, television, and mobile phones with mean scores of 3.65, 3.42, and 3.20, respectively. This implies that access to radio as ICTs may be a result of the fact that it is cheaper and has a high frequency that accommodates a network. Also, a transistor radio does not require power but has batteries that are common and affordable, in addition to its flexibility.

Mobile phones offer flexible and wider means of communication among the populace. It has many social platforms that ease communication with minimal costs. Mobile phones offer opportunities for both pictorial, voice, and motion information, making it more relevant in disseminating agricultural information. Agricultural size hosts research technologies that could be accessed by farmers freely.

Television is also accessible by the farms perhaps because they are relatively cheaper. Because of the ability to present motion pictures and voice messages, it is good for passing out information. Farmers learn a lot from agricultural programmes presented on Television in addition to other programmes of societal and social interest.

The majority of maize farmers appear to be aware of the potential benefits of technology in enhancing their farming practices, as evidenced by the high percentage of respondents (93.00%) who reported having some awareness of the technology. Awareness is a crucial first step towards adoption, as it helps farmers comprehend the benefits of using technology for communication, information access, and decision-making. This goes in line with the findings of Lawal *et al.* (2022), who found that farmers' willingness to adopt and use these technologies to improve agricultural productivity is strongly influenced by their awareness of ICTs.

The finding that 51.00% of the respondents had and used mobile phones highlights the widespread penetration of this technology among maize farmers. Mobile phones are versatile tools that facilitate communication, access to market information, weather forecasts, and extension services. Mobile phones are the most commonly used ICT tools among Nigerian farmers, providing them with essential information that can improve farm management and productivity. This is in line with Adebayo and Adesina (2021), who found that mobile phones are critical for disseminating agricultural information and enabling farmers to access vital resources and support.

Furthermore, Televisions and radios, which are owned by 22.00% and 24.00% of respondents respectively, also had a big impact. With the use of these instruments, farmers can improve their knowledge and practices by broadcasting agricultural programmes, market updates, and instructional



content. Especially radios are good at reaching large audiences, even those who live in distant places. Ezeh and Nwankwo's (2021) findings stated that radio and television play a crucial role in providing farmers with agricultural information, hence aiding in their endeavours to enhance crop yields and optimise farming operations.

Relation between Socio-economic Characteristics of Farmers and Their Access to ICTs or Dissemination of Agricultural Information

The study determined the relationship between the socio-economic parameters and access to ICTs by the maize farmers. This was achieved via correlation. The result is presented in Table 2. The results in Table 2 show that age positively and significantly correlated with access to computers (0.048) and radio (0.105). Marital status, however, negatively and significantly correlated with access to computers (-0.045) and radio (-0.254), but positively and significantly correlated with access to mobile phones (0.210) and television (0.200). Household size shows a positive and significant correlation with access to computers (0.092) by the farmers, however, negative and significant with radio access (-0.046) and television (-0.117).

Education revealed a significant relationship with access to mobile phones (-0.274). Education influences the economic decisions of an individual. Therefore, enlightened people had higher incomes and, hence, can easily have access and the capacity to acquire ICTs gadgets. The result of farm size shows a significant correlation with mobile phones (-0.269), computers (-0.210), radio (0.056), and television (-0.218). This means that the larger the farm size of a respondent, the more likely they are to have expanded enterprise, with the consequence of increased income. This can favour access to ICTs.

The source of capital significantly correlates with the computer (0.241), radio (-0.260), and television (-0.107). The more an individual has access to capital he or she will be able to access ICTs gadgets.

Occupation of the respondent significantly correlates with mobile phone (0.123). Communication is an important factor in the well-being of every occupation. Mobile provides a significant platform for information dissemination by organizations, agencies, and groups of friends, among others. This enhances productivity by curbing time.

Table 2: Relationship between Socio-economic Characteristics of Farmers and their Access to ICTs for Dissemination of Agricultural Information

Socio-economic characteristics	Access to ICTs			
	Mobile phone	Computer	Radio	Television
Age	-0.015	0.048 *	0.105 **	0.014
Marital status	0.210 **	-0.045*	-0.254**	0.200 **
Household size	-0.015	0.092**	-0.046*	-0.117**
Education	-0.294**	-0.015	0.017	-0.006
Farm size	-0.269**	-0.210**	0.056**	-0.218**
Source of capital	-0.022	0.241**	-0.260**	-0.107**
Occupation	0.123**	-0.033	-0.023	0.010

Source: Field Survey, 2023

Factors Influencing Use of ICTs by the Respondents

The study determined the factors that influence the use of ICTs by maize farmers. The results are presented in Table 3. The income level of the respondent, price (phone), individual differences, inadequate power supply, and availability influence the use of phones with mean scores of 2.98, 2.73, 2.55, 2.70 and 2.78, respectively. Similarly, the use of computers is influenced by the income level of the farmers, the price of the computer, individual differences, level of knowledge, inadequate power supply, and availability and flexibility of the computer, with mean scores of 3.32, 3.57, 2.50, 3.45, 2.73, 2.96 and 2.53, respectively.

In addition, the use of radio is influenced by individual differences, with mean scores of 3.13, availability (3.14) and flexibility (2.90), implying that they influence the use of the radio by the respondents. The result may be that most phones now have radio stations, so they pay less attention to



the use of transistor radios. On Television, the income level of the farmer and inadequate power supply are significant in influencing the use of television by the farmers. The result of the study demonstrates that the income level of the farmers is an important factor in the use of ICTs. The affordability of the ICT depends largely on the level of income of the farmer. The price of the ICTs gadget is also a significant factor in the use of ICTs, except for radio. This result is true in the sense that the income of an individual and price determine the amount and quality of goods and services consumed.

Table 3: Factors Influencing the Use of ICTs by Maize Farmers

S/n	ICTs gadget	Factors	Mean score sheet			
			Mangu	Bokkos	Kanam	Average
1.	Mobile Phone	Income Level	2.92	3.03	3.00	2.98
		Price of The Phone	3.00	2.13	3.05	2.73
		Individual Difference (Taste)	2.54	2.74	2.36	2.55
		Level of Knowledge	2.44	2.44	2.50	2.46
		Inadequate Power Supply	2.59	2.74	2.77	2.70
		Availability	2.74	2.74	2.86	2.78
		Flexibility	2.51	2.51	2.45	2.49
2.	Computer	Income Level	3.36	3.36	3.23	3.32
		Price of The computer	3.51	3.51	3.68	3.57
		Individual Difference (Taste)	2.38	3.38	2.73	2.50
		Level of Knowledge	3.38	3.38	3.59	3.45
		Inadequate Power Supply	2.71	2.72	2.77	2.73
		Availability	3.08	3.07	2.73	2.96
		Flexibility	2.64	2.64	2.27	2.52
3.	Radio	Income Level	1.95	2.10	2.00	2.02
		Price of The Radio	1.95	1.74	1.73	1.81
		Individual Difference (Taste)	3.15	3.15	3.09	3.13
		Level of Knowledge	2.00	2.00	1.91	1.97
		Inadequate Power Supply	2.46	2.46	2.55	2.49
		Availability	3.15	3.21	3.05	3.14
		Flexibility	2.82	2.92	2.95	2.90
4.	Television	Income Level	3.00	2.87	3.05	2.97
		Price of The Television	3.15	3.23	3.32	3.23
		Individual Difference (Taste)	1.94	1.82	2.23	2.00
		Level of Knowledge	1.97	2.00	1.95	1.93
		Inadequate Power Supply	3.38	3.38	3.41	3.39
		Availability	2.49	2.61	1.95	2.35
		Flexibility	2.21	2.59	2.59	2.33

Source: Field Survey, 2023

Constraints to Use of ICTs in the Dissemination of Agricultural Information

The results in Table 4 revealed that most (96.00%) of respondents reported that high cost of ICT gadgets was the major constraint to the use of ICTs in the dissemination of Agricultural information. This was followed by a poor power supply (93.00%), low level of knowledge and high cost of air time/data constituted 77.00% and 75.00%, respectively.

The implication of high cost of ICTs devices as a primary obstacle is a good indicator of the monetary hurdles preventing certain people from accessing necessary technologies. In rural areas, where farmers frequently have minimal financial resources, this problem is especially acute as posited by Oladele and Afolayan (2020) who asserted that, one important factor influencing smallholder farmers' adoption and usage of ICTs is their cost. Due to exorbitant prices, many farmers are unable to buy the equipment they need, which restricts their access to vital agricultural services and information.



The results indicates that a prevalent issue in numerous rural regions is the limited power supply, as reported by 73% of participants. Ensuring persistent access to information and charging ICTs devices require dependable electricity. Insufficient power supply impairs the functionality of computers, radios, televisions, and cell phones. The adoption of ICTs in rural agricultural communities is severely hampered by insufficient infrastructure, especially unstable energy, as noted by Adejumbi and Ogunlade (2022).

According to the results, 77.00% of the respondents view inadequate ICTs knowledge as a major barrier. This emphasizes how farmers must become more digitally literate to use ICTs tools efficiently. To close this knowledge gap, educational initiatives, and training programmes are crucial. Adebayo *et al.* (2021) claim that raising farmers' levels of digital literacy can help them become more adept at using ICTs tools, which will maximise the advantages of technology in farming.

Using ICTs is a big barrier for maize farmers because of the high cost of data and airtime. Farmers may be discouraged from routinely use of smartphones, the internet, and other digital tools that are necessary to obtain market pricing, weather updates, agricultural information, and extension services due to these costs. Consequently, farmers can overlook vital information that could improve their decision-making and output. This finding is in tandem with the report by Ojo and Adebayo (2021) which highlights that the high cost of airtime and data is a significant impediment to the effective use of mobile phones and other ICTs tools among smallholder farmers in Nigeria. It indicates that the financial burden of maintaining continuous connectivity restricts farmers' access to vital agricultural information, ultimately affecting their productivity and livelihood, which suggests that reducing the cost of airtime and data through policy interventions and subsidies could significantly enhance ICTs adoption and utilization among farmers.

Table 4: Constraints to the Use of ICTs in Dissemination of Agricultural Information

Constraints	Mangu	Bokkos	Kanam	Total
High cost of ICT Gadget	37 (94.90)	38 (94.90)	21 (95.50)	96 (96.00)
Low level of knowledge	27 (69.20)	33 (84.62)	17 (77.30)	77 (77.00)
High cost of airtime/data	26 (66.70)	33 (84.60)	16 (72.70)	75 (75.00)
Poor power supply	35 (89.70)	38 (97.43)	20 (90.90)	93 (93.00)

Source: Field Survey, 2023

Figures in parentheses are the percentages

CONCLUSION AND RECOMMENDATION

The study concluded that majority of the farmers are aware of the use of information communication technology for dissemination of agricultural information. The farmers have access to mobile phone, television and computer and are effective in dissemination of agricultural information. The socio-economic characteristics of the farmers significantly correlate with access and use of ICT for dissemination of agricultural information were level of income of the farmers, price of the ICT gadget, taste, inadequate power supply and flexibility influence the use of ICT in dissemination of agricultural information. High cost of gadget and poor power supply are the highest-ranking constraints of use of ICT for agricultural purposes by the farmers.

The following recommendations were made based on the study:

- Farmers should diversify sources of income to increase their purchasing power to enable them access ICTs gadgets for informed agricultural innovations.
- Farmers subscribe to independent sources of power such as solar, and use a smaller generator to power ICT gadgets for effective use and dissemination of agricultural activities. Also, rural electronic programmes by government and non-governmental organisations (NGOs) may help in connecting farmers in the rural areas to national grid.
- Farmers should join cooperative organizations to access soft loans to enable them to purchase ICT gadgets which can assist them in their maize agro-businesses.



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